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29 September 2023
Project: 210578

Donald K Tremble
c/o Matt Nelson
GM Blue Plan
1260-2nd Avenue East
Owen Sound ON N4K 2J3

Dear Mr. Tremble:

RE: TRANSPORTATION STUDY: PROPOSED J.T. EXCAVATING LTD. PIT CONCESSION 4 NDR, GREY COUNTY

Paradigm Transportation Solutions Limited (Paradigm) was retained to conduct an operational analysis and sightline review for the lands located at 382063 Concession 4 NDR in the Municipality of West Grey, Grey Country, Ontario.

Development Concept

The property owner is proposing to operate an aggregate pit with a haul route from the site using Concession 4 NDR and Mulock Road to Grey Road 4.

Figure 1 illustrates the location of the subject site. **Figure 2** illustrates the haul route.

Existing Conditions

Road Network

Concession 4 NDR is under the jurisdiction of the Municipality of West Grey. It is local east-west two rural lane-lane road with the posted speed limit of 80 km/h.

Mulock Road is under the jurisdiction of West Grey. It is local north-south two lane-lane rural road with the posted speed limit of 80 km/h.

Figure 3 illustrates the existing lane configuration and traffic control.

Traffic Volumes

The existing weekday AM and PM peak period intersection traffic counts were recorded at Concession 4 NDR and Mulock Road by Paradigm in November 2021.

Figure 4 illustrates the existing traffic volumes during the AM and PM peak hours.

Traffic Operations

The operation at the intersection of the Mulock Road and Concession 4 NDR was evaluated with existing volumes using Synchro 10.

The intersection analysis considered two separate measures of performance:

- the volume to capacity (v/c) ratio for each intersection;
- the LOS for each turning movement (LOS is based on the average control delay per vehicle); and
- The estimated 95th percentile queue lengths(s).

Table 2 summarizes the existing operations. No critical movements are identified.

Appendix A contains the details Synchro 10 Reports.

TABLE 2: EXISTING TRAFFIC CONDITIONS

Analysis Period	Intersection	Control Type	MOE	Direction/Movement/Approach																
				Eastbound				Westbound				Northbound				Southbound				Overall
				Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	
AM Peak Hour	Mulock Road /Mulock Road & Concession Road 4	TWSC	LOS	<	A	>	A	<	A	>	A	A	A	A	A	A	A	A	A	
			Delay	<	9	>	9	<	9	>	9	7	0	0	1	7	0	0	0	
			V/C	<	0.01	>		<	0.01	>		0.00	0.00	0.00		0.00	0.00	0.00		
			Q	<	0	>		<	0	>		0	0	0		0	0	0		
PM Peak Hour	Mulock Road /Mulock Road & Concession Road 4	TWSC	LOS	<	A	>	A	<	A	>	A	A	A	A	A	A	A	A	A	
			Delay	<	9	>	9	<	9	>	9	7	0	0	1	7	0	0	0	
			V/C	<	0.02	>		<	0.02	>		0.00	0.00	0.00		0.00	0.00	0.00		
			Q	<	1	>		<	1	>		0	0	0		0	0	0		

MOE - Measure of Effectiveness
LOS - Level of Service
Delay - Average Delay per Vehicle in Seconds
V/C - Volume to Capacity Ratio
Q - 95th Percentile Queue Length (m)
TWSC - Two-Way Stop Control
< / > - Shared with through movement

Site Operations

The estimated site trip generation is based on the number of trips made by trucks utilizing the proposed hauling route during the operation. It is expected that the trucks used for operations would be standard sized single-unit trucks or tri-axle trucks, but will have the potential to use

WB-19 tractor-trailer trucks. The number of forecast trips was calculated using the following information regarding expected pit operations:

- **Licenced Extraction Rate**: The maximum amount of tonnage applied for the aggregate licence is 300,000 tonnes per year. This rate represents the maximum amount of material that can be extracted from the site on yearly basis.
- **Pit Operations**: The operational plan for the pit notes that the trucks will be loaded between 7:00 AM and 6:00 PM daily, weekdays and Saturday mornings for a duration of 10 months. Realities of market forces and weather have shown that this activity can be sustained for 232 operating days per year.
- **Vehicle Size**: An average payload of 25 tonnes per truck was assumed for the purposes of the analysis.

Table 1 summarizes the estimated daily average and peak hour traffic generation at the aggregate pit. From the calculations, it was found that an average of 6 trips per hour can be expected. To account for minor variances in the average hourly volume throughout the day and to present a conservative analysis, the average hourly volume of 6 trips per hour has been rounded to 10 trips per hour.

TABLE 1: TRIP GENERATION ESTIMATES

Measure	Units	Input	Calculation
Annual Rate of Extraction	tonnes/year	300,000	
Operating Days per Year	day/year	232	
Average Extraction per day	tonnes/day		1293.1
Average Payload per Truck	tonnes/truck	25	
Average Number of Trucks per Day	trucks/day		52
Operating Hours per Day	hours/day	11	
Average Number of Trucks Load per Hour	truck/hour		5
Trip per Truck Load	trips/truck	2	
Average Hourly Truck Volume	trips/hours		10

Figure 5 illustrates the site traffic volumes during the AM and PM peak hours.

Trip Distribution and Assignment

The distribution of the site traffic consists only of truck load transportation. The truck hauling involves two steps:

- a trip of the loaded truck from the proposed pit destined to Grey County Road 4; and
- a return trip of the unloaded trucks to the proposed pit.

Hence, the trips were evenly split between inbound and outbound trips.

Evaluation of Future Traffic Conditions

Future traffic conditions assessed include estimates of future background and total traffic volumes for a five-year horizon. The future traffic volumes near the development will consist of:

- Increased non-site traffic (generalized background traffic growth of 2.0% per annum was assumed); and
- Traffic generated by the subject site.

No nearby in-stream developments were identified which would impact the background traffic in the study area.

Figure 6 (attached) illustrates the five-year horizon background AM and PM peak hour traffic volumes for the peak hour.

Figure 7 (attached) illustrates the five-year horizon total AM and PM peak hour traffic volumes for the peak hour.

Five- Year Horizon Traffic Operations

The study area intersection operation analysis followed the same methodology used for the existing traffic conditions. No critical movements are forecasts to occur.

Table 3 summarizes the five-year horizon Background level of service conditions.

Table 4 summarizes the five-year horizon Total level of service conditions.

Appendix B contains the details Synchro 10 reports.

TABLE 3: FIVE-YEAR HORIZON BACKGROUND TRAFFIC CONDITIONS

Analysis Period	Intersection	Control Type	MOE	Direction/Movement/Approach																Overall
				Eastbound				Westbound				Northbound				Southbound				
				Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	
AM Peak Hour	Mulock Road /Mulock Road & Concession Road 4	TWSC	LOS	<	A	>	**A**	<	A	>	**A**	A	A	A	**A**	A	A	A	**A**	
			Delay	<	9	>	**9**	<	9	>	**9**	7	0	0	**1**	7	0	0	**0**	
			V/C	<	0.01	>		<	0.01	>		0.00	0.00	0.00		0.00	0.00	0.00		
			Q	<	0	>		<	0	>		0	0	0		0	0	0		
PM Peak Hour	Mulock Road /Mulock Road & Concession Road 4	TWSC	LOS	<	A	>	**A**	<	A	>	**A**	A	A	A	**A**	A	A	A	**A**	
			Delay	<	9	>	**9**	<	9	>	**9**	7	0	0	**1**	7	0	0	**0**	
			V/C	<	0.03	>		<	0.02	>		0.00	0.00	0.00		0.00	0.00	0.00		
			Q	<	1	>		<	1	>		0	0	0		0	0	0		

MOE - Measure of Effectiveness
LOS - Level of Service
Delay - Average Delay per Vehicle in Seconds
V/C - Volume to Capacity Ratio
Q - 95th Percentile Queue Length (m)
TWSC - Two-Way Stop Control
< / > - Shared with through movement

TABLE 4: FIVE-YEAR HORIZON TOTAL TRAFFIC CONDITIONS

Analysis Period	Intersection	Control Type	MOE	Direction/Movement/Approach																Overall
				Eastbound				Westbound				Northbound				Southbound				
				Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	
AM Peak Hour	Mulock Road /Mulock Road & Concession Road 4	TWSC	LOS	<	A	>	**A**	<	A	>	**A**	A	A	A	**A**	A	A	A	**A**	
			Delay	<	9	>	**9**	<	10	>	**10**	7	0	0	**2**	7	0	0	**0**	
			V/C	<	0.01	>		<	0.01	>		0.01	0.00	0.00		0.00	0.00	0.00		
			Q	<	0	>		<	0	>		0	0	0		0	0	0		
PM Peak Hour	Mulock Road /Mulock Road & Concession Road 4	TWSC	LOS	<	A	>	**A**	<	A	>	**A**	A	A	A	**A**	A	A	A	**A**	
			Delay	<	9	>	**9**	<	9	>	**9**	7	0	0	**2**	7	0	0	**0**	
			V/C	<	0.03	>		<	0.02	>		0.01	0.00	0.00		0.00	0.00	0.00		
			Q	<	1	>		<	1	>		0	0	0		0	0	0		

MOE - Measure of Effectiveness
LOS - Level of Service
Delay - Average Delay per Vehicle in Seconds
V/C - Volume to Capacity Ratio
Q - 95th Percentile Queue Length (m)
TWSC - Two-Way Stop Control
< / > - Shared with through movement

Summer Volumes Comparison

The counts for this assessment were collected in the Fall season. There is potential for higher volumes during the summer. The Ministry of Transportation collects data on their provincial highway regarding average annual daily traffic volumes and also winter and summer average daily traffic volumes. The nearest point of data is Highway 6, to the east of the study area, which suggests that summer volumes are approximately 20% higher than the annual daily average.

Given the very low volumes on Concession Road 4 and Mulock Road, a 20% increase in volumes will not significantly change the levels of service shown in the analysis above, as the volume to capacity (V/C) ratio is not forecast to be greater than 0.03.

Sight Distance Assessment

It was requested that the sight distance be measured for trucks making an eastbound right-turn from Concession 4 NDR onto Mulock Road. The required sight distance for this movement was assessed based on the methodology outlined in the Transportation Association of Canada (TAC) *Geometric Design Guide for Canadian Roads*[1] ("TAC Guide").

The sight distance requirement at the study intersection of Concession 4 NDR and Mulock Road was determined based on a design speed of 100 km/h, which is 20 km/h above the posted speed limit of 80 km/h on Mulock Road. This results in requirement of 295 metres of sightline distance.

Paradigm staff completed a site visit in November 2021 to measure the sightlines at the intersection of interest. Sightlines were measures assuming standard driver eye and object

[1] Geometric Design Guide for Canadian Roads, *Transportation Association of Canada*, June 2017.

height[2]. The vision of a driver, set back 5.4 metres from the edge of roadway is obstructed by vegetation on the west side of Mulock Road, north of Concession Road NDR. However, without the obstruction, it was confirmed that the 295 metres of sight distance recommended in the TAC Guide can be achieved. Therefore, it is recommended that some trees within the right-of-way be removed to allow for adequate sight distance.

Figure 8 illustrates the relative departure sight triangle and decision point. **Figure 9** highlights the trees that may be subject to be removal to achieve adequate sight distance from the driver's eye position noted in the TAC Manual. Any removal of trees to achieve adequate sight lines should be confirmed with a detailed survey.

It is noted that this is an existing condition, and not caused by the addition of traffic from the subject site.

Turning Assessment

Figure 10 shows an AutoTurn assessment of a WB-19 truck making an eastbound right-turn from Concession 4 NDR onto Mulock Road. The analysis shows that the truck would need to make a wide right-turn into the opposing lanes and would travel over the unpaved shoulder on the southwest corner of the intersection. To accommodate a WB-19 truck, the southwest shoulder should be paved.

Similar to the sight distance assessment, it is noted that this is an existing condition, and not caused by the addition of traffic from the subject site. **Figure 11** shows the existing condition of that corner which shows evidence of vehicles driving over the unpaved shoulder.

[2] Table 2.5.1, TAC Geometric Design Guide for Canadian Roads

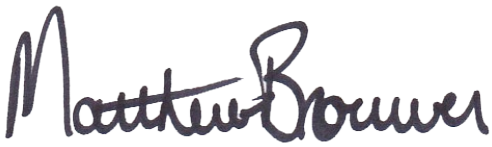
Conclusions

Based on the analyses contained in this letter, it is concluded that:

- Existing Traffic Operations: The study area intersection is currently operating at a good levels of service during the AM and PM Peak hour periods;
- Site-generated Traffic: The proposed development is forecast to generate 10 truck trips per hour at full build-out;
- Total Traffic Operations: The observed intersection is forecasted to operate well by the five-year horizon without any problem movements;
- Sight Distance Assessment: The sight distance required for truck driver's eye height meets the recommended minimum if the appropriate vegetation is removed. This is an existing condition, not introduced by the subject development.
- The southwest corner of the intersection of Mulock Road and Concession 4 NDR should be paved to better accommodate truck movements. This is an existing condition, not introduced by the subject development.

Yours very truly,

PARADIGM TRANSPORTATION SOLUTIONS LIMITED



Matt Brouwer
P.Eng.
Senior Project Manager

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Location of Subject Site

382063 Concession– Hauling Route Study
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Figure 1

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Hauling Route

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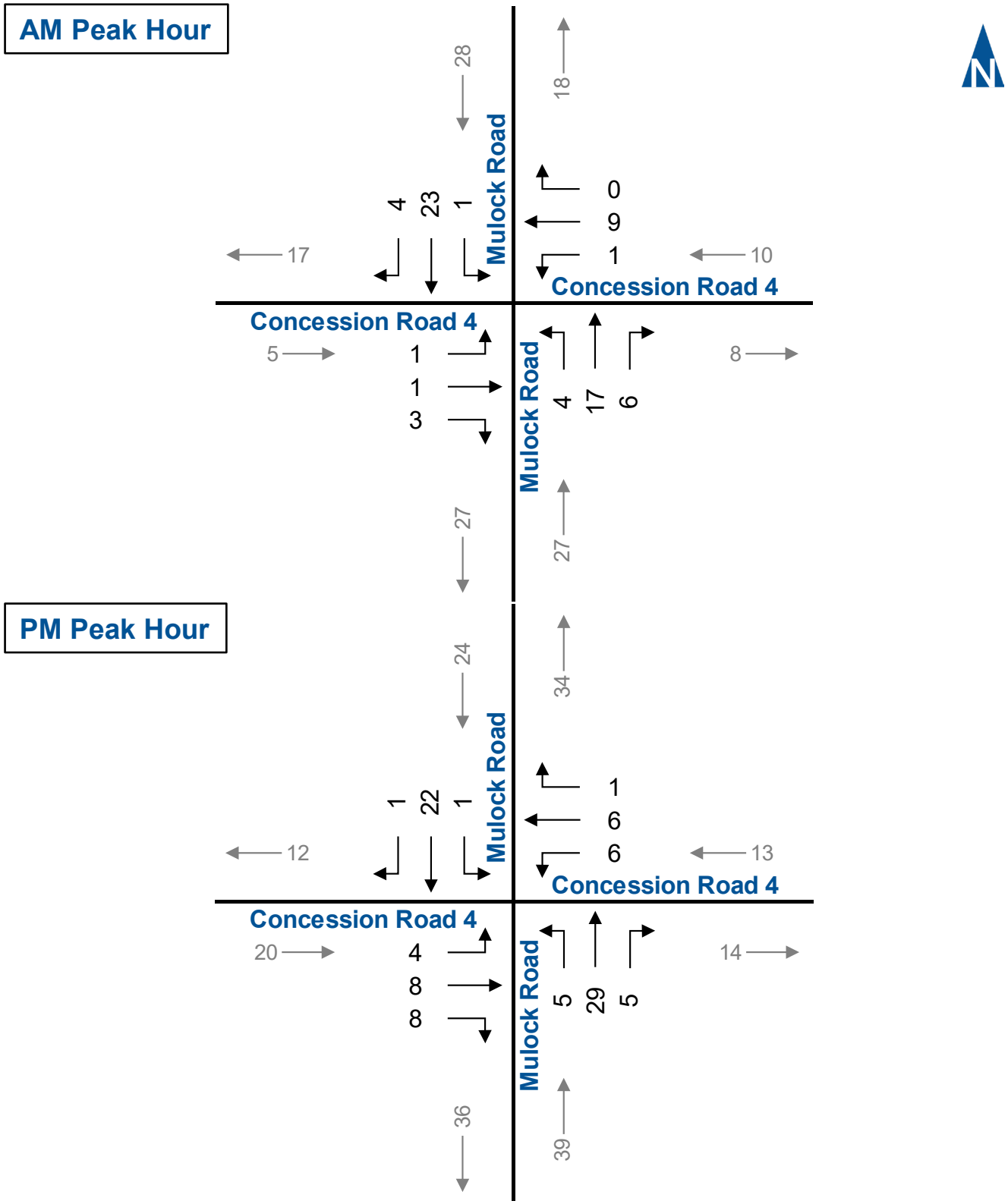
Figure 2



Existing Traffic Volumes
Weekday AM and PM Peak Hours

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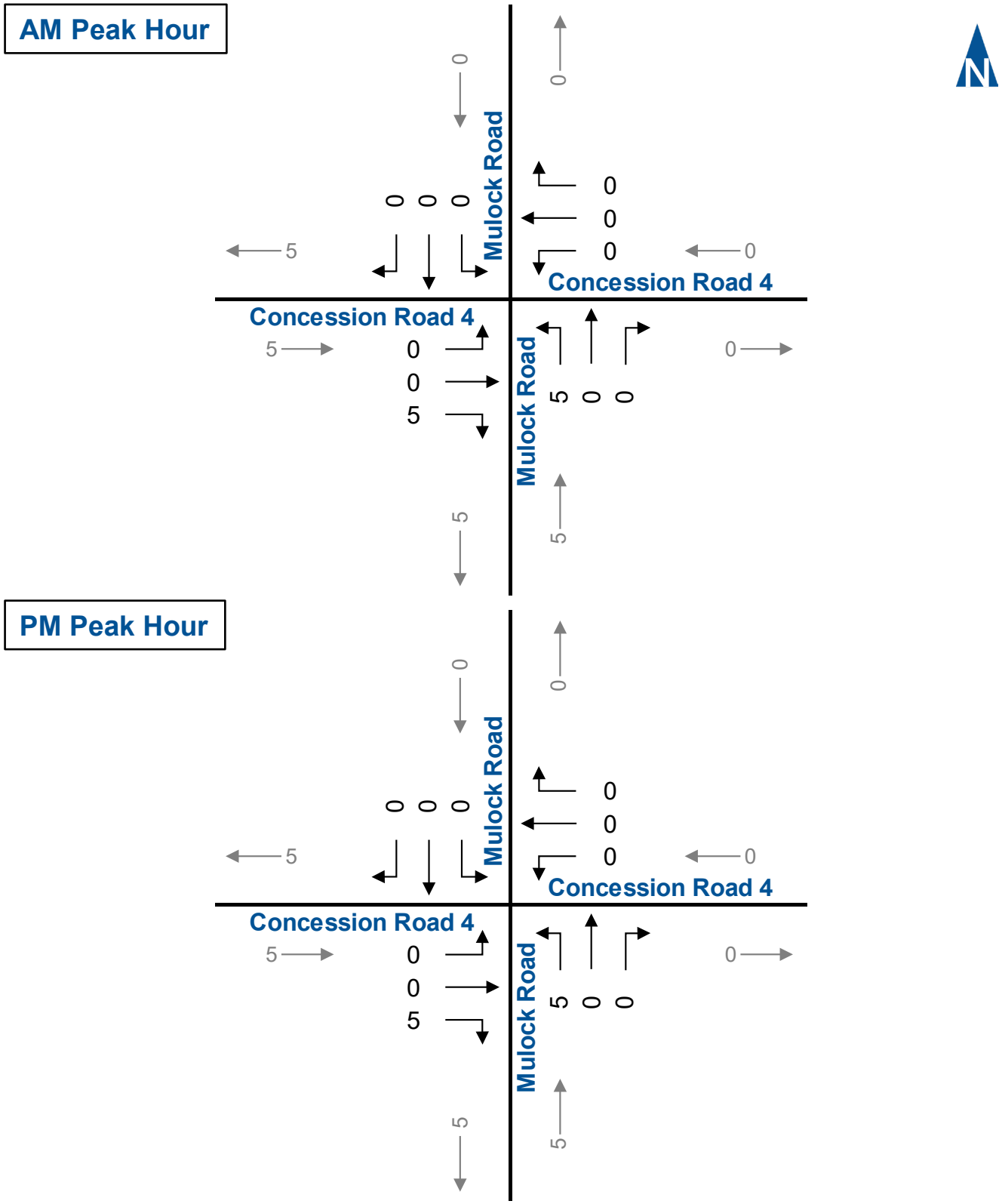
Figure 4



Site Traffic Volumes
Weekday AM and PM Peak Hours

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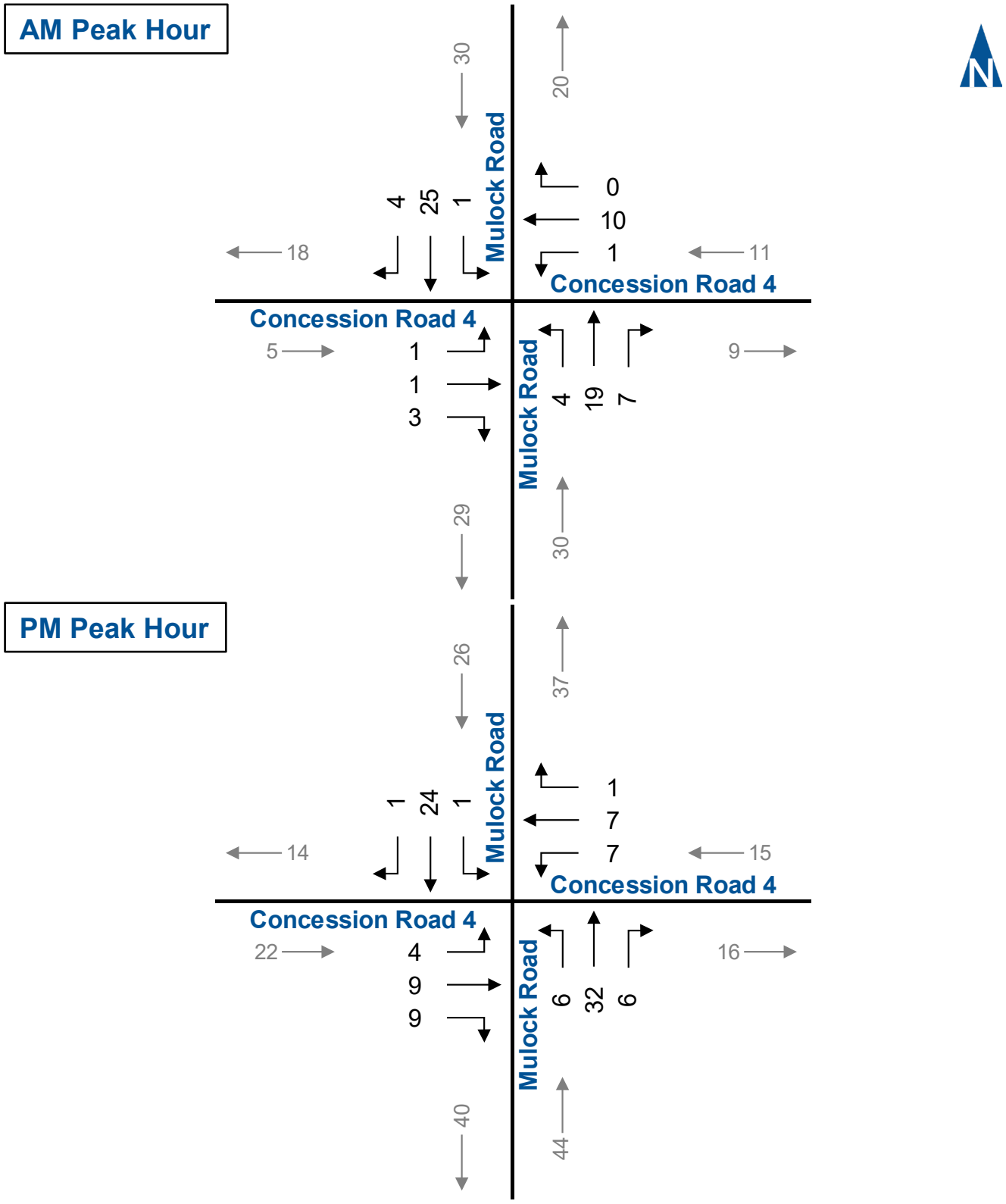
Figure 5



Background 5-Year Traffic Volumes
Weekday AM and PM Peak Hours

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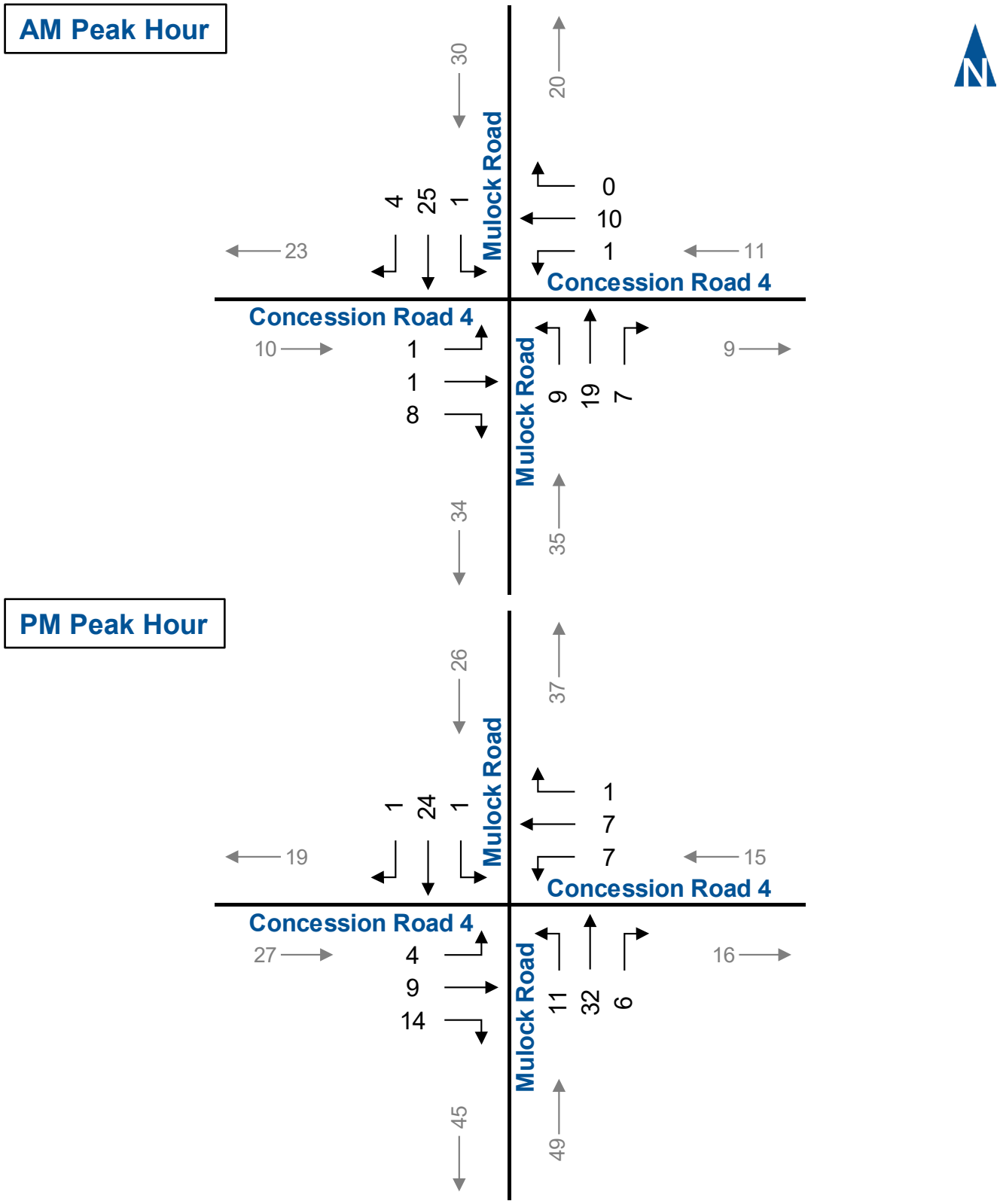
Figure 6



Total 5-Year Traffic Volumes
Weekday AM and PM Peak Hours

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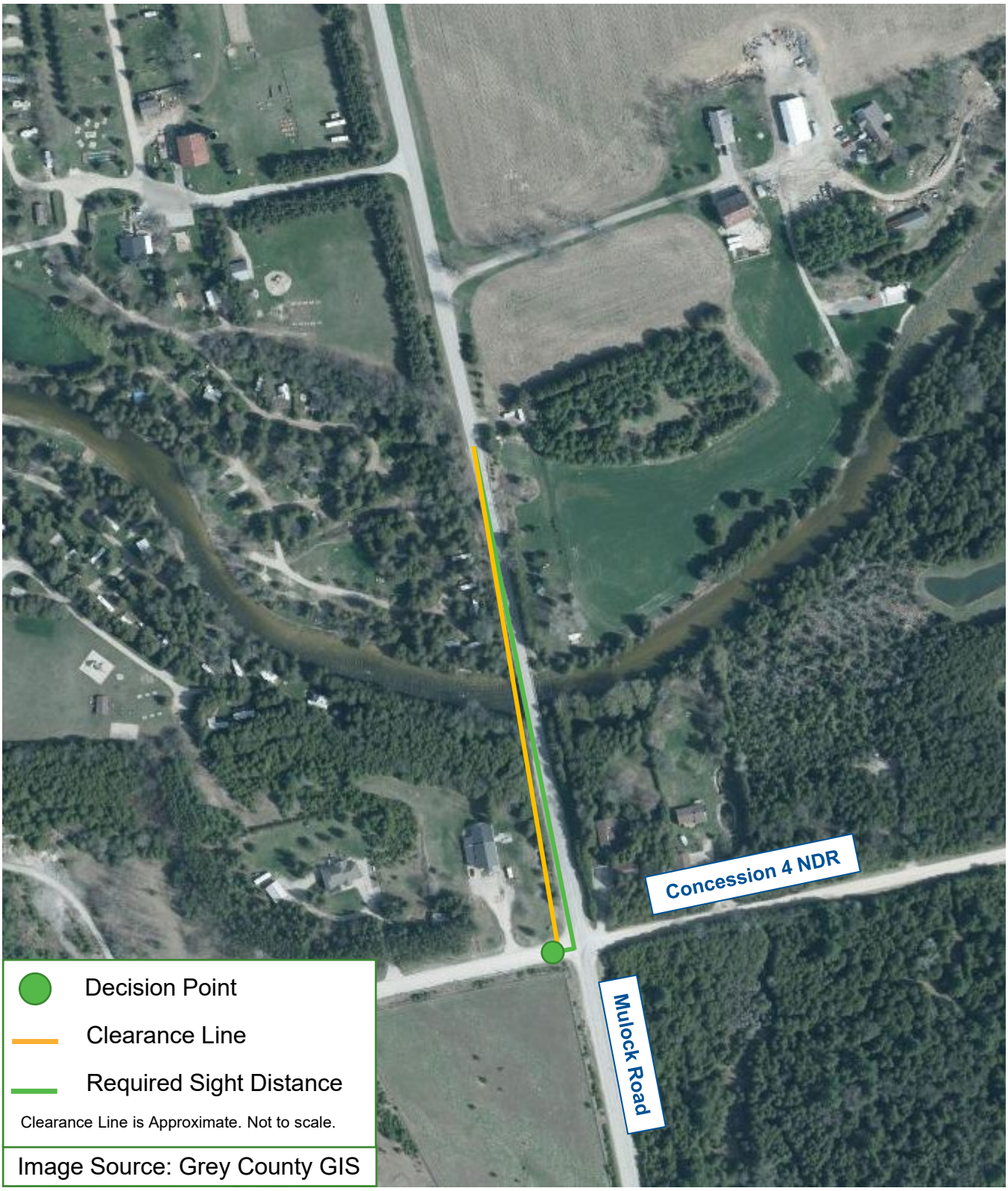
Figure 7



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Required Sightline Distance Relative to Decision Point

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Figure 8

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Area of Tree Removal

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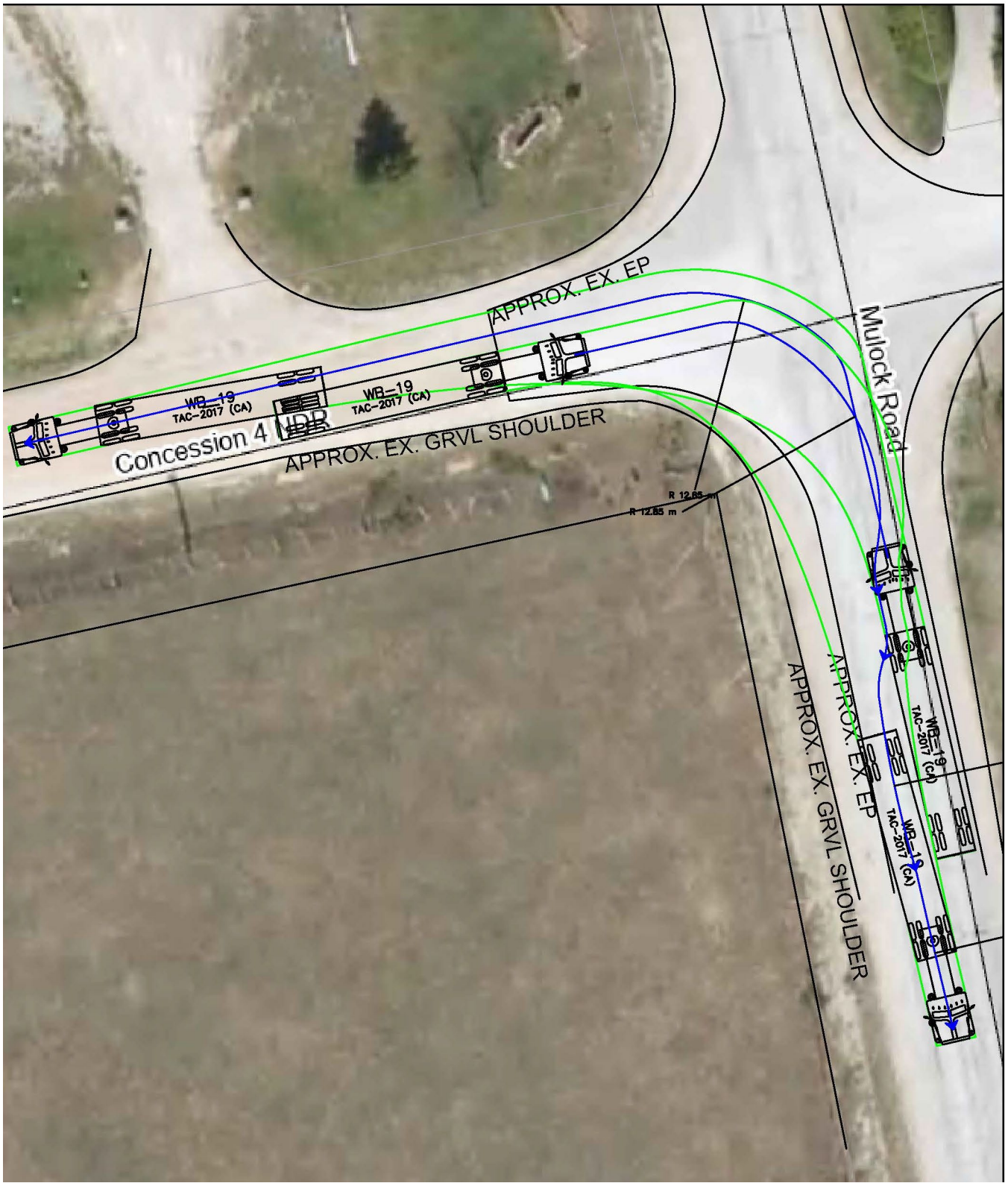
Figure 9



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WB-19 Truck Turning Paths
Concession 4 NDR and Mulock Road

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Figure 10

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Southwest Corner of Mulock Road & Concession 4 NDR

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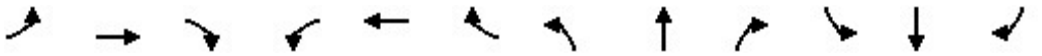
Figure 11

Appendix A

Existing Synchro 10 Reports



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	1	3	1	9	0	4	17	6	1	23	4
Future Volume (vph)	1	1	3	1	9	0	4	17	6	1	23	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	0.0		0.0	0.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	0		0	0		0	0		0	0		0
Taper Length (m)	7.6			7.6			7.6			7.6		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.919						0.967			0.982	
Flt Protected		0.990			0.995			0.993			0.998	
Satd. Flow (prot)	0	1714	0	0	1874	0	0	1809	0	0	1846	0
Flt Permitted		0.990			0.995			0.993			0.998	
Satd. Flow (perm)	0	1714	0	0	1874	0	0	1809	0	0	1846	0
Link Speed (k/h)		80			80			80			80	
Link Distance (m)		185.5			200.0			197.0			234.4	
Travel Time (s)		8.3			9.0			8.9			10.5	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	1	1	3	1	10	0	4	18	7	1	25	4
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	5	0	0	11	0	0	29	0	0	30	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 13.3%		ICU Level of Service A	
Analysis Period (min) 15			

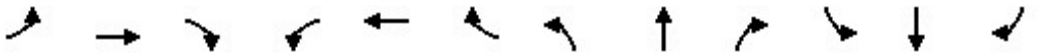
Intersection	
Int Delay, s/veh	2.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	1	1	3	1	9	0	4	17	6	1	23	4
Future Vol, veh/h	1	1	3	1	9	0	4	17	6	1	23	4
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	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	1	1	3	1	10	0	4	18	7	1	25	4

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	64	62	27	61	61	22	29	0	0	25	0	0
Stage 1	29	29	-	30	30	-	-	-	-	-	-	-
Stage 2	35	33	-	31	31	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	930	829	1048	934	830	1055	1584	-	-	1589	-	-
Stage 1	988	871	-	987	870	-	-	-	-	-	-	-
Stage 2	981	868	-	986	869	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	919	826	1048	927	827	1055	1584	-	-	1589	-	-
Mov Cap-2 Maneuver	919	826	-	927	827	-	-	-	-	-	-	-
Stage 1	985	870	-	984	867	-	-	-	-	-	-	-
Stage 2	967	865	-	981	868	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	8.7	9.4	1.1	0.3
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1584	-	-	969	836	1589	-	-
HCM Lane V/C Ratio	0.003	-	-	0.006	0.013	0.001	-	-
HCM Control Delay (s)	7.3	0	-	8.7	9.4	7.3	0	-
HCM Lane LOS	A	A	-	A	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0	0	0	-	-



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	4	8	8	6	6	1	5	29	5	1	22	1
Future Volume (vph)	4	8	8	6	6	1	5	29	5	1	22	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	0.0		0.0	0.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	0		0	0		0	0		0	0		0
Taper Length (m)	7.6			7.6			7.6			7.6		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.945			0.991			0.984			0.995	
Flt Protected		0.991			0.977			0.994			0.998	
Satd. Flow (prot)	0	1764	0	0	1824	0	0	1842	0	0	1870	0
Flt Permitted		0.991			0.977			0.994			0.998	
Satd. Flow (perm)	0	1764	0	0	1824	0	0	1842	0	0	1870	0
Link Speed (k/h)		80			80			80			80	
Link Distance (m)		185.5			200.0			197.0			234.4	
Travel Time (s)		8.3			9.0			8.9			10.5	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	4	9	9	7	7	1	5	32	5	1	24	1
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	22	0	0	15	0	0	42	0	0	26	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 13.9%		ICU Level of Service A	
Analysis Period (min) 15			

Intersection	
Int Delay, s/veh	3.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	4	8	8	6	6	1	5	29	5	1	22	1
Future Vol, veh/h	4	8	8	6	6	1	5	29	5	1	22	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	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	4	9	9	7	7	1	5	32	5	1	24	1

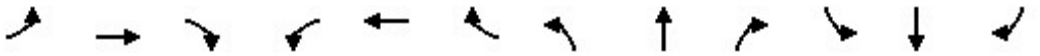
Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	76	74	25	81	72	35	25	0	0	37	0	0
Stage 1	27	27	-	45	45	-	-	-	-	-	-	-
Stage 2	49	47	-	36	27	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	914	816	1051	907	818	1038	1589	-	-	1574	-	-
Stage 1	990	873	-	969	857	-	-	-	-	-	-	-
Stage 2	964	856	-	980	873	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	905	813	1051	890	815	1038	1589	-	-	1574	-	-
Mov Cap-2 Maneuver	905	813	-	890	815	-	-	-	-	-	-	-
Stage 1	987	872	-	966	854	-	-	-	-	-	-	-
Stage 2	953	853	-	961	872	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	9	9.2	0.9	0.3
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1589	-	-	914	863	1574	-	-
HCM Lane V/C Ratio	0.003	-	-	0.024	0.016	0.001	-	-
HCM Control Delay (s)	7.3	0	-	9	9.2	7.3	0	-
HCM Lane LOS	A	A	-	A	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0.1	0	-	-

Appendix B

Future Background and Total Synchro 10 Reports



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	1	3	1	10	0	4	19	7	1	25	4
Future Volume (vph)	1	1	3	1	10	0	4	19	7	1	25	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	0.0		0.0	0.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	0		0	0		0	0		0	0		0
Taper Length (m)	7.6			7.6			7.6			7.6		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.919						0.967			0.983	
Flt Protected		0.990			0.996			0.994			0.998	
Satd. Flow (prot)	0	1714	0	0	1876	0	0	1810	0	0	1848	0
Flt Permitted		0.990			0.996			0.994			0.998	
Satd. Flow (perm)	0	1714	0	0	1876	0	0	1810	0	0	1848	0
Link Speed (k/h)		80			80			80			80	
Link Distance (m)		185.5			200.0			197.0			234.4	
Travel Time (s)		8.3			9.0			8.9			10.5	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	1	1	3	1	11	0	4	21	8	1	27	4
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	5	0	0	12	0	0	33	0	0	32	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 13.3%		ICU Level of Service A	
Analysis Period (min) 15			

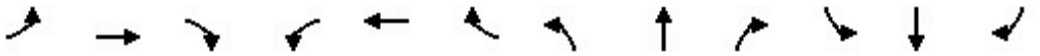
Intersection	
Int Delay, s/veh	2.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	1	1	3	1	10	0	4	19	7	1	25	4
Future Vol, veh/h	1	1	3	1	10	0	4	19	7	1	25	4
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	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	1	1	3	1	11	0	4	21	8	1	27	4

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	70	68	29	66	66	25	31	0	0	29	0	0
Stage 1	31	31	-	33	33	-	-	-	-	-	-	-
Stage 2	39	37	-	33	33	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	922	823	1046	927	825	1051	1582	-	-	1584	-	-
Stage 1	986	869	-	983	868	-	-	-	-	-	-	-
Stage 2	976	864	-	983	868	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	910	820	1046	921	822	1051	1582	-	-	1584	-	-
Mov Cap-2 Maneuver	910	820	-	921	822	-	-	-	-	-	-	-
Stage 1	983	868	-	980	865	-	-	-	-	-	-	-
Stage 2	961	861	-	978	867	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	8.8	9.4	1	0.2
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1582	-	-	964	830	1584	-	-
HCM Lane V/C Ratio	0.003	-	-	0.006	0.014	0.001	-	-
HCM Control Delay (s)	7.3	0	-	8.8	9.4	7.3	0	-
HCM Lane LOS	A	A	-	A	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0	0	0	-	-



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	4	9	9	7	7	1	6	32	6	1	24	1
Future Volume (vph)	4	9	9	7	7	1	6	32	6	1	24	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	0.0		0.0	0.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	0		0	0		0	0		0	0		0
Taper Length (m)	7.6			7.6			7.6			7.6		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.944			0.992			0.981			0.995	
Flt Protected		0.992			0.977			0.993			0.998	
Satd. Flow (prot)	0	1764	0	0	1825	0	0	1835	0	0	1870	0
Flt Permitted		0.992			0.977			0.993			0.998	
Satd. Flow (perm)	0	1764	0	0	1825	0	0	1835	0	0	1870	0
Link Speed (k/h)		80			80			80			80	
Link Distance (m)		185.5			200.0			197.0			234.4	
Travel Time (s)		8.3			9.0			8.9			10.5	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	4	10	10	8	8	1	7	35	7	1	26	1
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	24	0	0	17	0	0	49	0	0	28	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 14.6%		ICU Level of Service A	
Analysis Period (min) 15			

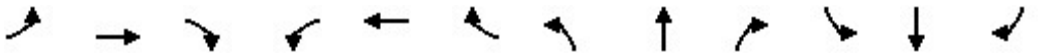
Intersection	
Int Delay, s/veh	3.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	4	9	9	7	7	1	6	32	6	1	24	1
Future Vol, veh/h	4	9	9	7	7	1	6	32	6	1	24	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	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	4	10	10	8	8	1	7	35	7	1	26	1

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	86	85	27	92	82	39	27	0	0	42	0	0
Stage 1	29	29	-	53	53	-	-	-	-	-	-	-
Stage 2	57	56	-	39	29	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	900	805	1048	892	808	1033	1587	-	-	1567	-	-
Stage 1	988	871	-	960	851	-	-	-	-	-	-	-
Stage 2	955	848	-	976	871	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	888	800	1048	871	803	1033	1587	-	-	1567	-	-
Mov Cap-2 Maneuver	888	800	-	871	803	-	-	-	-	-	-	-
Stage 1	983	870	-	955	847	-	-	-	-	-	-	-
Stage 2	941	844	-	955	870	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	9.1	9.3	1	0.3
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1587	-	-	904	846	1567	-	-
HCM Lane V/C Ratio	0.004	-	-	0.026	0.019	0.001	-	-
HCM Control Delay (s)	7.3	0	-	9.1	9.3	7.3	0	-
HCM Lane LOS	A	A	-	A	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0.1	0	-	-



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	1	8	1	10	0	9	19	7	1	25	4
Future Volume (vph)	1	1	8	1	10	0	9	19	7	1	25	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	0.0		0.0	0.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	0		0	0		0	0		0	0		0
Taper Length (m)	7.6			7.6			7.6			7.6		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.890						0.972			0.983	
Flt Protected		0.995			0.996			0.987			0.998	
Satd. Flow (prot)	0	1668	0	0	1876	0	0	1807	0	0	1848	0
Flt Permitted		0.995			0.996			0.987			0.998	
Satd. Flow (perm)	0	1668	0	0	1876	0	0	1807	0	0	1848	0
Link Speed (k/h)		80			80			80			80	
Link Distance (m)		185.5			200.0			197.0			234.4	
Travel Time (s)		8.3			9.0			8.9			10.5	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	1	1	9	1	11	0	10	21	8	1	27	4
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	11	0	0	12	0	0	39	0	0	32	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 15.9%		ICU Level of Service A	
Analysis Period (min) 15			

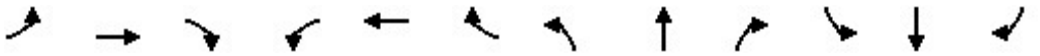
Intersection	
Int Delay, s/veh	3.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	1	1	8	1	10	0	9	19	7	1	25	4
Future Vol, veh/h	1	1	8	1	10	0	9	19	7	1	25	4
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	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	1	1	9	1	11	0	10	21	8	1	27	4

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	82	80	29	81	78	25	31	0	0	29	0	0
Stage 1	31	31	-	45	45	-	-	-	-	-	-	-
Stage 2	51	49	-	36	33	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	905	810	1046	907	812	1051	1582	-	-	1584	-	-
Stage 1	986	869	-	969	857	-	-	-	-	-	-	-
Stage 2	962	854	-	980	868	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	891	804	1046	893	806	1051	1582	-	-	1584	-	-
Mov Cap-2 Maneuver	891	804	-	893	806	-	-	-	-	-	-	-
Stage 1	980	868	-	963	852	-	-	-	-	-	-	-
Stage 2	944	849	-	970	867	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	8.6	9.5	1.9	0.2
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1582	-	-	999	813	1584	-	-
HCM Lane V/C Ratio	0.006	-	-	0.011	0.015	0.001	-	-
HCM Control Delay (s)	7.3	0	-	8.6	9.5	7.3	0	-
HCM Lane LOS	A	A	-	A	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0	0	0	-	-



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	4	9	14	7	7	1	11	32	6	1	24	1
Future Volume (vph)	4	9	14	7	7	1	11	32	6	1	24	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	0.0		0.0	0.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	0		0	0		0	0		0	0		0
Taper Length (m)	7.6			7.6			7.6			7.6		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.930			0.992			0.982			0.995	
Flt Protected		0.993			0.977			0.989			0.998	
Satd. Flow (prot)	0	1739	0	0	1825	0	0	1829	0	0	1870	0
Flt Permitted		0.993			0.977			0.989			0.998	
Satd. Flow (perm)	0	1739	0	0	1825	0	0	1829	0	0	1870	0
Link Speed (k/h)		80			80			80			80	
Link Distance (m)		185.5			200.0			197.0			234.4	
Travel Time (s)		8.3			9.0			8.9			10.5	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	4	10	15	8	8	1	12	35	7	1	26	1
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	29	0	0	17	0	0	54	0	0	28	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 17.1%		ICU Level of Service A	
Analysis Period (min) 15			

Intersection	
Int Delay, s/veh	4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	4	9	14	7	7	1	11	32	6	1	24	1
Future Vol, veh/h	4	9	14	7	7	1	11	32	6	1	24	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	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	4	10	15	8	8	1	12	35	7	1	26	1

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	96	95	27	104	92	39	27	0	0	42	0	0
Stage 1	29	29	-	63	63	-	-	-	-	-	-	-
Stage 2	67	66	-	41	29	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	887	795	1048	876	798	1033	1587	-	-	1567	-	-
Stage 1	988	871	-	948	842	-	-	-	-	-	-	-
Stage 2	943	840	-	974	871	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	874	788	1048	849	791	1033	1587	-	-	1567	-	-
Mov Cap-2 Maneuver	874	788	-	849	791	-	-	-	-	-	-	-
Stage 1	980	870	-	940	835	-	-	-	-	-	-	-
Stage 2	926	833	-	948	870	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	9	9.4	1.6	0.3
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1587	-	-	920	830	1567	-	-
HCM Lane V/C Ratio	0.008	-	-	0.032	0.02	0.001	-	-
HCM Control Delay (s)	7.3	0	-	9	9.4	7.3	0	-
HCM Lane LOS	A	A	-	A	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0.1	0	-	-