

**LANDMARK VILLAGE – PHASE 2
L'HERITAGE DRIVE, SARNIA
TRAFFIC IMPACT ASSESSMENT**

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March, 2020**



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LANDMARK VILLAGE – PHASE 2 L'HERITAGE DRIVE, SARNIA

TRAFFIC IMPACT ASSESSMENT

1. INTRODUCTION AND BACKGROUND

The Steeves & Rozema Group has proposed the development of Phase 2 of the Landmark Village property. Phase 2 will consist of 76 townhouse units adjacent to the existing Phase 1 development. The location of the site is shown in Figure 1.

Access to the site will be available via the existing right turns only access off Exmouth Street and via L'Heritage Drive from Lambton Mall Road. After discussions with County and City staff, it was agreed that the potential impacts on the intersections of Lambton Mall Road with Exmouth Street and London Road would not be significant enough to warrant an assessment of these two intersections. Accordingly, this study focused on an analysis of existing and projected peak hour conditions at the intersection of Lambton Mall Road and L'Heritage Drive.

2. EXISTING CONDITIONS

Lambton Mall Road is a four lane arterial street with a posted speed limit of 50km/h. It connects Exmouth Street to London Road, both major east-west arterial streets. It also provides access to the Lambton Mall, a regional shopping centre. L'Heritage Drive to the west of Lambton Mall Road is a two lane local street which provides access to the Landmark seniors' residence and to a small office commercial development. The office commercial development has an internal private driveway which connects L'Heritage Drive to Exmouth Street.

The intersection of Lambton Mall Road and L'Heritage Drive is controlled by stop signs on the east and west approaches. Both of these approaches are wide enough to accommodate two lanes of traffic. For the purposes of this study, the lane configuration on each of the minor approaches was assumed to be an exclusive left turn lane plus a shared through and right turn lane. Each of the



approaches on Lambton Mall Road has two lanes – a shared through and right turn lane and a shared through and left turn lane.

For the purposes of this study, an eight hour turning movement count was made at the intersection of Lambton Mall Road and L'Heritage Drive on Thursday, February 27. Peak hour turning movements derived from this count are shown in **Figure 2**. The count report is contained in Appendix A.

3. PROPOSED DEVELOPMENT

The site plan for the proposed townhouse development is shown in **Figure 3**. The development will be complementary to the existing seniors' apartments on the same site. The units will be marketed to seniors and empty nesters.

Estimates of peak hour vehicle trip generation were based on data contained in the Institute of Transportation Engineers (ITE) Trip Generation Manual, Tenth Edition. While the manual contains rates for various types of retirement residences, in this case it was considered to be prudent to use the rates for typical townhouse developments. The resulting trip generations, therefore, are likely to be conservative.

Estimated peak hour vehicle trip generation was obtained through the use of regression equations for ITE Land Use 220, Multifamily Housing (Low-Rise). For the proposed 76 units, morning peak hour trip generation would be 37 vehicles, 8 entering and 29 leaving, and for the afternoon peak hour, 46 vehicles, 29 entering and 17 leaving.

Figure 4 shows the assignment of these peak hour trips. It is estimated that, in the afternoon peak hour, 9 trips would use the right turns only access to Exmouth Street while 20 trips would pass through the intersection of Lambton Mall Road and Exmouth Street. Similarly, in the afternoon peak hour, 14 trips were assigned to the intersection of London Road and Lambton Mall Road.

As noted above, it was agreed with City and County staff that the incremental volumes assigned to the two major intersections were not large enough in comparison with existing volumes to cause any significant impact on the operation of these intersections.



4. PROJECTED TRAFFIC

City staff made available a turning movement count made at the intersection of Exmouth Street and Lambton Mall Road in October, 2016. A copy of that count is contained in Appendix A. A comparison of traffic volumes in the mid-day and afternoon peak hours for the section of Lambton Mall Road between Exmouth Street and L'Heritage Drive showed that total two-way volumes were 28 percent lower in 2020 than in 2016 in the mid-day peak hour. In the afternoon peak hour, the decrease was 13 percent.

This comparison suggests that peak hour traffic volumes on Lambton Mall Road have gone down in recent years. However, bearing in mind that one-day counts merely provide a snapshot of on-going activity, it was determined that a traffic growth factor of one percent per year would be appropriate.

It is anticipated that the proposed development would be fully built-out by 2022. Existing traffic volumes from **Figure 2** were projected to 2022 and to 2027, five years beyond build-out, assuming a one percent growth rate. The projected background volumes are shown in **Figures 5 and 6**. Site generated traffic from **Figure 4** was added to these background volumes to give total projected peak hour traffic volumes as shown in **Figures 7 and 8**.

5. ANALYSIS

Existing and projected peak hour traffic volumes at the intersection of Lambton Mall Road and L'Heritage Drive were analyzed for delays, volume to capacity (v/c) and queue lengths using the Synchro 10 analysis program. The results of the analysis are summarized in **Table 1**. Analysis reports are contained in Appendix B.

Level of service is a measure of how well an intersection operates under prevailing traffic conditions. It is expressed on a scale of A to F where A is the highest level of service and F indicates unacceptable congestion and delay. Level of service is measured in terms of average delay to all vehicles passing through the intersection in the peak hour.

Under existing conditions, the intersection operates at a good level of service with the exception of the left turn movement from L'Heritage Drive to Lambton



Mall Road. The analysis indicates that this movement currently operates in the afternoon peak hour at level of service E with an average delay of 38 seconds.

Under projected 2022 and 2028 afternoon peak hour conditions, average delay for this movement would increase to 48.8 and then to 60.7 seconds. The number of vehicles waiting to make the left turn would increase to over three for 95 percent of the time in the peak hour. Morning peak hour delays would be much less, resulting in a good level of service for this movement. All other movements through the intersection would operate at a good level of service under projected morning and afternoon peak hour conditions.

A preliminary review indicates that the volumes on the minor street approaches to the intersection are too low to warrant consideration of signalization of the intersection

It is likely that, faced with potential delay at Lambton Mall Road, drivers exiting the proposed development would opt to use the right turn only exit to Exmouth Street. This movement does not conflict with other movements and is subject only to acceptable gaps in the eastbound traffic flow on Exmouth Street.

6. SUMMARY AND CONCLUSIONS

The proposed 76 unit townhouse development will generate 37 vehicle trips in the morning peak hour and 46 vehicle trips in the afternoon peak hour. These estimates are likely to be conservative if the development is occupied by seniors and empty nesters as planned.

Most of the site generated traffic would use the L'Heritage Drive to access Lambton Mall Road. The volume of site generated traffic passing through the intersections of Lambton Mall Road with Exmouth Street and London Road would be insufficient to have any significant impact.

The intersection of Lambton Mall Road and L'Heritage Drive would operate at a good level of service under projected peak hour conditions with the exception of the left turn movement from L'Heritage Drive to Lambton Mall Road in the afternoon peak hour. Faced with delays, drivers are likely to avoid this movement and use the right turn only exit to Exmouth Street.



No improvements would be required at the intersection of Lambton Mall Road and L'Heritage Drive. Signalization is not a consideration due to the low volumes on the minor street approaches.





Figure 1
Area Plan

300 m

Site

Howard Watson Nature Trail

16

Pontiac Ct

Willa Ct

Pontiac Dr

Logan St

Willa Dr

Isabella St

Isabel St

Google Earth

© 2019 Google

402

Quinn Dr

Barelay Dr

Esplanade

Lambton Mall Rd

Heritage Dr

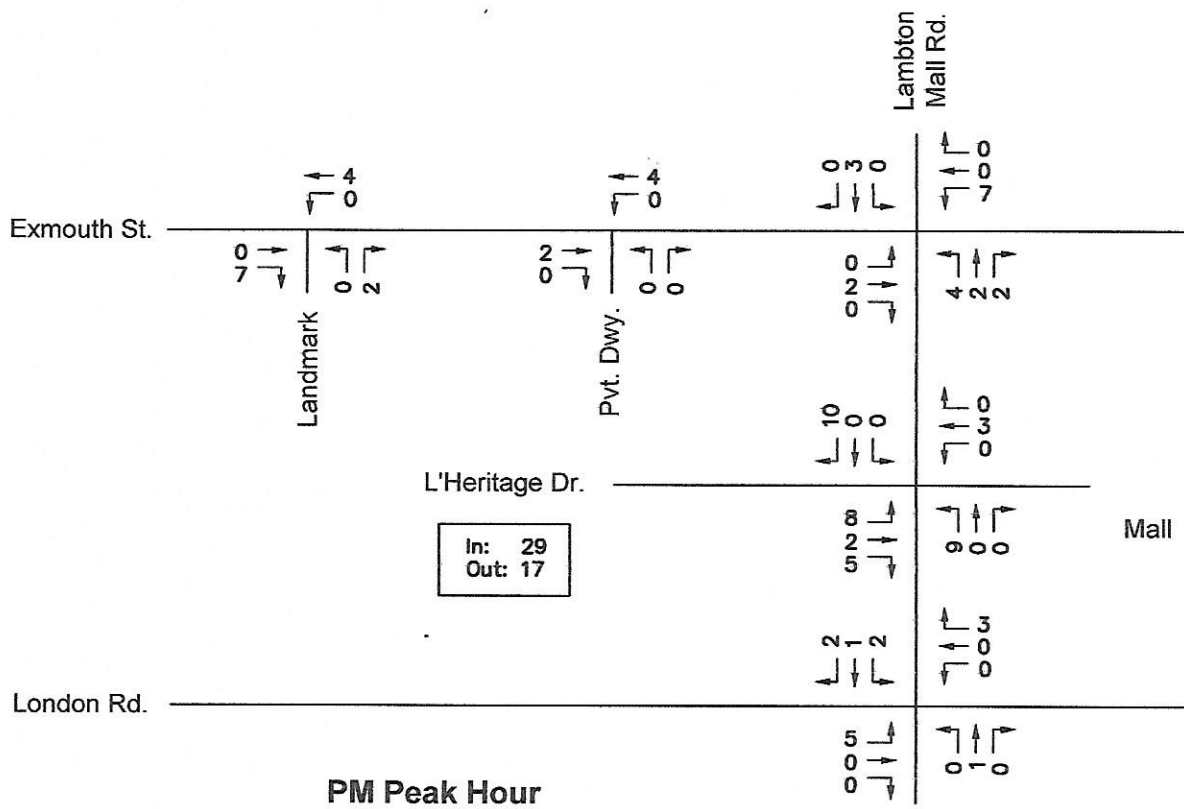
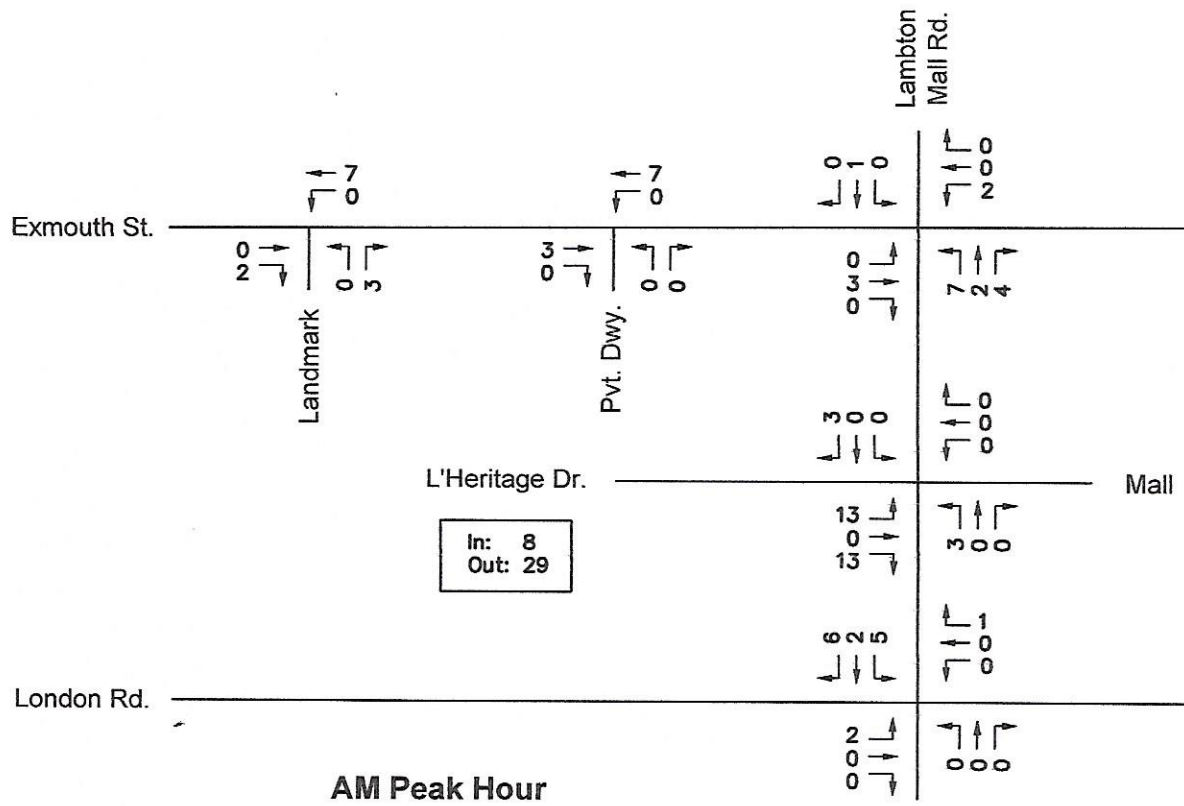


Figure 4
Site Generated Traffic

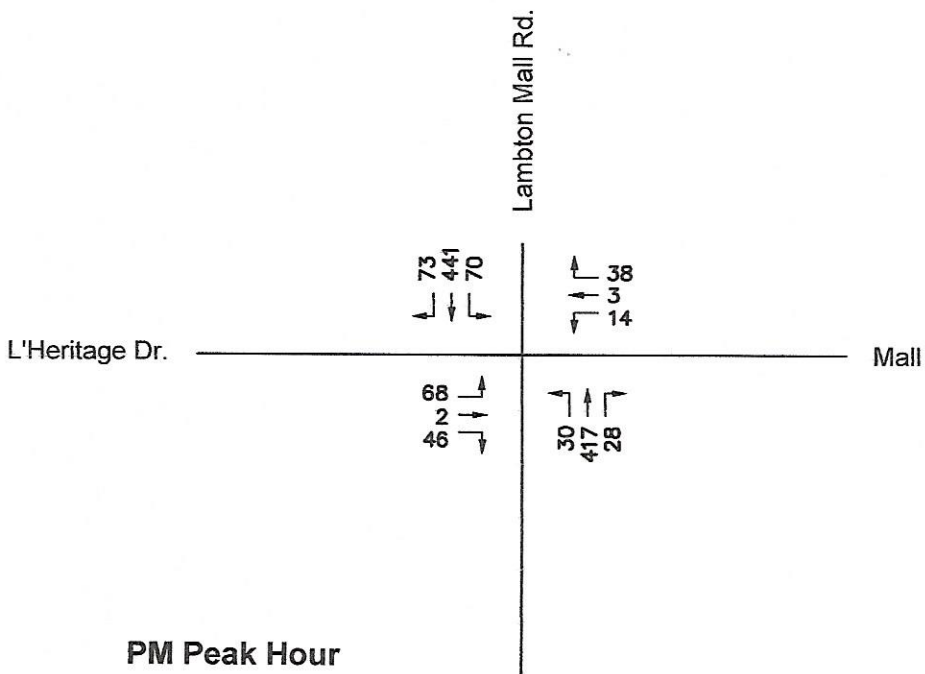
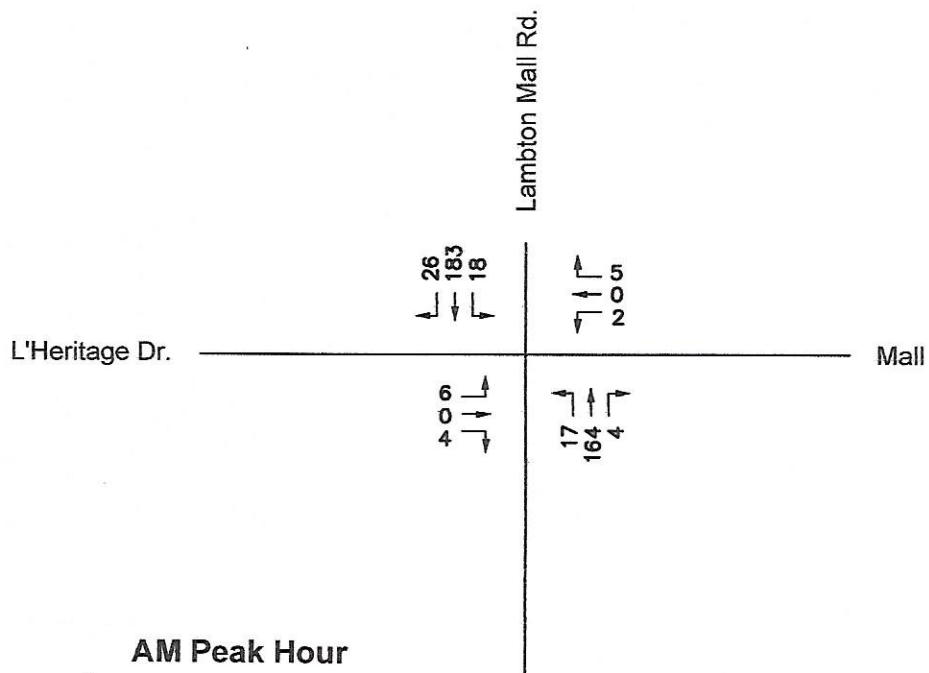


Figure 5
Background Traffic 2022

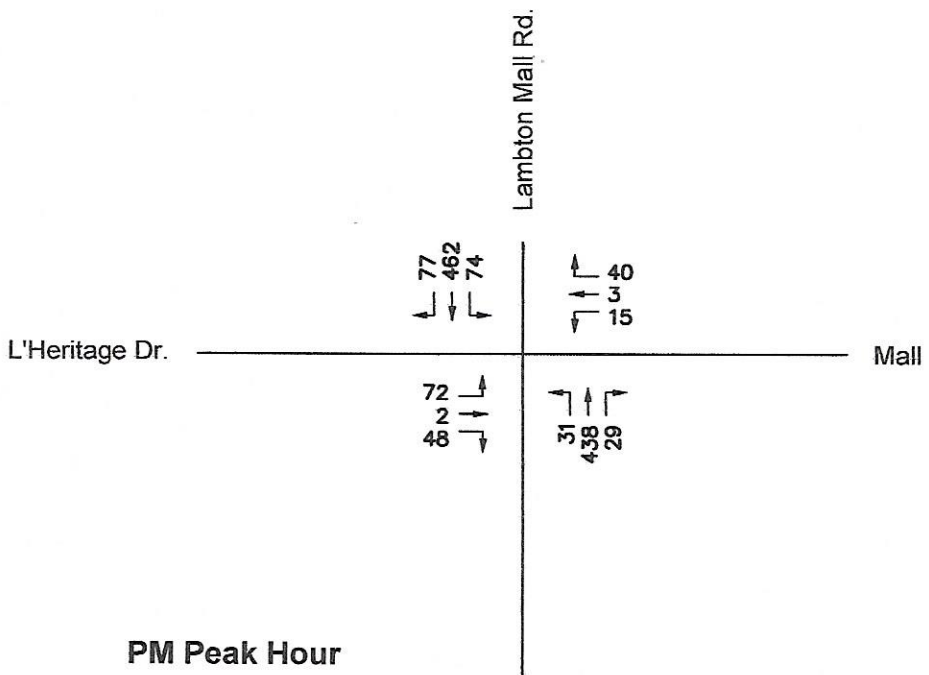
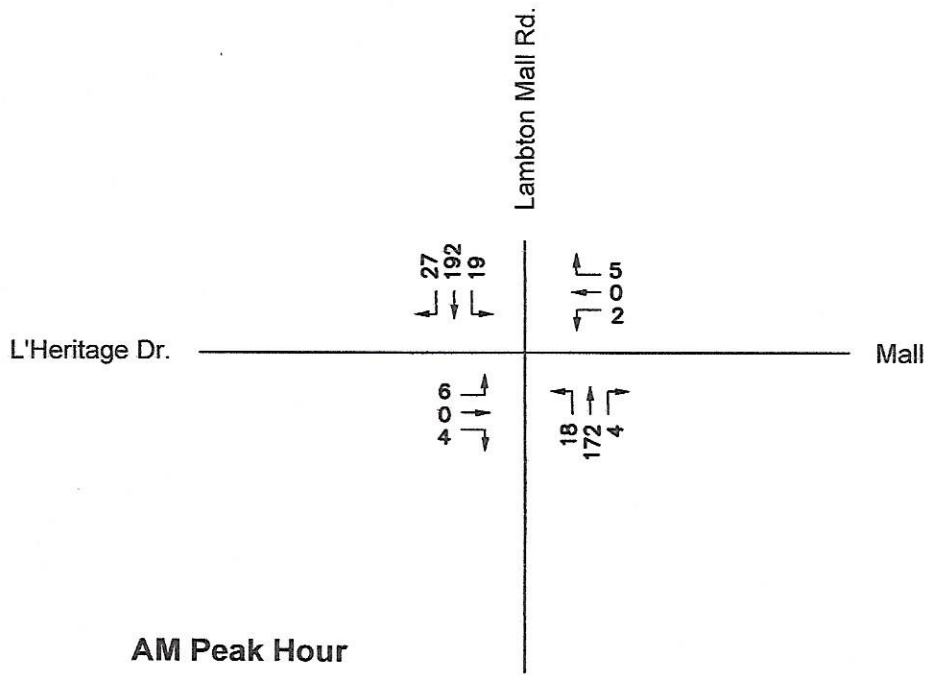


Figure 6
Background Traffic 2027

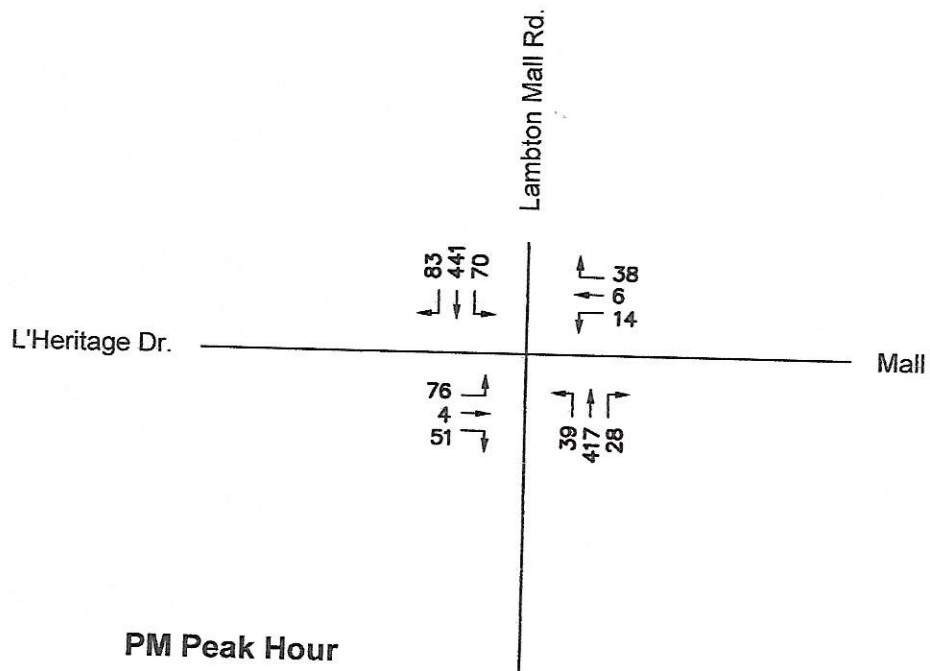
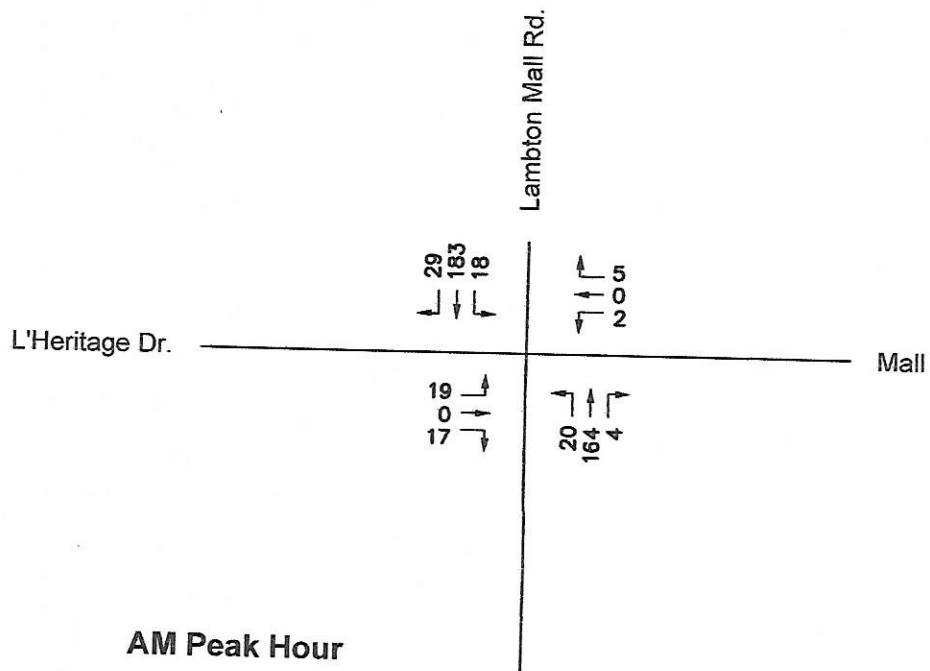


Figure 7
Total Traffic 2022

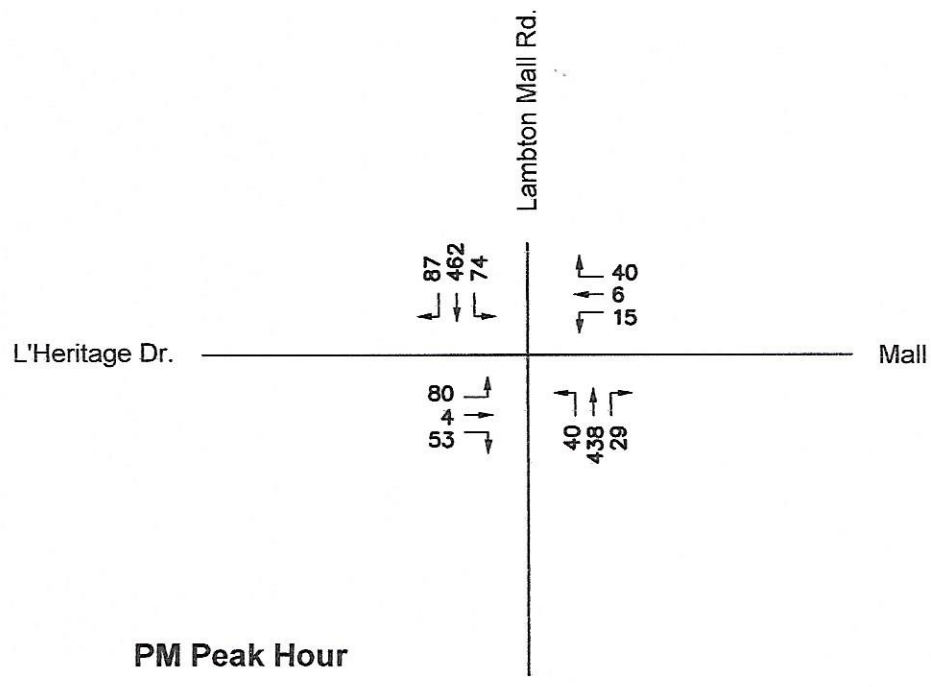
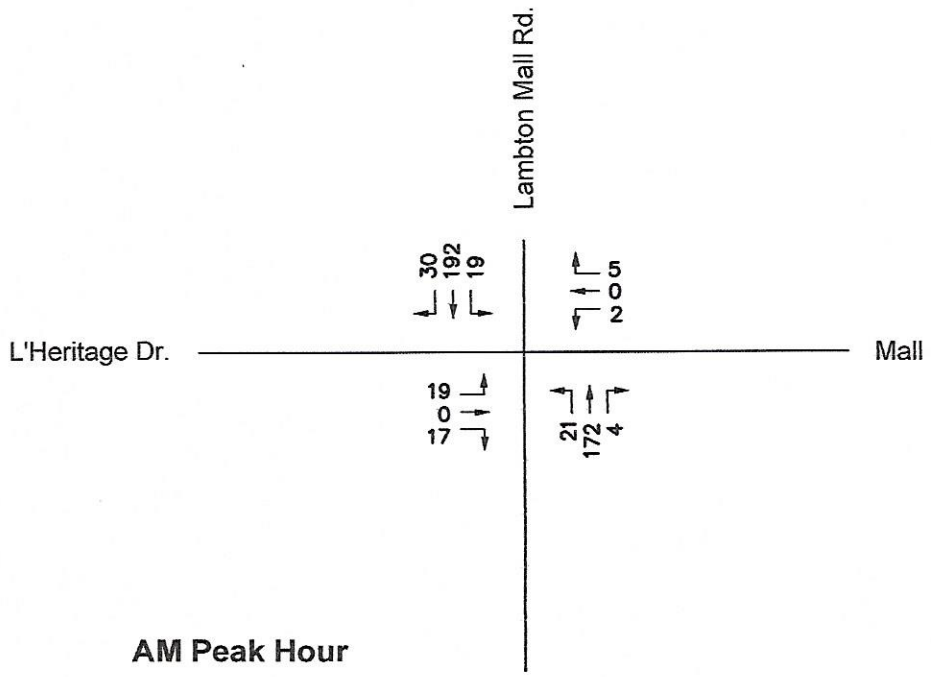


Figure 8
Total Traffic 2027

Intersection	AM Peak Hour				PM Peak Hour			
	v/c	Del.	LofS	Q	v/c	Del.	LofS	Q
Existing 2020								
Eastbound L	0.01	11.7	B	0.0	0.41	38.0	E	1.8
Eastbound TR	0.01	8.9	A	0.0	0.08	11.2	B	0.3
Westbound L	0.00	11.4	B	0.0	0.08	25.6	D	0.3
Westbound TR	0.01	8.8	A	0.0	0.07	11.6	B	0.2
Northbound LT	0.01	7.7	A	0.0	0.03	8.6	A	0.1
Northbound TR	0.00	0.0	A	0.0	0.00	0.2	A	0.0
Southbound LT	0.01	7.6	A	0.0	0.07	8.6	A	0.2
Southbound TR	0.00	0.1	A	0.0	0.00	0.3	A	0.0
Ave. Intersection Delay		1.1				4.1		
LofS		A				A		
Total Traffic 2022								
Eastbound L	0.04	12.1	B	0.1	0.51	48.8	E	2.5
Eastbound TR	0.02	9.0	A	0.1	0.11	12.3	B	0.4
Westbound L	0.00	11.7	B	0.0	0.09	28.1	D	0.3
Westbound TR	0.01	8.8	A	0.0	0.10	13.4	B	0.3
Northbound LT	0.02	7.7	A	0.1	0.04	8.8	A	0.1
Northbound TR	0.00	0.1	A	0.0	0.00	0.2	A	0.0
Southbound LT	0.01	7.6	A	0.0	0.07	8.6	A	0.2
Southbound TR	0.00	0.1	A	0.0	0.00	0.3	A	0.0
Ave. Intersection Delay		1.7				5.1		
LofS		A				A		
Total Traffic 2027								
Eastbound L	0.04	12.4	B	0.1	0.59	60.7	F	3.1
Eastbound TR	0.02	9.0	A	0.1	0.12	12.6	B	0.4
Westbound L	0.00	11.9	B	0.0	0.11	30.8	D	0.3
Westbound TR	0.01	8.8	A	0.0	0.11	13.9	B	0.4
Northbound LT	0.02	7.8	A	0.1	0.05	8.9	A	0.1
Northbound TR	0.00	0.1	A	0.0	0.00	0.2	A	0.0
Southbound LT	0.02	7.6	A	0.0	0.08	8.7	A	0.2
Southbound TR	0.00	0.1	A	0.0	0.00	0.4	A	0.0
Ave. Intersection Delay		1.7				6.0		
LofS		A				A		

Note: Del. - ave. delay (secs.)
LofS - level of service
v/c - volume to capacity ratio
Average Intersection Delay (secs.)
Q - maximum queue length (vehicles)
(95th percentile)

Table 1

**Level of Service
Lambton Mall Road and
L'Heritage Drive**

APPENDIX A
TRAFFIC COUNTS



Lambton Mall Rd @ L'Heritage Dr

Morning Peak Diagram

Specified Period

From: 7:00:00

To: 9:00:00

One Hour Peak

From: 8:00:00

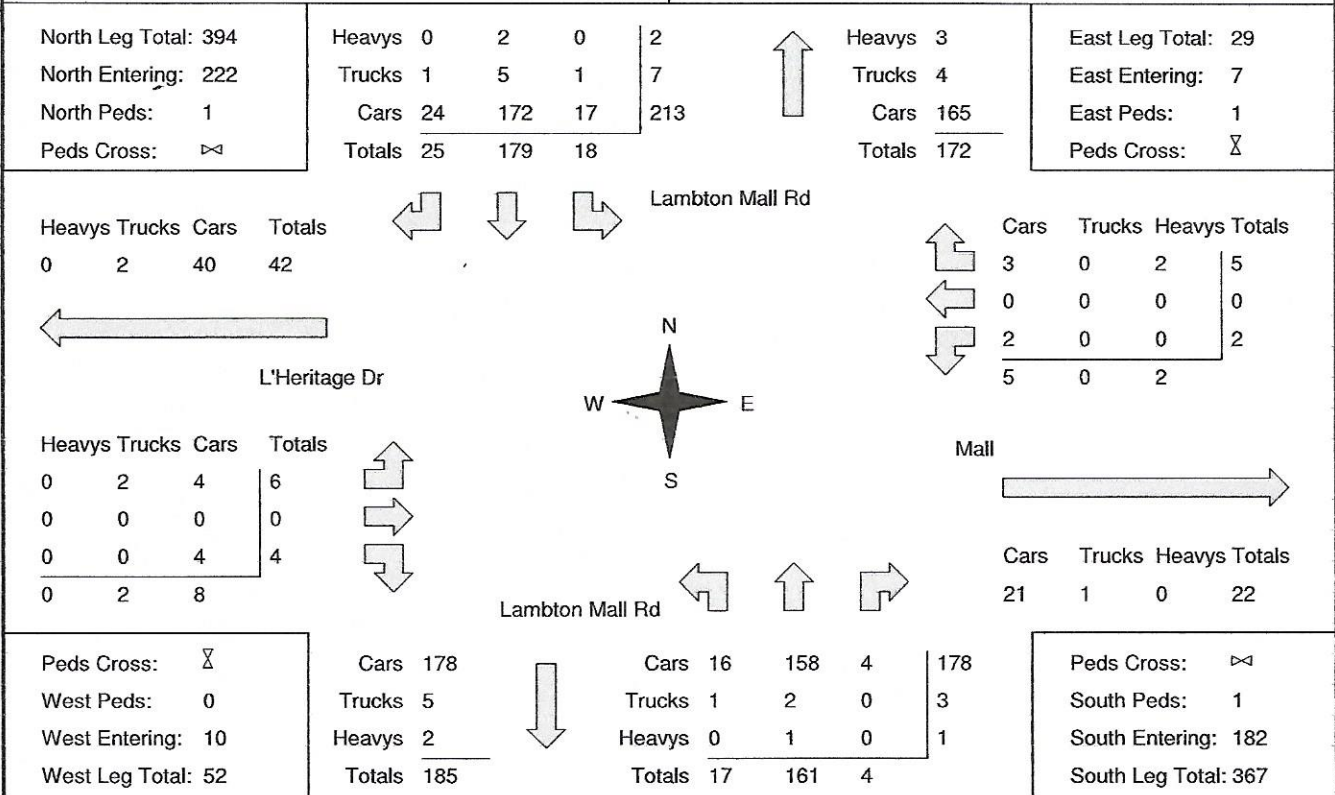
To: 9:00:00

Municipality: Sarnia
Site #: 0000000001
Intersection: Lambton Mall Rd & L'Heritage Dr
TFR File #: 1
Count date: 27-Feb-2020

Weather conditions:
 Overcast/Wet
Person(s) who counted:
 Matt

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

Major Road: Lambton Mall Rd runs N/S



Comments

Lambton Mall Rd @ L'Heritage Dr

Mid-day Peak Diagram

Specified Period

From: 11:00:00

To: 14:00:00

One Hour Peak

From: 12:00:00

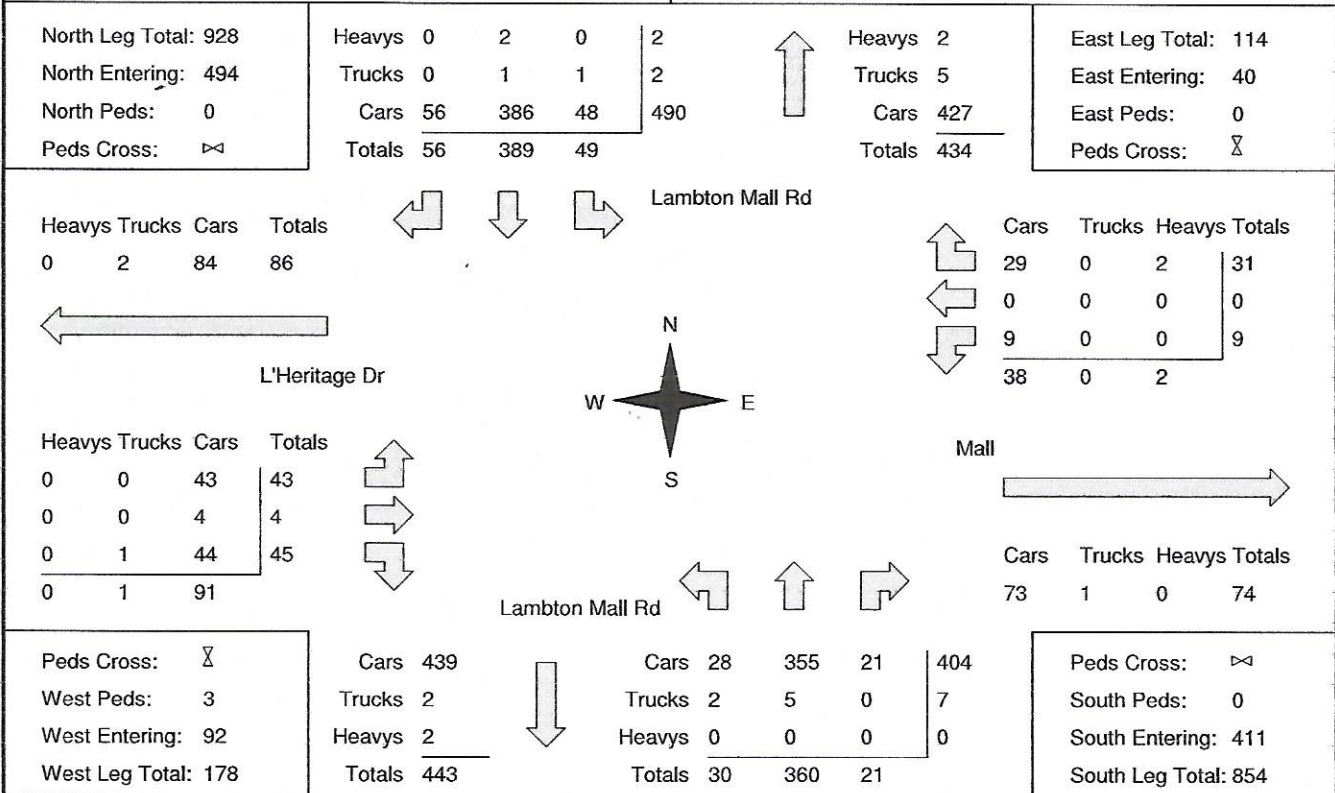
To: 13:00:00

Municipality: Sarnia
Site #: 0000000001
Intersection: Lambton Mall Rd & L'Heritage Dr
TFR File #: 1
Count date: 27-Feb-2020

Weather conditions:
 Overcast/Wet
Person(s) who counted:
 Matt

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

Major Road: Lambton Mall Rd runs N/S



Comments

Lambton Mall Rd @ L'Heritage Dr

Afternoon Peak Diagram

Specified Period

From: 15:00:00

To: 18:00:00

One Hour Peak

From: 16:30:00

To: 17:30:00

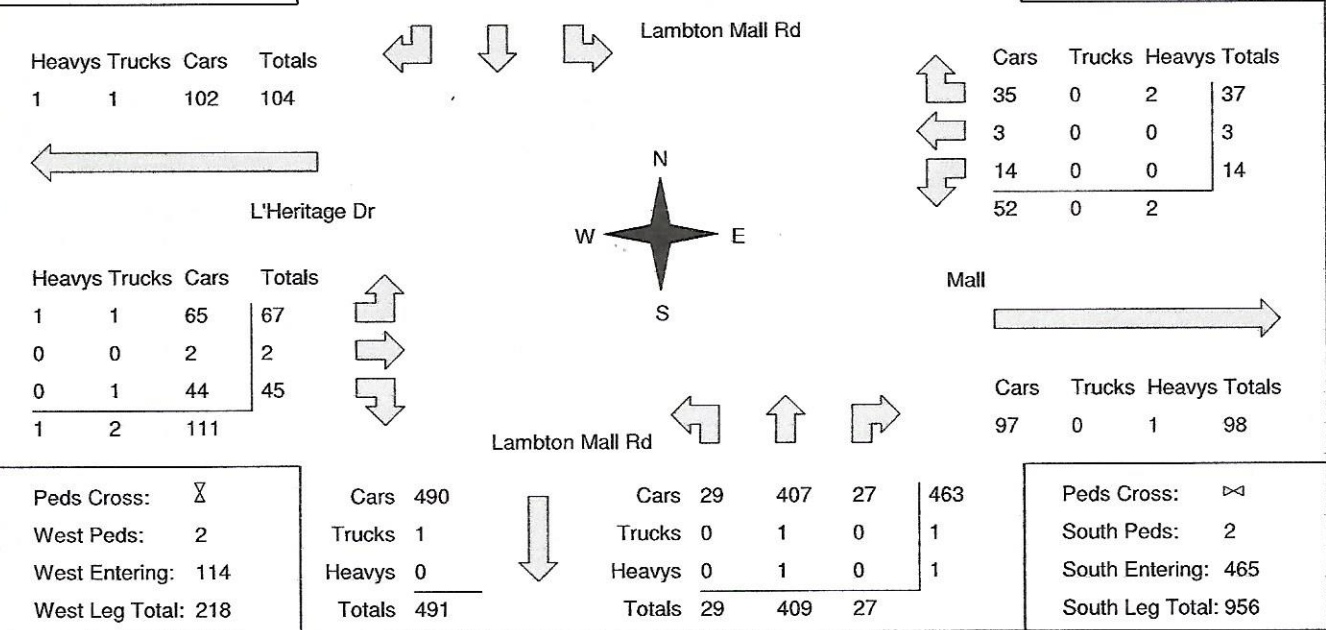
Municipality: Sarnia
Site #: 0000000001
Intersection: Lambton Mall Rd & L'Heritage Dr
TFR File #: 1
Count date: 27-Feb-2020

Weather conditions:
 Overcast/Wet
Person(s) who counted:
 Matt

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

Major Road: Lambton Mall Rd runs N/S

North Leg Total: 1086 North Entering: 573 North Peds: 0 Peds Cross: ∞	<table style="border-collapse: collapse;"> <tr><td>Heavys</td><td>1</td><td>0</td><td>1</td><td>2</td></tr> <tr><td>Trucks</td><td>1</td><td>0</td><td>0</td><td>1</td></tr> <tr><td>Cars</td><td>70</td><td>432</td><td>68</td><td>570</td></tr> <tr><td>Totals</td><td>72</td><td>432</td><td>69</td><td></td></tr> </table>	Heavys	1	0	1	2	Trucks	1	0	0	1	Cars	70	432	68	570	Totals	72	432	69		↑	<table style="border-collapse: collapse;"> <tr><td>Heavys</td><td>4</td></tr> <tr><td>Trucks</td><td>2</td></tr> <tr><td>Cars</td><td>507</td></tr> <tr><td>Totals</td><td>513</td></tr> </table>	Heavys	4	Trucks	2	Cars	507	Totals	513	East Leg Total: 152 East Entering: 54 East Peds: 1 Peds Cross: ∞
Heavys	1	0	1	2																												
Trucks	1	0	0	1																												
Cars	70	432	68	570																												
Totals	72	432	69																													
Heavys	4																															
Trucks	2																															
Cars	507																															
Totals	513																															



Comments

Lambton Mall Rd @ L'Heritage Dr

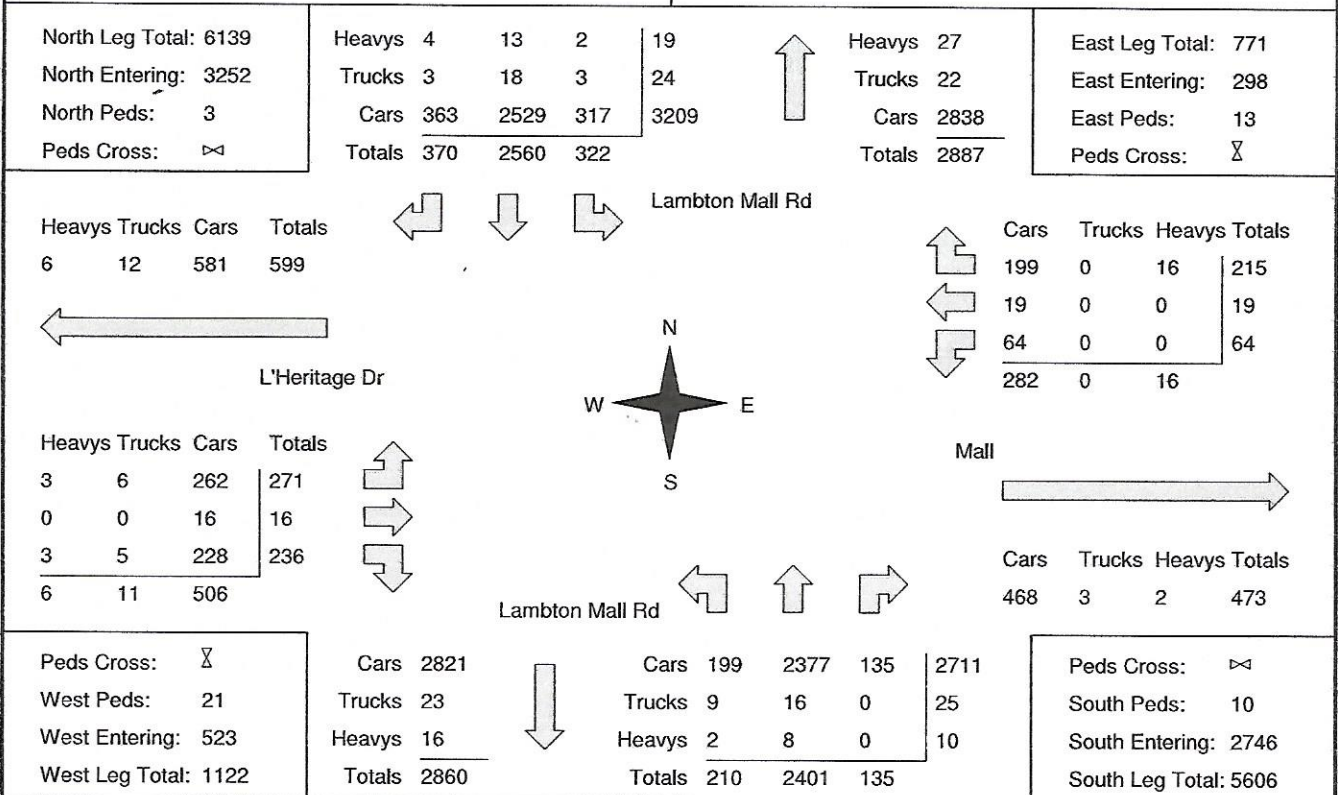
Total Count Diagram

Municipality: Sarnia
Site #: 0000000001
Intersection: Lambton Mall Rd & L'Heritage Dr
TFR File #: 1
Count date: 27-Feb-2020

Weather conditions:
 Overcast/Wet
Person(s) who counted:
 Matt

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

Major Road: Lambton Mall Rd runs N/S



Comments

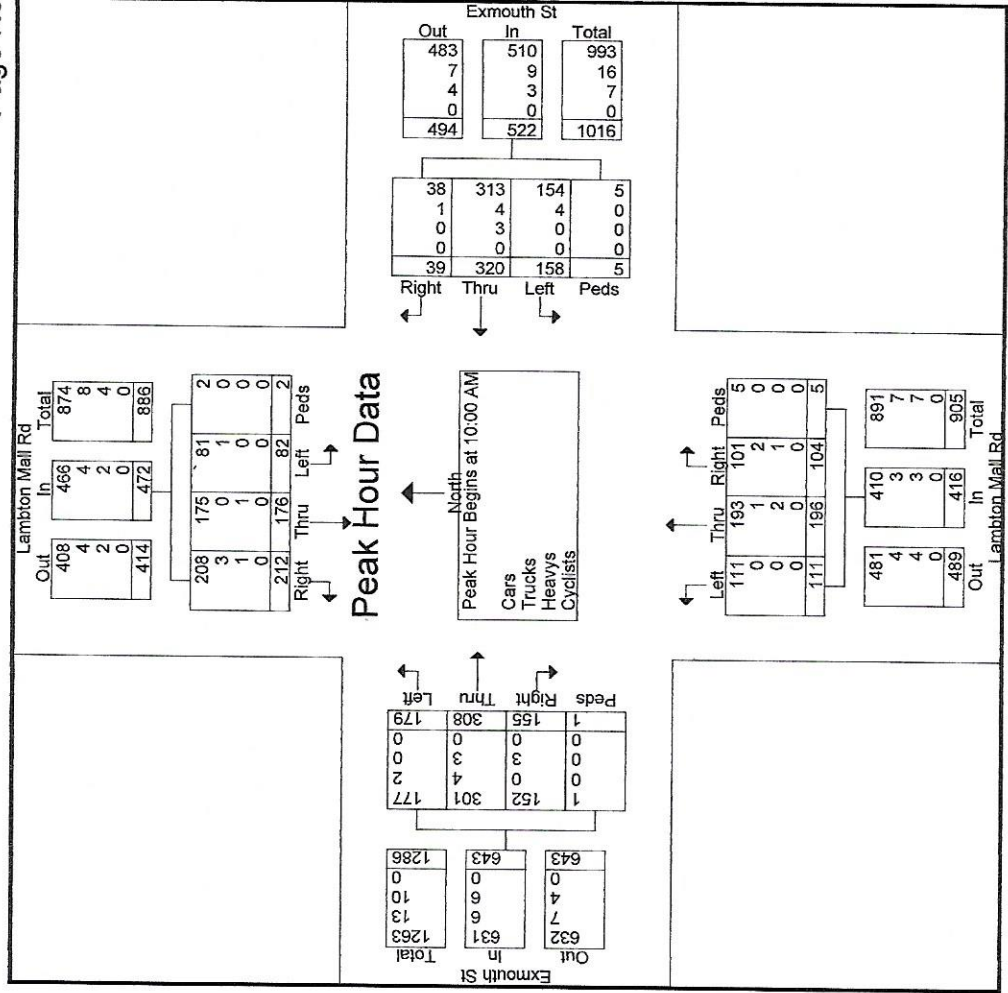


Horizon Data Services Ltd

318 Simonston Boulevard
 Thornhill ON L3T 4T5
 (416) 840-6619

"We do not estimate...we count"

File Name : Lambton Mall Rd at Exmouth St
 Site Code : 00000000
 Start Date : 10/20/2016
 Page No : 6



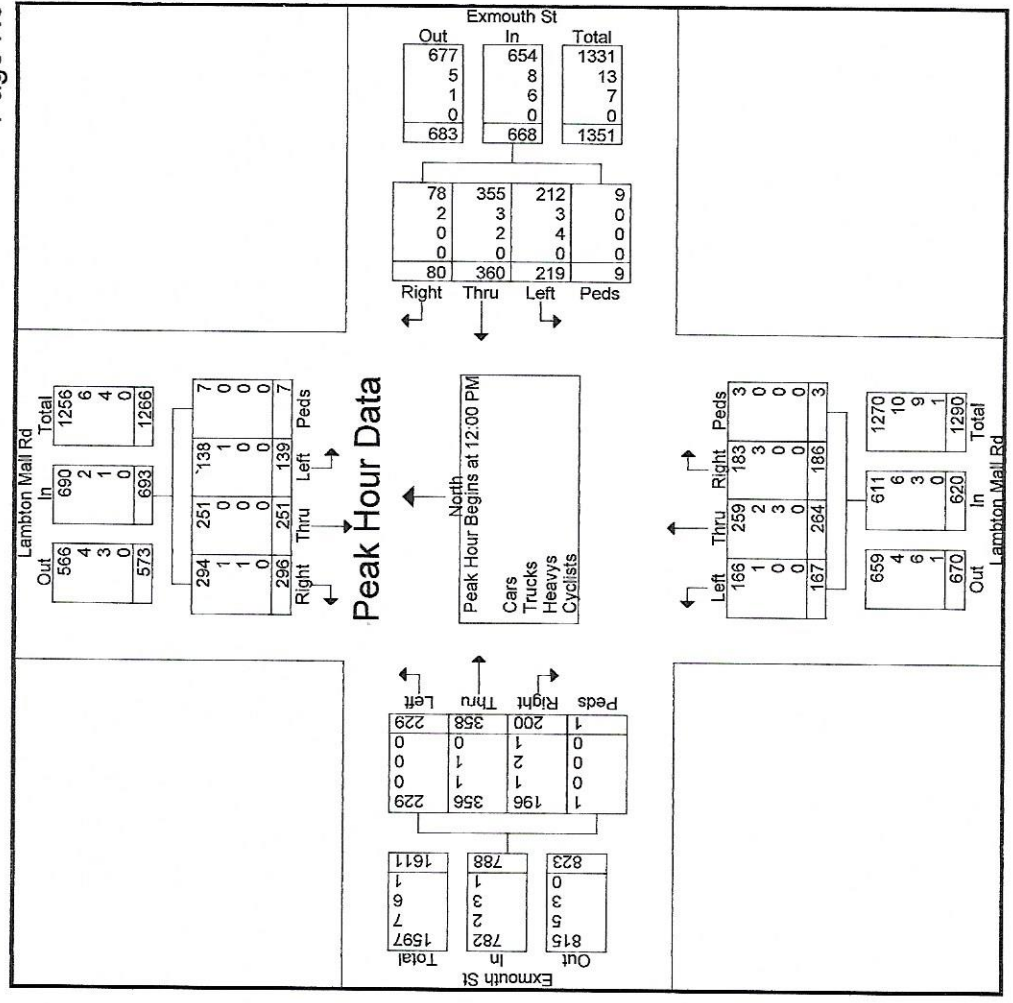


Horizon Data Services Ltd

318 Simonston Boulevard
 Thornhill ON L3T 4T5
 (416) 840-6619

"We do not estimate...we count"

File Name : Lambton Mall Rd at Exmouth St
 Site Code : 00000000
 Start Date : 10/20/2016
 Page No : 8



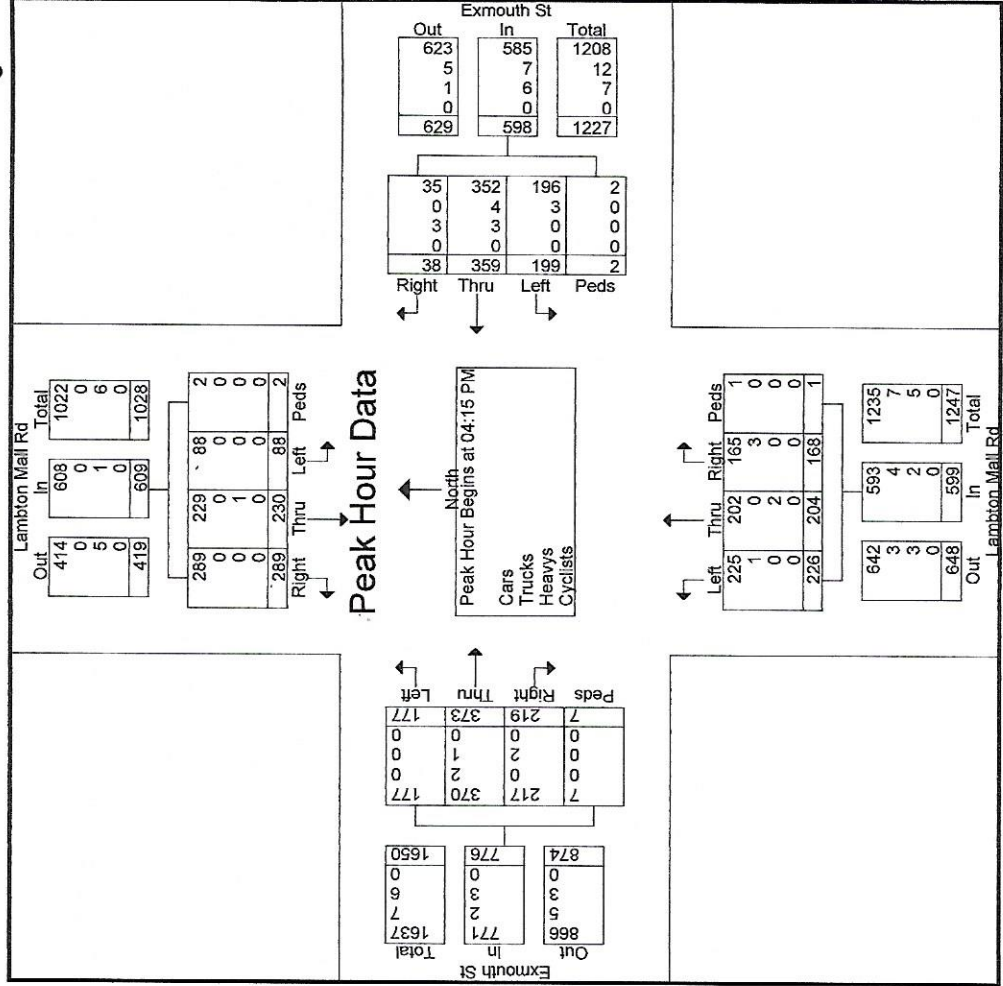


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 (416) 840-6619

"We do not estimate...we count"

File Name : Lambton Mall Rd at Exmouth St
 Site Code : 00000000
 Start Date : 10/20/2016
 Page No : 10



APPENDIX B
LEVEL OF SERVICE ANALYSIS



Intersection												
Int Delay, s/veh	1.1											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↙	↘		↙	↘			↔			↔	
Traffic Vol, veh/h	6	0	4	2	0	5	17	161	4	18	179	25
Future Vol, veh/h	6	0	4	2	0	5	17	161	4	18	179	25
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	150	-	-	100	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	7	0	4	2	0	5	18	175	4	20	195	27

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	373	464	111	351	475	90	222	0	0	179	0	0
Stage 1	249	249	-	213	213	-	-	-	-	-	-	-
Stage 2	124	215	-	138	262	-	-	-	-	-	-	-
Critical Hdwy	7.54	6.54	6.94	7.54	6.54	6.94	4.14	-	-	4.14	-	-
Critical Hdwy Stg 1	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.52	4.02	3.32	3.52	4.02	3.32	2.22	-	-	2.22	-	-
Pot Cap-1 Maneuver	559	494	921	579	487	950	1344	-	-	1394	-	-
Stage 1	733	699	-	769	725	-	-	-	-	-	-	-
Stage 2	867	724	-	851	690	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	543	479	921	563	472	950	1344	-	-	1394	-	-
Mov Cap-2 Maneuver	543	479	-	563	472	-	-	-	-	-	-	-
Stage 1	722	688	-	757	714	-	-	-	-	-	-	-
Stage 2	849	713	-	833	679	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	10.6	9.5	0.7	0.7
HCM LOS	B	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	1344	-	-	543	921	563	950	1394	-	-
HCM Lane V/C Ratio	0.014	-	-	0.012	0.005	0.004	0.006	0.014	-	-
HCM Control Delay (s)	7.7	0	-	11.7	8.9	11.4	8.8	7.6	0.1	-
HCM Lane LOS	A	A	-	B	A	B	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0	0	0	0	0	-	-

Intersection												
Int Delay, s/veh	4.1											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗			↕			↕	
Traffic Vol, veh/h	67	2	45	14	3	37	29	409	27	69	432	72
Future Vol, veh/h	67	2	45	14	3	37	29	409	27	69	432	72
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	150	-	-	100	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	73	2	49	15	3	40	32	445	29	75	470	78

Major/Minor	Minor2		Minor1		Major1			Major2				
Conflicting Flow All	947	1197	274	910	1222	237	548	0	0	474	0	0
Stage 1	659	659	-	524	524	-	-	-	-	-	-	-
Stage 2	288	538	-	386	698	-	-	-	-	-	-	-
Critical Hdwy	7.54	6.54	6.94	7.54	6.54	6.94	4.14	-	-	4.14	-	-
Critical Hdwy Stg 1	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.52	4.02	3.32	3.52	4.02	3.32	2.22	-	-	2.22	-	-
Pot Cap-1 Maneuver	216	185	724	230	178	764	1018	-	-	1084	-	-
Stage 1	419	459	-	504	528	-	-	-	-	-	-	-
Stage 2	695	521	-	609	440	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	180	159	724	190	153	764	1018	-	-	1084	-	-
Mov Cap-2 Maneuver	180	159	-	190	153	-	-	-	-	-	-	-
Stage 1	401	413	-	482	505	-	-	-	-	-	-	-
Stage 2	626	499	-	508	396	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	27	15.2	0.7	1.3
HCM LOS	D	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	1018	-	-	180	629	190	588	1084	-	-
HCM Lane V/C Ratio	0.031	-	-	0.405	0.081	0.08	0.074	0.069	-	-
HCM Control Delay (s)	8.6	0.2	-	38	11.2	25.6	11.6	8.6	0.3	-
HCM Lane LOS	A	A	-	E	B	D	B	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	1.8	0.3	0.3	0.2	0.2	-	-

Intersection

Int Delay, s/veh 1.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↵	↵		↵	↵			↕↕			↕↕	
Traffic Vol, veh/h	6	0	4	2	0	5	17	164	4	18	183	26
Future Vol, veh/h	6	0	4	2	0	5	17	164	4	18	183	26
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	150	-	-	100	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	7	0	4	2	0	5	18	178	4	20	199	28

Major/Minor	Minor2	Minor1	Major1	Major2
Conflicting Flow All	378	471	114	356
Stage 1	253	253	-	216
Stage 2	125	218	-	140
Critical Hdwy	7.54	6.54	6.94	7.54
Critical Hdwy Stg 1	6.54	5.54	-	6.54
Critical Hdwy Stg 2	6.54	5.54	-	6.54
Follow-up Hdwy	3.52	4.02	3.32	3.52
Pot Cap-1 Maneuver	554	489	917	575
Stage 1	729	696	-	766
Stage 2	866	721	-	849
Platoon blocked, %				
Mov Cap-1 Maneuver	537	473	917	558
Mov Cap-2 Maneuver	537	473	-	558
Stage 1	718	684	-	755
Stage 2	848	710	-	831

Approach	EB	WB	NB	SB
HCM Control Delay, s	10.6	9.6	0.7	0.7
HCM LOS	B	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	1339	-	-	537	917	558	949	1391	-	-
HCM Lane V/C Ratio	0.014	-	-	0.012	0.005	0.004	0.006	0.014	-	-
HCM Control Delay (s)	7.7	0	-	11.8	8.9	11.5	8.8	7.6	0.1	-
HCM Lane LOS	A	A	-	B	A	B	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0	0	0	0	0	-	-

Intersection												
Int Delay, s/veh	4.3											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↘	↗		↘	↗			↕			↕	
Traffic Vol, veh/h	68	2	46	14	3	38	30	417	28	70	441	73
Future Vol, veh/h	68	2	46	14	3	38	30	417	28	70	441	73
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	150	-	-	100	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	74	2	50	15	3	41	33	453	30	76	479	79

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All -	965	1220	279	927	1244	242	558	0	0	483	0	0
Stage 1	671	671	-	534	534	-	-	-	-	-	-	-
Stage 2	294	549	-	393	710	-	-	-	-	-	-	-
Critical Hdwy	7.54	6.54	6.94	7.54	6.54	6.94	4.14	-	-	4.14	-	-
Critical Hdwy Stg 1	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.52	4.02	3.32	3.52	4.02	3.32	2.22	-	-	2.22	-	-
Pot Cap-1 Maneuver	209	179	718	223	173	759	1009	-	-	1076	-	-
Stage 1	412	453	-	498	523	-	-	-	-	-	-	-
Stage 2	690	515	-	603	435	-	-	-	-	-	-	-
Platoon blocked, %												
Mov Cap-1 Maneuver	173	153	718	183	148	759	1009	-	-	1076	-	-
Mov Cap-2 Maneuver	173	153	-	183	148	-	-	-	-	-	-	-
Stage 1	393	406	-	476	499	-	-	-	-	-	-	-
Stage 2	619	492	-	500	390	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	28.4	15.4	0.7	1.3
HCM LOS	D	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	1009	-	-	173	622	183	583	1076	-	-
HCM Lane V/C Ratio	0.032	-	-	0.427	0.084	0.083	0.076	0.071	-	-
HCM Control Delay (s)	8.7	0.2	-	40.5	11.3	26.4	11.7	8.6	0.3	-
HCM Lane LOS	A	A	-	E	B	D	B	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	1.9	0.3	0.3	0.2	0.2	-	-

Intersection												
Int Delay, s/veh	1.7											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↵	↵		↵	↵			↵↵			↵↵	
Traffic Vol, veh/h	19	0	17	2	0	5	20	164	4	18	183	29
Future Vol, veh/h	19	0	17	2	0	5	20	164	4	18	183	29
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	150	-	-	100	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	21	0	18	2	0	5	22	178	4	20	199	32
Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	388	481	116	364	495	91	231	0	0	182	0	0
Stage 1	255	255	-	224	224	-	-	-	-	-	-	-
Stage 2	133	226	-	140	271	-	-	-	-	-	-	-
Critical Hdwy	7.54	6.54	6.94	7.54	6.54	6.94	4.14	-	-	4.14	-	-
Critical Hdwy Stg 1	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.52	4.02	3.32	3.52	4.02	3.32	2.22	-	-	2.22	-	-
Pot Cap-1 Maneuver	545	483	914	567	474	949	1334	-	-	1391	-	-
Stage 1	727	695	-	758	717	-	-	-	-	-	-	-
Stage 2	857	716	-	849	684	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	528	466	914	541	457	949	1334	-	-	1391	-	-
Mov Cap-2 Maneuver	528	466	-	541	457	-	-	-	-	-	-	-
Stage 1	714	683	-	744	704	-	-	-	-	-	-	-
Stage 2	837	703	-	818	672	-	-	-	-	-	-	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	10.6			9.6			0.9			0.7		
HCM LOS	B			A								
Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	WBLn2	SBL	SBT	SBR		
Capacity (veh/h)	1334	-	-	528	914	541	949	1391	-	-		
HCM Lane V/C Ratio	0.016	-	-	0.039	0.02	0.004	0.006	0.014	-	-		
HCM Control Delay (s)	7.7	0.1	-	12.1	9	11.7	8.8	7.6	0.1	-		
HCM Lane LOS	A	A	-	B	A	B	A	A	A	-		
HCM 95th %tile Q(veh)	0.1	-	-	0.1	0.1	0	0	0	-	-		

Intersection

Int Delay, s/veh 5.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔		↔	↔			↔			↔	
Traffic Vol, veh/h	76	4	51	14	6	38	39	417	28	70	441	83
Future Vol, veh/h	76	4	51	14	6	38	39	417	28	70	441	83
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	150	-	-	100	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	83	4	55	15	7	41	42	453	30	76	479	90

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	990	1243	285	946	1273	242	569	0	0	483	0	0
Stage 1	676	676	-	552	552	-	-	-	-	-	-	-
Stage 2	314	567	-	394	721	-	-	-	-	-	-	-
Critical Hdwy	7.54	6.54	6.94	7.54	6.54	6.94	4.14	-	-	4.14	-	-
Critical Hdwy Stg 1	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.52	4.02	3.32	3.52	4.02	3.32	2.22	-	-	2.22	-	-
Pot Cap-1 Maneuver	201	173	712	216	166	759	999	-	-	1076	-	-
Stage 1	409	451	-	486	513	-	-	-	-	-	-	-
Stage 2	671	505	-	602	430	-	-	-	-	-	-	-
Platoon blocked, %												
Mov Cap-1 Maneuver	161	146	712	171	140	759	999	-	-	1076	-	-
Mov Cap-2 Maneuver	161	146	-	171	140	-	-	-	-	-	-	-
Stage 1	385	404	-	458	483	-	-	-	-	-	-	-
Stage 2	590	476	-	491	385	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	33.5		16.9		0.9		1.2	
HCM LOS	D		C					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	999	-	-	161	555	171	474	1076	-	-
HCM Lane V/C Ratio	0.042	-	-	0.513	0.108	0.089	0.101	0.071	-	-
HCM Control Delay (s)	8.8	0.2	-	48.8	12.3	28.1	13.4	8.6	0.3	-
HCM Lane LOS	A	A	-	E	B	D	B	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	2.5	0.4	0.3	0.3	0.2	-	-

Intersection												
Int Delay, s/veh	1.1											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗			↔			↔	
Traffic Vol, veh/h	6	0	4	2	0	5	18	172	4	19	192	27
Future Vol, veh/h	6	0	4	2	0	5	18	172	4	19	192	27
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	150	-	-	100	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	7	0	4	2	0	5	20	187	4	21	209	29

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	400	497	119	376	509	96	238	0	0	191	0	0
Stage 1	266	266	-	229	229	-	-	-	-	-	-	-
Stage 2	134	231	-	147	280	-	-	-	-	-	-	-
Critical Hdwy	7.54	6.54	6.94	7.54	6.54	6.94	4.14	-	-	4.14	-	-
Critical Hdwy Stg 1	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.52	4.02	3.32	3.52	4.02	3.32	2.22	-	-	2.22	-	-
Pot Cap-1 Maneuver	535	473	910	556	466	942	1326	-	-	1380	-	-
Stage 1	716	687	-	753	713	-	-	-	-	-	-	-
Stage 2	855	712	-	841	678	-	-	-	-	-	-	-
Platoon blocked, %												
Mov Cap-1 Maneuver	518	456	910	539	450	942	1326	-	-	1380	-	-
Mov Cap-2 Maneuver	518	456	-	539	450	-	-	-	-	-	-	-
Stage 1	704	675	-	740	701	-	-	-	-	-	-	-
Stage 2	836	700	-	822	666	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	10.8	9.6	0.8	0.7
HCM LOS	B	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	1326	-	-	518	910	539	942	1380	-	-
HCM Lane V/C Ratio	0.015	-	-	0.013	0.005	0.004	0.006	0.015	-	-
HCM Control Delay (s)	7.8	0.1	-	12	9	11.7	8.8	7.6	0.1	-
HCM Lane LOS	A	A	-	B	A	B	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0	0	0	0	0	-	-

Intersection	
Int Delay, s/veh	4.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔		↔	↔			↔			↔	↔
Traffic Vol, veh/h	72	2	48	15	3	40	31	438	29	74	462	77
Future Vol, veh/h	72	2	48	15	3	40	31	438	29	74	462	77
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	150	-	-	100	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	78	2	52	16	3	43	34	476	32	80	502	84

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	1012	1280	293	972	1306	254	586	0	0	508	0	0
Stage 1	704	704	-	560	560	-	-	-	-	-	-	-
Stage 2	308	576	-	412	746	-	-	-	-	-	-	-
Critical Hdwy	7.54	6.54	6.94	7.54	6.54	6.94	4.14	-	-	4.14	-	-
Critical Hdwy Stg 1	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.52	4.02	3.32	3.52	4.02	3.32	2.22	-	-	2.22	-	-
Pot Cap-1 Maneuver	193	165	703	207	159	745	985	-	-	1053	-	-
Stage 1	394	438	-	480	509	-	-	-	-	-	-	-
Stage 2	677	500	-	588	419	-	-	-	-	-	-	-
Platoon blocked, %												
Mov Cap-1 Maneuver	157	139	703	167	134	745	985	-	-	1053	-	-
Mov Cap-2 Maneuver	157	139	-	167	134	-	-	-	-	-	-	-
Stage 1	375	388	-	457	485	-	-	-	-	-	-	-
Stage 2	603	476	-	480	371	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	33.5	16.3	0.7	1.4
HCM LOS	D	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	985	-	-	157	605	167	565	1053	-	-
HCM Lane V/C Ratio	0.034	-	-	0.498	0.09	0.098	0.083	0.076	-	-
HCM Control Delay (s)	8.8	0.2	-	48.8	11.5	28.9	11.9	8.7	0.4	-
HCM Lane LOS	A	A	-	E	B	D	B	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	2.4	0.3	0.3	0.3	0.2	-	-

Intersection												
Int Delay, s/veh	1.7											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↙	↘		↙	↘			↕			↕	
Traffic Vol, veh/h	19	0	17	2	0	5	21	172	4	19	192	30
Future Vol, veh/h	19	0	17	2	0	5	21	172	4	19	192	30
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	150	-	-	100	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	21	0	18	2	0	5	23	187	4	21	209	33

Major/Minor	Minor2		Minor1			Major1			Major2			
Conflicting Flow All	408	505	121	382	519	96	242	0	0	191	0	0
Stage 1	268	268	-	235	235	-	-	-	-	-	-	-
Stage 2	140	237	-	147	284	-	-	-	-	-	-	-
Critical Hdwy	7.54	6.54	6.94	7.54	6.54	6.94	4.14	-	-	4.14	-	-
Critical Hdwy Stg 1	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.52	4.02	3.32	3.52	4.02	3.32	2.22	-	-	2.22	-	-
Pot Cap-1 Maneuver	528	468	908	551	460	942	1322	-	-	1380	-	-
Stage 1	714	686	-	747	709	-	-	-	-	-	-	-
Stage 2	849	708	-	841	675	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	510	451	908	525	443	942	1322	-	-	1380	-	-
Mov Cap-2 Maneuver	510	451	-	525	443	-	-	-	-	-	-	-
Stage 1	700	674	-	733	696	-	-	-	-	-	-	-
Stage 2	828	695	-	809	663	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	10.8	9.7	0.9	0.7
HCM LOS	B	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	1322	-	-	510	908	525	942	1380	-	-
HCM Lane V/C Ratio	0.017	-	-	0.04	0.02	0.004	0.006	0.015	-	-
HCM Control Delay (s)	7.8	0.1	-	12.4	9	11.9	8.8	7.6	0.1	-
HCM Lane LOS	A	A	-	B	A	B	A	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0.1	0.1	0	0	0	-	-

Intersection												
Int Delay, s/veh	6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↵	↶		↵	↶			↕			↕	
Traffic Vol, veh/h	80	4	53	15	6	40	40	438	29	74	462	87
Future Vol, veh/h	80	4	53	15	6	40	40	438	29	74	462	87
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	150	-	-	100	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	87	4	58	16	7	43	43	476	32	80	502	95

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	1038	1304	299	991	1335	254	597	0	0	508	0	0
Stage 1	710	710	-	578	578	-	-	-	-	-	-	-
Stage 2	328	594	-	413	757	-	-	-	-	-	-	-
Critical Hdwy	7.54	6.54	6.94	7.54	6.54	6.94	4.14	-	-	4.14	-	-
Critical Hdwy Stg 1	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.52	4.02	3.32	3.52	4.02	3.32	2.22	-	-	2.22	-	-
Pot Cap-1 Maneuver	185	159	697	200	152	745	976	-	-	1053	-	-
Stage 1	391	435	-	468	499	-	-	-	-	-	-	-
Stage 2	659	491	-	587	414	-	-	-	-	-	-	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	146	132	697	156	126	745	976	-	-	1053	-	-
Mov Cap-2 Maneuver	146	132	-	156	126	-	-	-	-	-	-	-
Stage 1	367	385	-	439	468	-	-	-	-	-	-	-
Stage 2	574	461	-	471	366	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	40.7	18.1	0.9	1.3
HCM LOS	E	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	976	-	-	146	536	156	454	1053	-	-
HCM Lane V/C Ratio	0.045	-	-	0.596	0.116	0.105	0.11	0.076	-	-
HCM Control Delay (s)	8.9	0.2	-	60.7	12.6	30.8	13.9	8.7	0.4	-
HCM Lane LOS	A	A	-	F	B	D	B	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	3.1	0.4	0.3	0.4	0.2	-	-