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June 30, 2015

via mail  
CCTA File 115091

**Lester Wideman**  
44166 Southgate Road 4  
RR#1 Mount Forest, ON N0G 2L0

**Re: Conn Commercial Development, Township of Southgate  
Traffic Review**

Dear Mr. Wideman:

As requested, we have reviewed the proposed Conn Commercial Development from a transportation perspective, addressing the site access, site traffic volumes, sight lines at the access point and the potential impacts to the adjacent road system. Our comments are set out in this letter report as follows.

### **Site Location**

The subject site is located on the northwest corner of the intersection of Highway 89 with Grey Road 14, in the Township of Southgate (as per Figure 1). The property has an area of 0.37 hectares (0.91 acres) with approximately 65 metres of frontage on Grey Road 14.

### **Road Network**

Grey Road 14 is a County road within the Grey County road network. While the County does not currently assign a functional classification to its road system, a County road typical of Grey Road 14 would generally be considered as a minor or secondary arterial road. In the vicinity of the site, Grey Road 14 has a posted speed limit of 80 km/h and a two-lane cross section (1 lane of travel per direction). The road is paved to a width of 7.5 metres with gravel shoulders. The assumed planning capacity for a road reflective of Grey Road 14 is 700 to 800 vehicles per hour per lane (vphpl). Through the study area the road maintains a straight horizontal alignment. With respect to the vertical alignment, there is a slight positive slope (<1%) towards the north which culminates in a vertical crest curve approximately 560 metres north of the site.

Highway 89 is a provincial highway. The posted limit through the study area is 60 km/h. As a provincial highway, the road has an assumed planning capacity in the order of 900 to 1200 vphpl. For

the purpose of this study, a lower planning capacity of 900 vphpl has been assumed given the reduced speed limit through the hamlet of Conn. There are slight horizontal curves to the east and west of Grey Road 14 and a minor vertical crest curve immediately west of Grey Road 14.

The intersection of Highway 89 with Grey Road 14 is a 4-leg intersection with stop control on Grey Road 14. Each approach consists of a single shared left/through/right lane. It is noted that Grey Road 14 transitions to Wellington Road 14 at Highway 89 (thus the south approach is Wellington Road 14).

The study area road network is illustrated in Figure 2.

### **Existing Traffic Volumes**

To determine existing traffic volumes, a traffic count was obtained from MTO for the intersection of Highway 89 with Grey Road 14. The traffic count was conducted on Wednesday April 12, 2014 from 6:00 to 10:00, 11:00 to 14:00, and 15:00 to 18:00. The traffic count details are provided in Appendix A.

Through the area, MTO considers Highway 89 to reflect traffic pattern variations consistent with an *intermediate recreation* use. As per the MTO *intermediate recreation* seasonal variation curve and published data for Highway 89, the peak summer conditions occur in July and are approximately 22% greater than the average conditions. As previously noted, the traffic data provided was observed in April. Based on the seasonal variation curve, April traffic conditions are approximately 18% greater than the average conditions. Thus to account for peak summer conditions, the observed traffic volumes have been increased by 4%. While it is recognized that the seasonal variation curves are based on traffic volumes observed on MTO facilities, the adjustment has also been applied to the volumes on Grey Road 14 and Wellington Road 14.

Additional consideration was given to peak weekend conditions, recognizing that the proposed commercial development will experience peak operations on Saturdays throughout the summer. A review of the 2010 Summer Average Daily Traffic (SADT – average 24 hour, 2-way traffic for the period July 1 to August 31, including weekends) and 2010 Summer Average Weekday Traffic (SAWDT – average 24 hour, 2-way traffic for the period July 1 to August 31, excluding weekends) indicates that summer weekend traffic on Highway 89 through the area is approximately 40% greater than the average summer weekday traffic. To establish the summer Saturday peak hour conditions, the summer weekday PM peak hour volumes (i.e. the observed PM peak hour volumes adjusted by 4% to reflect peak summer conditions) have been increased by an additional 40%. To ensure a conservative approach, this increase has been applied to the volumes on Highway 89, Grey Road 14 and Wellington Road 14.

Historic traffic volumes through the study area were reviewed for Highway 89 to the west and east of Grey Road 14 as obtained from the MTO. The Average Annual Daily Traffic (AADT) for the period 2000 to 2010 (the most recent data available) shows an annual increase of approximately 1.2% to the

west and 1.0% to the east. In order to ensure a conservative approach, the 2014 volumes have been adjusted by an annual growth rate of 2% to reflect the existing 2015 conditions.

The 2015 traffic volumes are illustrated in Figure 3. The volumes are based on the observed 2014 volumes, adjusted by 4% to reflect the summer peak conditions and an additional 2% to reflect background growth from 2014 to 2015. The Saturday peak hour volumes include an additional 40% adjustment to reflect peak weekend conditions. It is noted that this review only considers the weekday PM and Saturday peak hour periods as they are considered the critical peak periods.

### Existing Traffic Operations

Based on the 2015 volumes, the peak hour peak directional volumes on Grey Road 14 are in the order of 60 to 85 vehicles, whereas the peak hour directional volumes on Highway 89 are 165 to 175 vehicles. As previously noted, the assumed planning capacities of Grey Road 14 and Highway 400 are 700 and 900 vphpl, respectively. In considering the 2015 volumes, Grey Road 14 is operating at 12% of capacity or less, whereas Highway 89 is operation at 19% of capacity. As such, the study area road network is considered to be operating well below capacity and can readily accommodate new development traffic.

The operations of the intersection of Highway 89 with Grey Road 14 were also analyzed based on the 2015 traffic volumes, the existing configuration and intersection control and procedures outlined in the *2010 Highway Capacity Manual*<sup>1</sup> (using Synchro v.8 software). For the unsignalized intersection the review considers the average delay (measured in seconds), level of service (LOS) and volume to capacity (v/c) for the critical movements, namely the stop movements on the minor street. A summary of the analyses is provided in Table 1 (detailed worksheets are provided in Appendix B). Level of service A corresponds to the best operating condition with minimal delays whereas level of service F corresponds to poor operations resulting from high intersection delays. A v/c ratio of less than 1.0 indicates the intersection movement/approach is operating at less than capacity while v/c of 1.0 indicates capacity has been reached.

**Table 1: Intersection Operations – 2015 Background Conditions**

Intersection & Movements	Control	Weekday PM Peak Hour			Saturday Peak Hour			
		delay	LOS	v/c	delay	LOS	v/c	
Highway 89 & Grey Road 14	NB	stop	11	B	0.11	12	B	0.18
	SB	stop	11	B	0.07	12	B	0.11

<sup>1</sup> *Highway Capacity Manual*. Transportation Research Board, Washington DC, 2010.

As indicated, the intersection is providing excellent operating conditions with minimal delays under existing conditions.

## **Development Plan**

The proposed commercial development involves the construction of an approximate 835 m<sup>2</sup> (9,000 ft<sup>2</sup>) retail store and warehouse. The purpose of the proposed development is to accommodate the relocation of the existing retail country market store currently located on the adjacent property. It is understood that upon relocation of the market store to the new facility, the existing building on the adjacent property will revert to a residential dwelling.

A site plan showing the proposed development is provided in Figure 4.

## **Site Access**

The site currently has direct access to Grey Road 14; however, there is no distinguishable access point as approximately 30 metres of the frontage on Grey Road 14 is open and provides ready access to the site. The proposed development of the site will include the construction of a single commercial driveway on Grey Road 14, located approximately 60 metres north of Highway 89 (measured centreline of access to the highway edge of pavement).

With respect to entrance standards, the *Grey County Entrance Permit Procedure* (Procedure # MS-TS-001-001) defers to the MTO *Commercial Site Access Policy and Standards Manual* and the design standards contained therein. Based on the location of the site (at the intersection of 2 roads), the nature of the proposed development and the anticipated traffic volumes and design vehicles (including tractor trailers), the CSAS-18 access standard is considered appropriate. The CSAS-18 standard, as illustrated in Figure 5, is used for sites with commercial operations comparable to those proposed. As per Figure 5, and considering only the access to the intersecting road, the CSAS-18 standard requires the following: an access width of 9.0 metres; radii of 10.0 metres; and a minimum separation of 35 metres along the side street between the proposed access and the adjacent highway (measured from centreline of access to edge of pavement). This separation is the minimum required to allow a WB-17.5 design vehicle (i.e. a tractor trailer) to exit the site and stop at the stop bar at Highway 89 without obstructing northbound traffic on Grey Road 14. As previously noted, the location of the proposed site access on Grey Road 14 will provide a 60 metre separation between the centreline of access and the edge of pavement on Highway 89, thus satisfying the minimum MTO separation requirements. In this regard, the proposed site access can be designed to satisfy the requirements of MTO and the County with respect to width, radii and distance from the adjacent intersection.

It is noted that the site is connected to the adjacent site via an internal driveway. This internal connection will be closed as part of the proposed development and relocation of the existing retail operation. Thus the existing commercial access on Highway 89 will revert to a residential access,

whereas access to the new development will be provided via a new access on Grey Road 14 (as noted above).

### Site Generated Traffic

The number of vehicle trips to be generated by the proposed retail country market store has been determined based on trip estimates provided by the owner. These estimates have also been compared to trip generation rates provided in the *ITE Trip Generation Manual, 9<sup>th</sup> Edition* for land uses similar to those proposed for the site.

The owner provided daily vehicle estimates and operating hours for Friday and Saturday (considered the peak operating days where site traffic is greatest) for the existing country market store. The volumes are as follows:

- Friday (8 AM to 8 PM) – 120 cars/day; and
- Saturday (8 AM to 8 PM) – 120 cars/day.

The existing retail market has approximately 334 m<sup>2</sup> (3,600 ft<sup>2</sup>) of retail space (including outdoor space and trailer storage). As previously noted, the proposed development will have 835 m<sup>2</sup> (9,000 ft<sup>2</sup>) of retail space and storage area. This translates to an increase of approximately 150% when compared to the existing space. To establish the trips for the new site, the trip estimates for the existing site have therefore been increased by the same amount. This is considered a conservative approach given that the increased size of the new facility is not expected to result in any appreciable increase in business (i.e. the existing retail store serves a relatively small rural market with limited growth).

A summary of the resulting trip estimates for the proposed development is provided in Table 2, including daily and hourly volumes. It is noted that each vehicle visiting the site will result in 2 trips (i.e. 1 trip in and 1 out) and thus the trips per day equates to 2x the vehicles per day. To further consider peak hour operations during a typical day, the average hourly volumes have been increased by a factor of 1.5, recognizing that site activity will not be uniform over the course of the day as some hours will be busier than others.

**Table 2: Trip Estimates – Site Specific**

Day of Operation	Hours of Operation	Vehicles/Day	Trips/Day	Trips/Hour	
				average	peak <sup>1</sup>
Friday	12 hrs	300	600	50	75
Saturday	12 hrs	300	600	50	75

<sup>1</sup> peak hour assumed as 1.5x average hour

Based on the estimates provided and the noted peak hour assumptions, the proposed development is expected to generate 75 peak hour trips on Fridays and Saturdays. It is noted that the existing store is open Monday through Saturday; however, weekday operations (Monday through Thursday) are somewhat less than Friday and Saturday operations and thus have not been considered in the review.

For the purpose of comparison, the site specific trip estimates provided by the owner have been compared to trip estimates established based on trip rates published in the *ITE Trip Generation Manual*. In considering the proposed uses, the trip generation rates for the *specialty retail* (ITE code 826) land use have been applied. The corresponding trip rates and estimates are summarized in Table 3 and Table 4. The comparative review only considers the weekday PM and Saturday peak hour conditions (the critical operating periods). It is noted that the *ITE Trip Generation Manual* does not provide Saturday peak hour trip rates for the *specialty retail* land use. As such, Saturday peak hour trip rates for the *shopping centre* land use were used to derive the Saturday rates for the *specialty retail* land use. The Saturday trip rates for the *shopping centre* land use (ITE code 820 - which is related to the *specialty retail* use) were found to be approximately 132% of the PM rates; thus this factor was applied to the *specialty retail* PM rates in order to derive Saturday rates.

**Table 3: ITE Trip Generation Rates**

Land Use	rate/unit	Weekday PM Peak Hour			Saturday Peak Hour		
		in	out	total	in	out	total
specialty retail	1000 ft <sup>2</sup> GFA	1.19	1.52	2.71	1.86	1.71	3.57

**Table 4: Trip Estimates – ITE**

Land Use	size	PM Peak Hour			Saturday Peak Hour		
		in	out	total	in	out	total
specialty retail	9,000 ft <sup>2</sup>	11	14	25	17	15	32

As indicated, the proposed development is expected to generate 25 trips (11 trips in and 14 trips out) during the weekday PM peak hour and 32 additional trips (17 trips in and 15 trips out) during the Saturday peak hour when considering the ITE trip generation rates for the noted land uses. The ITE trip estimates are considerably lower than the site specific trip estimates. In order to ensure a conservative approach, the estimates developed based on the site specific details provided by the owner have been considered in the assessment of the site access and the potential traffic impacts.

With respect to the generation of trips by the site, it is noted that not all of the trips generated will be new trips generated by the development recognizing that the existing retail store is currently

generating 30 peak hour trips. Thus the new development will contribute a net increase of 45 trips to the road network. Regardless, all of the site trips will access the site via Grey Road 14.

The site trips were distributed to area road network based on the location of the site, the proximity of surrounding urban development (i.e. Mount Forest, Arthur, Shelburne and Flesherton) and the expected travel routes.

The 2015 total traffic volumes are illustrated in Figure 6.

### Traffic Impacts

As noted, the proposed development of the subject site is expected to generate 75 trips during the Friday PM and Saturday peak hour periods. These additional volumes are not considered significant. The existing traffic volumes on Highway 89 and Grey Road 14 indicate that the roads are operating well below capacity and thus can readily accommodate the additional traffic entering and exiting the site. With the increase in traffic associated with the proposed development, the peak directional peak hour volumes on Grey Road 14 will be in the order of 95 to 120 vehicles, or approximately 14% to 17% of capacity. The peak directional peak hour volumes on Highway 89 are in the order of 180 to 190 vehicles, or approximately 20% of capacity. Thus the adjacent road network will continue to operate with ample reserve capacity.

The operations of the intersection of Highway 89 with Grey Road 14 were again investigated to consider the additional site volumes on the road network. The site access operations were also reviewed. The results of the operational analysis are provided in Table 5 (detailed worksheets are provided in Appendix B).

**Table 5: Intersection Operations – 2015 Total Conditions**

Intersection & Movements	Control		Weekday PM Peak Hour			Saturday Peak Hour		
			delay	LOS	v/c	delay	LOS	v/c
Highway 89 & Grey Road 14	NB	stop	12	B	0.13	13	B	0.20
	SB	stop	11	B	0.13	13	B	0.18
Site Access & Grey Road 14	EB	stop	9	A	0.04	9	A	0.04

As indicated, the site access and the intersection of Highway 89 with Grey Road 14 will provide excellent operating conditions. Thus the overall impact of the additional traffic volumes associated with the proposed commercial development on the study area road network will be negligible.

With respect to truck volumes, the site is expected to generate 3 to 4 truck trips per week (3 to 4 trips in and 3 to 4 trips out). Thus the truck traffic generated by the site is not expected to have any appreciable impacts on the road network.

### **Sight Line Analysis**

Based on the *Grey County Entrance Permit Procedure*, which regulates entrances onto County roads, the minimum sight distance for a County road with a speed of 80 km/h is 230 metres. In comparison, the MTO guidelines dictate a minimum stopping sight distance of 185 metres for a road with a posted speed of 80 km/h (and hence an assumed design speed of 100 km/h). This provides a sufficient distance for an approaching motorist to observe a stationary hazard in the road (i.e. a vehicle stopped on the adjacent road waiting to access the site) and bring their vehicle to a complete stop prior to the hazard. MTO guidelines also dictate a requirement of 230 metres, which is referred to as the safe sight distance, for a vehicle to turn left from the site and enter Grey Road 14 across a vehicle approaching from the left without affecting that vehicle's approach speed.

The available sight distances were determined from measurements taken in the field. At the proposed site access, the available sight distance to the north along Grey Road 14 is 245 metres, whereas the sight distance to the south is 60 metres to the stop controlled intersection at Highway 89. The sight distance to the north satisfies the minimum sight distance as published in the County's entrance permit procedure. To the south, the sight distance is 60 metres, limited by the intersection of Grey Road 14 with Highway 89. The stopping sight distance in this instance is not problematic given the proximity to the intersection with Highway 89 as vehicles approaching from the south will be travelling at a reduced speed having either just completed a turning movement from Highway 89 onto Grey Road 14 or having come to a complete stop on Wellington Road 14 before proceeding across Highway 89 and onto Grey Road 14. It is noted that the County's minimum sight distance requirements are considered conservative when compared to the MTO minimum stopping distance requirements. Regardless, the available sight distances at the proposed access location meet the County's minimum requirements and readily exceed the requirements of the MTO. As such, the available sight lines are considered appropriate.

### **Summary**

The proposed commercial development to be located on the north-west corner of the intersection of Highway 89 with Grey Road 14 in the hamlet of Conn is not expected to result in any significant increases in traffic volumes. The additional traffic volumes will not have any appreciable impacts on the road network which is currently operating well below the available capacity. Likewise, the site access point and the intersection of Highway 89 with Grey Road 14 will readily accommodate the additional site volumes with no operational concerns.

The proposed access can be designed to satisfy the criteria set forth in the County's entrance permit procedure and the MTO *Commercial Site Access Policy and Standards Manual* with respect to



entrance width (9.0 metres), corner radii (10.0 metres) and distance from the intersection (minimum of 35 metres - 60 metres proposed).

The sight distances at the proposed access point were also reviewed against the County's minimum stopping sight distance requirements for a road with a posted speed limit of 80 km/h. The sight distances are considered acceptable in all instances and thus no improvements are recommended to address the sight distances.

Should you have any questions or comments on the above, please do not hesitate to contact us.

Yours truly,  
**C.C. Tatham & Associates Ltd.**



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DRP:drp

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source: maps.google.ca



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Consulting Engineers

## Highway 89 & Grey Road 14 Commercial Development

### Site Location

Figure  
1



Looking north along Grey Road 14 from proposed site access



Looking south along Grey Road 14 from proposed site access



Looking east along Highway 89 from Grey Road 14



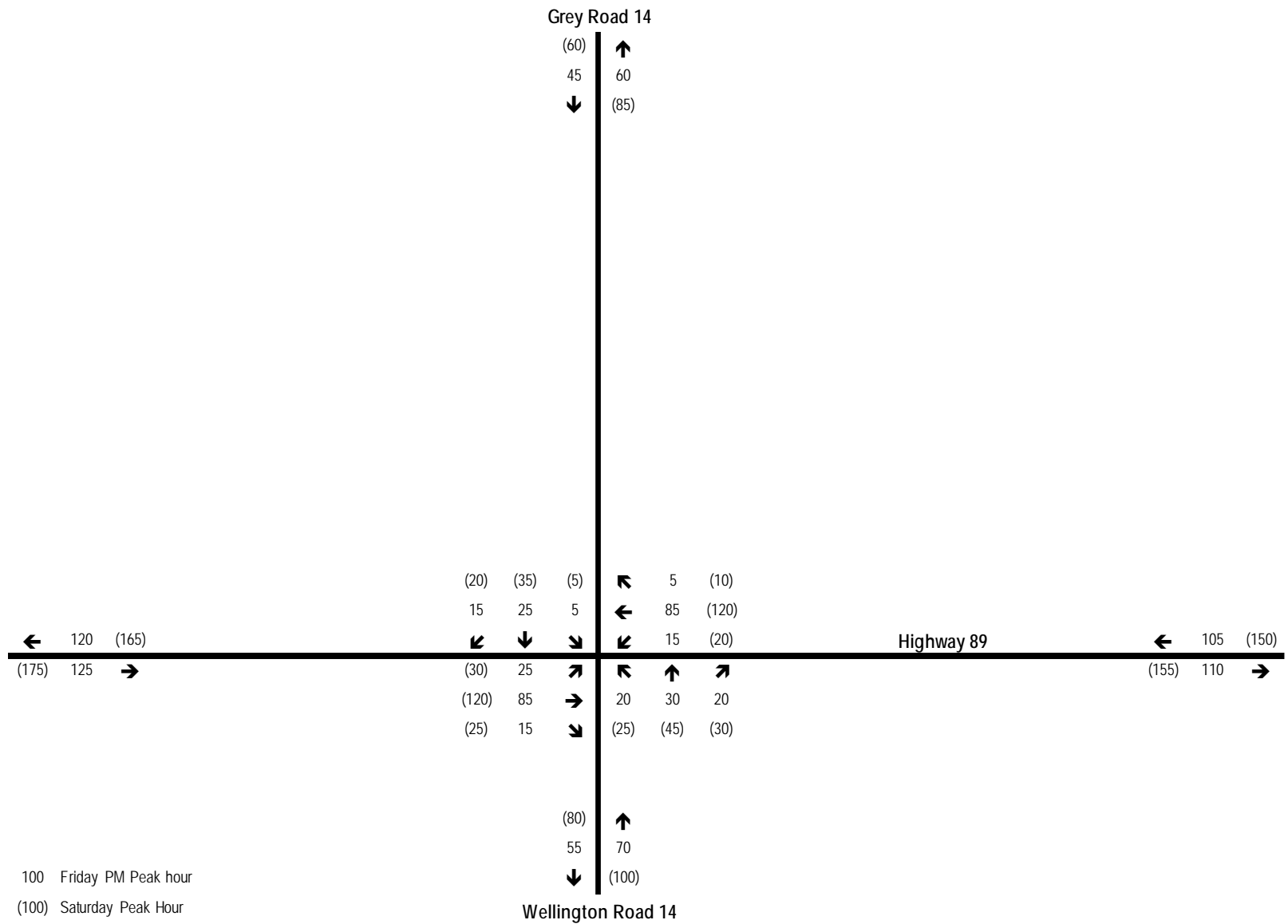
Looking west along Highway 89 from Grey Road 14



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## Highway 89 & Grey Road 14 Commercial Development Area Road Network

Figure  
2

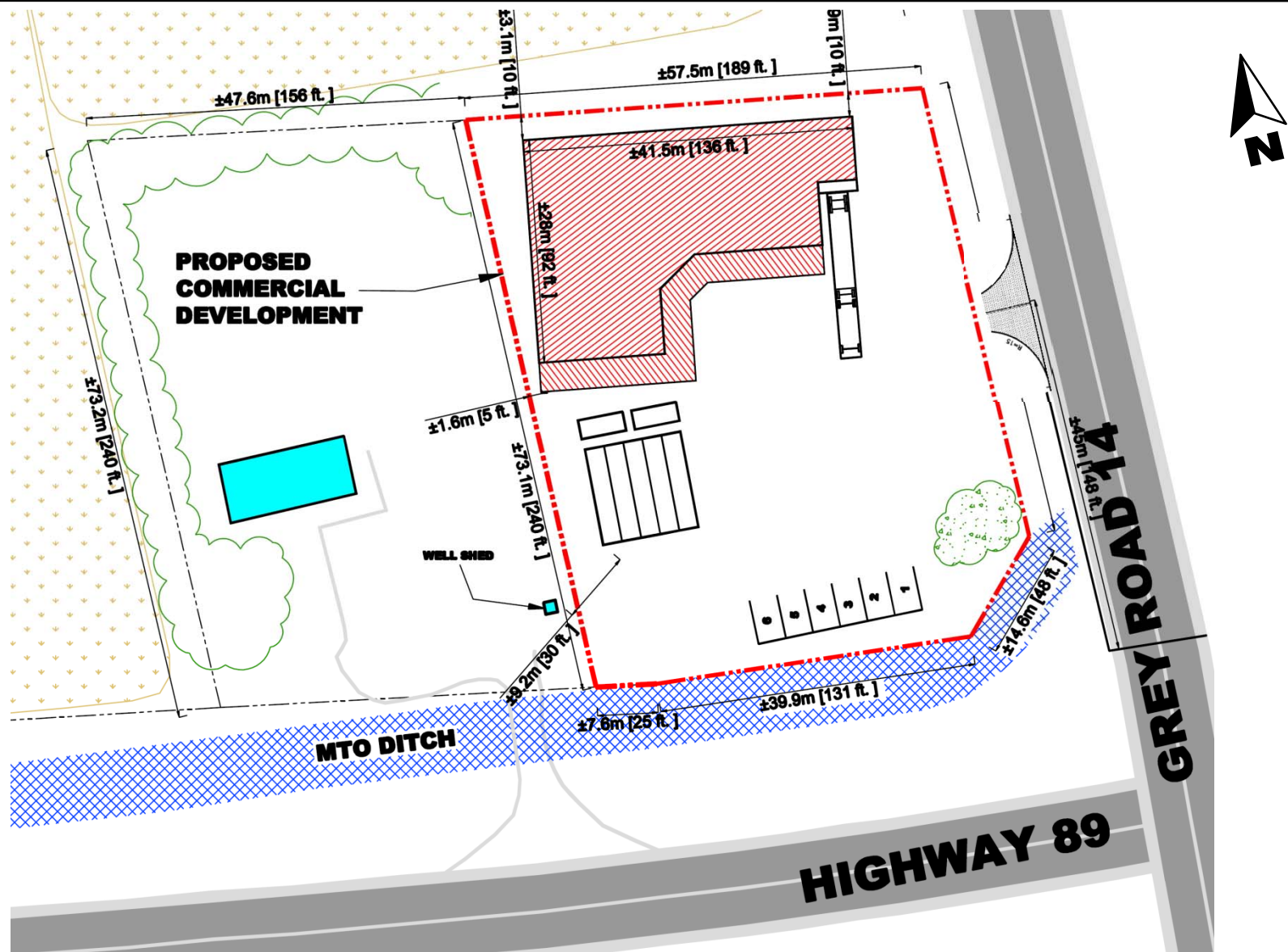


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## Highway 89 & Grey Road 14 Commercial Development 2015 Traffic Volumes - Summer

Figure  
3





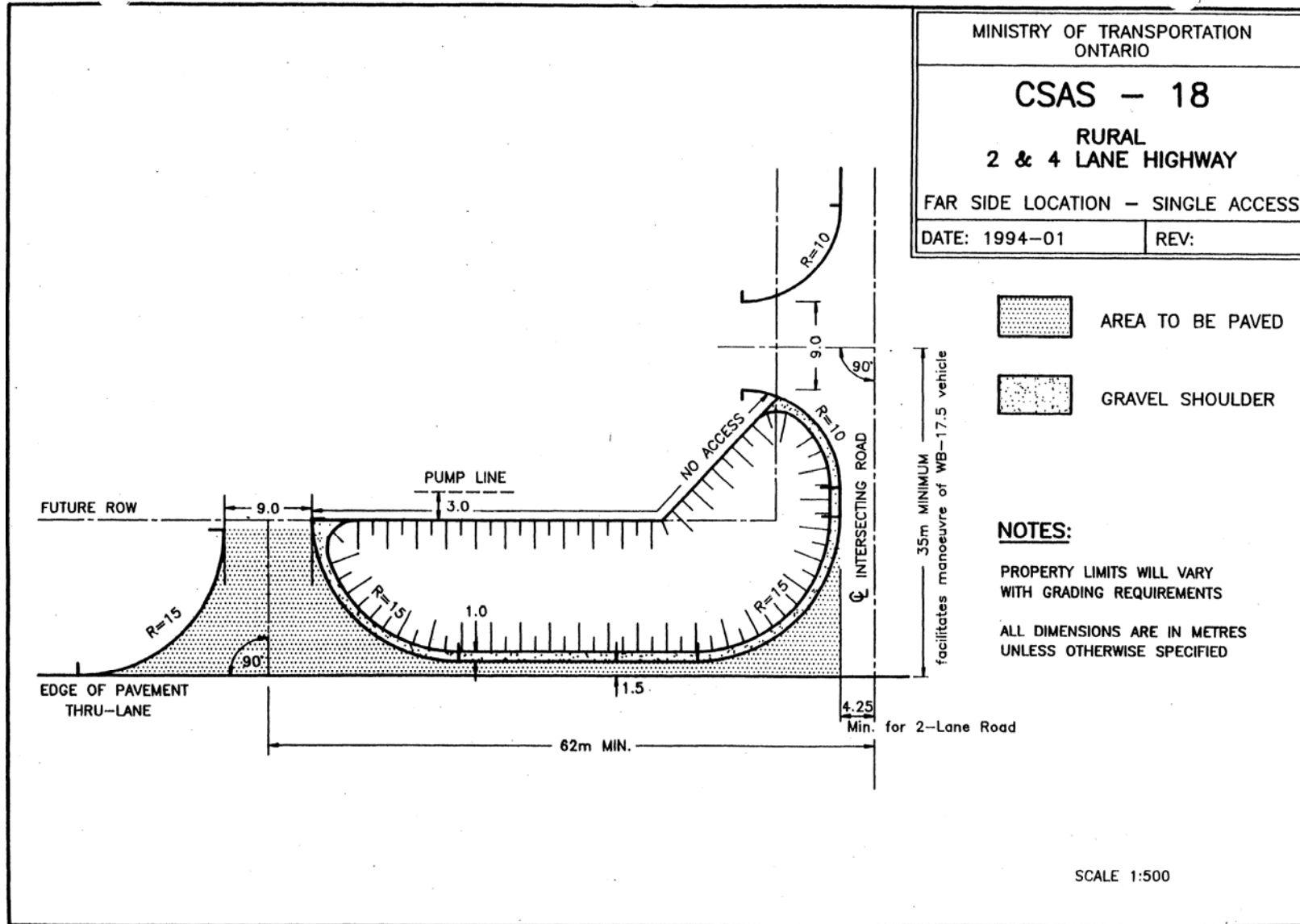
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Highway 89 & Grey Road 14 Commercial Development

Site Plan

Figure

4



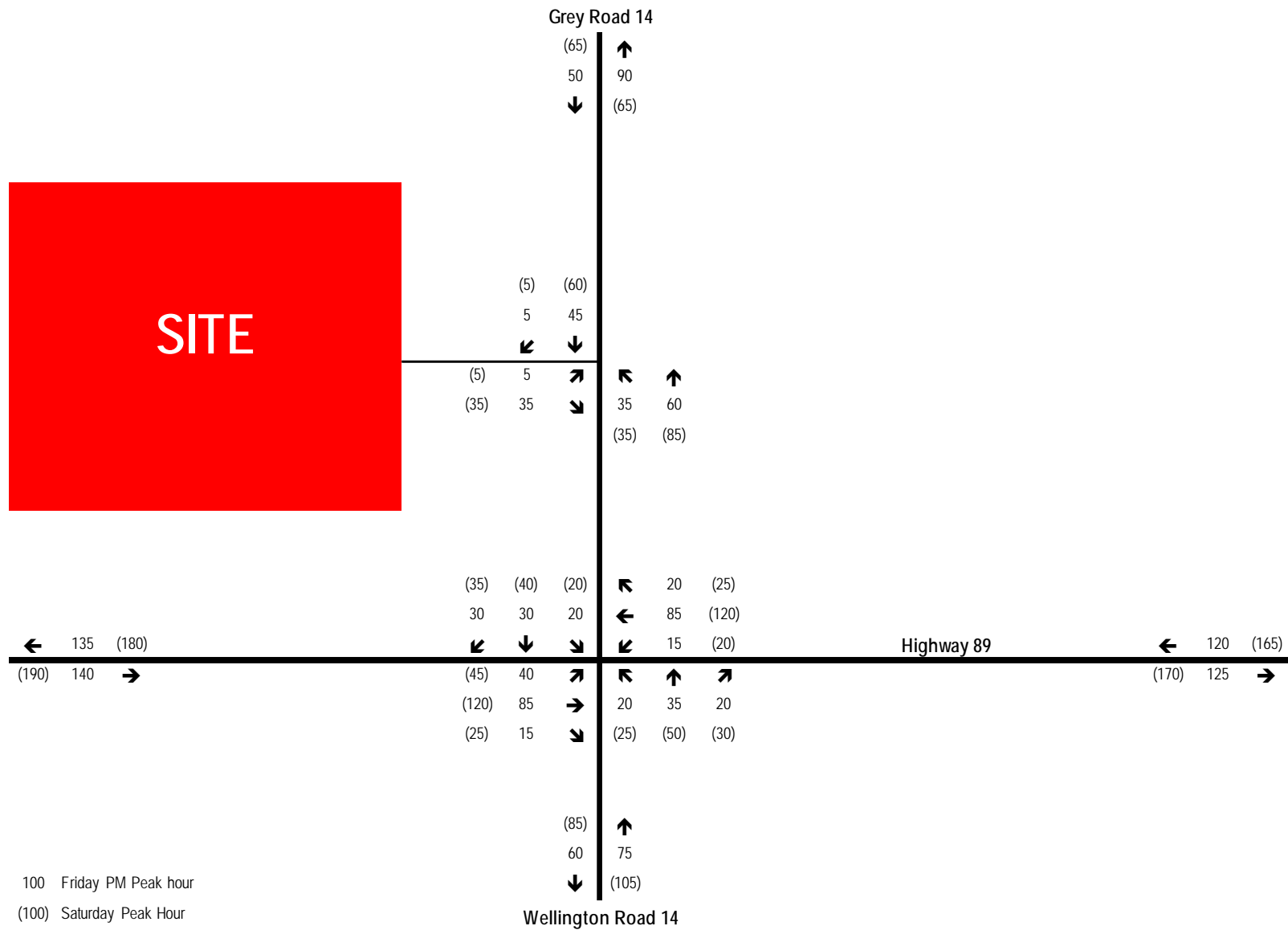
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Consulting Engineers

Highway 89 & Grey Road 14 Commercial Development

**CSAS-18 Design Standard**

Figure

5



## **APPENDIX A: TRAFFIC COUNTS**





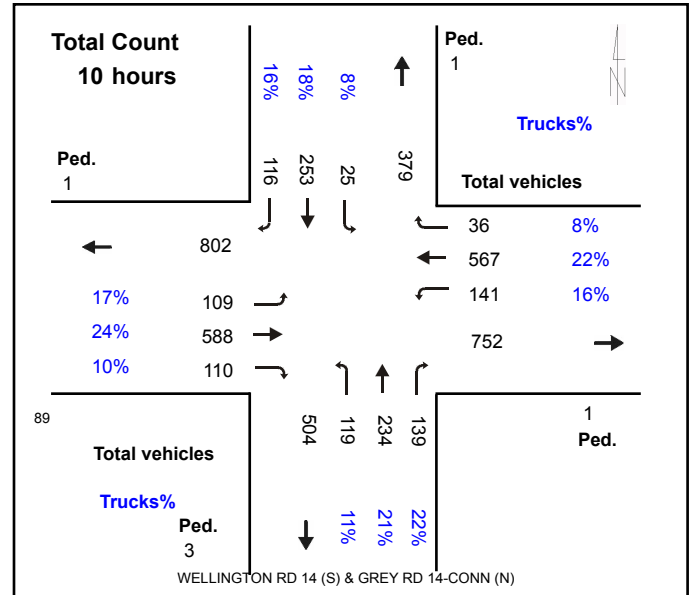
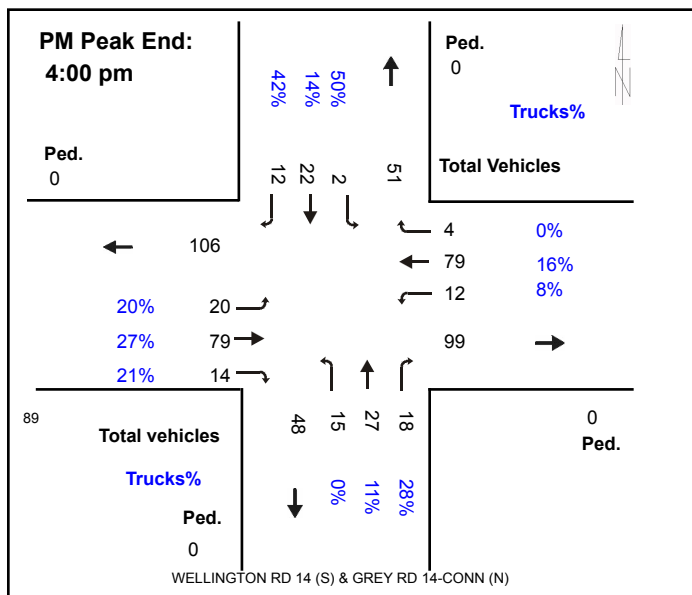
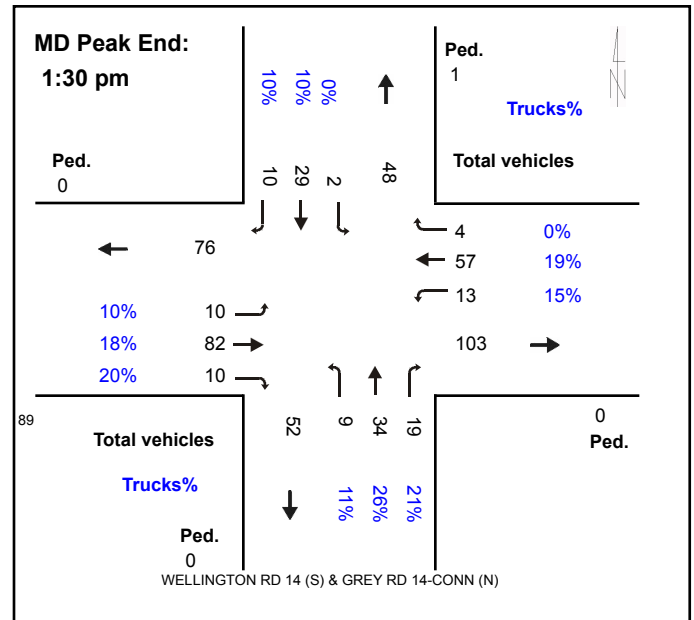
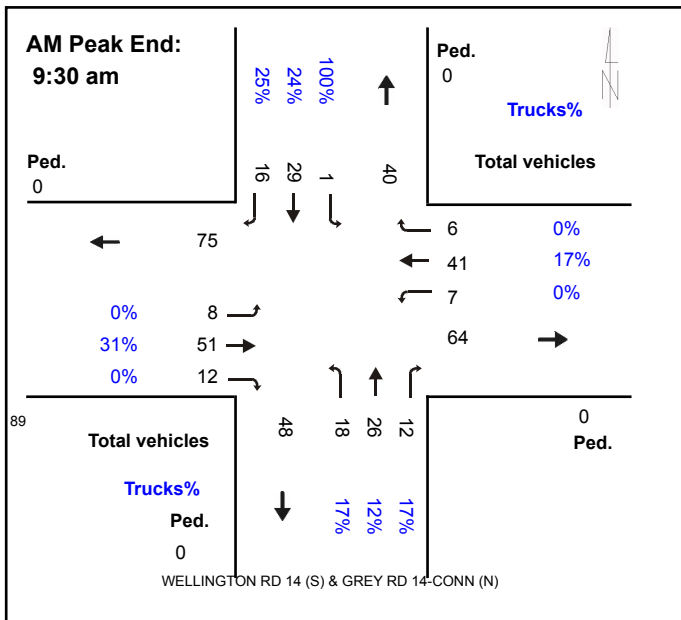
# HWY 89 @ WELLINGTON RD 14 (S) & GREY RD 14-CONN (N)

Southwest

Intersection ID:386900000

Count Day: Wednesday

Count Date: 23-Apr-2014



## **APPENDIX B: TRAFFIC OPERATIONS**

Intersection												
Int Delay, s/veh	4.5											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	25	85	15	15	85	5	20	30	20	5	25	15
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	5	5	5	5	5	5	5	5	5	5	5	5
Mvmt Flow	26	89	16	16	89	5	21	32	21	5	26	16
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	95	0	0	105	0	0	295	276	97	300	282	92
Stage 1	-	-	-	-	-	-	150	150	-	124	124	-
Stage 2	-	-	-	-	-	-	145	126	-	176	158	-
Critical Hdwy	4.15	-	-	4.15	-	-	7.15	6.55	6.25	7.15	6.55	6.25
Critical Hdwy Stg 1	-	-	-	-	-	-	6.15	5.55	-	6.15	5.55	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.15	5.55	-	6.15	5.55	-
Follow-up Hdwy	2.245	-	-	2.245	-	-	3.545	4.045	3.345	3.545	4.045	3.345
Pot Cap-1 Maneuver	1480	-	-	1468	-	-	651	626	951	646	622	957
Stage 1	-	-	-	-	-	-	845	767	-	873	788	-
Stage 2	-	-	-	-	-	-	851	786	-	819	761	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1480	-	-	1468	-	-	604	607	951	592	603	957
Mov Cap-2 Maneuver	-	-	-	-	-	-	604	607	-	592	603	-
Stage 1	-	-	-	-	-	-	829	752	-	856	779	-
Stage 2	-	-	-	-	-	-	799	777	-	753	747	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	1.5			1.1			11			10.6		
HCM LOS							B			B		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	676	1480	-	-	1468	-	-	686				
HCM Lane V/C Ratio	0.109	0.018	-	-	0.011	-	-	0.069				
HCM Control Delay (s)	11	7.5	0	-	7.5	0	-	10.6				
HCM Lane LOS	B	A	A	-	A	A	-	B				
HCM 95th %tile Q(veh)	0.4	0.1	-	-	0	-	-	0.2				

Intersection												
Int Delay, s/veh	4.8											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	30	120	25	20	120	10	25	45	30	5	35	20
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	5	5	5	5	5	5	5	5	5	5	5	5
Mvmt Flow	32	126	26	21	126	11	26	47	32	5	37	21
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	137	0	0	153	0	0	406	382	139	416	390	132
Stage 1	-	-	-	-	-	-	203	203	-	174	174	-
Stage 2	-	-	-	-	-	-	203	179	-	242	216	-
Critical Hdwy	4.15	-	-	4.15	-	-	7.15	6.55	6.25	7.15	6.55	6.25
Critical Hdwy Stg 1	-	-	-	-	-	-	6.15	5.55	-	6.15	5.55	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.15	5.55	-	6.15	5.55	-
Follow-up Hdwy	2.245	-	-	2.245	-	-	3.545	4.045	3.345	3.545	4.045	3.345
Pot Cap-1 Maneuver	1429	-	-	1409	-	-	550	546	901	542	541	909
Stage 1	-	-	-	-	-	-	792	728	-	821	749	-
Stage 2	-	-	-	-	-	-	792	746	-	755	718	-
Platoon blocked, %			-	-		-						
Mov Cap-1 Maneuver	1429	-	-	1409	-	-	493	524	901	472	519	909
Mov Cap-2 Maneuver	-	-	-	-	-	-	493	524	-	472	519	-
Stage 1	-	-	-	-	-	-	772	710	-	800	737	-
Stage 2	-	-	-	-	-	-	723	734	-	663	700	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	1.3			1			12.4			11.7		
HCM LOS							B			B		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	589	1429	-	-	1409	-	-	600				
HCM Lane V/C Ratio	0.179	0.022	-	-	0.015	-	-	0.105				
HCM Control Delay (s)	12.4	7.6	0	-	7.6	0	-	11.7				
HCM Lane LOS	B	A	A	-	A	A	-	B				
HCM 95th %tile Q(veh)	0.6	0.1	-	-	0	-	-	0.4				

Intersection												
Int Delay, s/veh	5.3											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	40	85	15	15	85	20	20	35	20	20	30	30
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	5	5	5	5	5	5	5	5	5	5	5	5
Mvmt Flow	42	89	16	16	89	21	21	37	21	21	32	32
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	111	0	0	105	0	0	345	324	97	343	321	100
Stage 1	-	-	-	-	-	-	182	182	-	132	132	-
Stage 2	-	-	-	-	-	-	163	142	-	211	189	-
Critical Hdwy	4.15	-	-	4.15	-	-	7.15	6.55	6.25	7.15	6.55	6.25
Critical Hdwy Stg 1	-	-	-	-	-	-	6.15	5.55	-	6.15	5.55	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.15	5.55	-	6.15	5.55	-
Follow-up Hdwy	2.245	-	-	2.245	-	-	3.545	4.045	3.345	3.545	4.045	3.345
Pot Cap-1 Maneuver	1460	-	-	1468	-	-	604	589	951	605	591	947
Stage 1	-	-	-	-	-	-	813	743	-	864	781	-
Stage 2	-	-	-	-	-	-	832	774	-	784	738	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1460	-	-	1468	-	-	541	564	951	544	566	947
Mov Cap-2 Maneuver	-	-	-	-	-	-	541	564	-	544	566	-
Stage 1	-	-	-	-	-	-	788	720	-	837	772	-
Stage 2	-	-	-	-	-	-	762	765	-	705	715	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	2.2			0.9			11.6			11.3		
HCM LOS							B			B		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	625	1460	-	-	1468	-	-	659				
HCM Lane V/C Ratio	0.126	0.029	-	-	0.011	-	-	0.128				
HCM Control Delay (s)	11.6	7.5	0	-	7.5	0	-	11.3				
HCM Lane LOS	B	A	A	-	A	A	-	B				
HCM 95th %tile Q(veh)	0.4	0.1	-	-	0	-	-	0.4				

Intersection						
Int Delay, s/veh	3.3					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	5	35	35	60	45	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	5	37	37	63	47	5
Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	187	50	53	0	-	0
Stage 1	50	-	-	-	-	-
Stage 2	137	-	-	-	-	-
Critical Hdwy	6.45	6.25	4.15	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.345	2.245	-	-	-
Pot Cap-1 Maneuver	795	1010	1534	-	-	-
Stage 1	965	-	-	-	-	-
Stage 2	882	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	775	1010	1534	-	-	-
Mov Cap-2 Maneuver	775	-	-	-	-	-
Stage 1	965	-	-	-	-	-
Stage 2	860	-	-	-	-	-
Approach	EB	NB		SB		
HCM Control Delay, s	8.9	2.7		0		
HCM LOS	A					
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR	
Capacity (veh/h)	1534	-	973	-	-	
HCM Lane V/C Ratio	0.024	-	0.043	-	-	
HCM Control Delay (s)	7.4	0	8.9	-	-	
HCM Lane LOS	A	A	A	-	-	
HCM 95th %tile Q(veh)	0.1	-	0.1	-	-	

Intersection												
Int Delay, s/veh	5.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	45	120	25	20	120	25	25	50	30	20	40	35
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	5	5	5	5	5	5	5	5	5	5	5	5
Mvmt Flow	47	126	26	21	126	26	26	53	32	21	42	37
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	153	0	0	153	0	0	455	429	139	458	429	139
Stage 1	-	-	-	-	-	-	234	234	-	182	182	-
Stage 2	-	-	-	-	-	-	221	195	-	276	247	-
Critical Hdwy	4.15	-	-	4.15	-	-	7.15	6.55	6.25	7.15	6.55	6.25
Critical Hdwy Stg 1	-	-	-	-	-	-	6.15	5.55	-	6.15	5.55	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.15	5.55	-	6.15	5.55	-
Follow-up Hdwy	2.245	-	-	2.245	-	-	3.545	4.045	3.345	3.545	4.045	3.345
Pot Cap-1 Maneuver	1409	-	-	1409	-	-	510	514	901	508	514	901
Stage 1	-	-	-	-	-	-	762	706	-	813	743	-
Stage 2	-	-	-	-	-	-	775	734	-	724	696	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1409	-	-	1409	-	-	439	487	901	432	487	901
Mov Cap-2 Maneuver	-	-	-	-	-	-	439	487	-	432	487	-
Stage 1	-	-	-	-	-	-	734	680	-	783	731	-
Stage 2	-	-	-	-	-	-	689	722	-	621	670	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	1.8			0.9			13.3			12.7		
HCM LOS							B			B		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	544	1409	-	-	1409	-	-	568				
HCM Lane V/C Ratio	0.203	0.034	-	-	0.015	-	-	0.176				
HCM Control Delay (s)	13.3	7.6	0	-	7.6	0	-	12.7				
HCM Lane LOS	B	A	A	-	A	A	-	B				
HCM 95th %tile Q(veh)	0.8	0.1	-	-	0	-	-	0.6				

Intersection

Int Delay, s/veh 2.8

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	5	35	35	85	60	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	5	37	37	89	63	5

Major/Minor	Minor2	Major1	Major2
Conflicting Flow All	229	66	68 0
Stage 1	66	-	- -
Stage 2	163	-	- -
Critical Hdwy	6.45	6.25	4.15 -
Critical Hdwy Stg 1	5.45	-	- -
Critical Hdwy Stg 2	5.45	-	- -
Follow-up Hdwy	3.545	3.345	2.245 -
Pot Cap-1 Maneuver	753	989	1514 -
Stage 1	949	-	- -
Stage 2	859	-	- -
Platoon blocked, %			- -
Mov Cap-1 Maneuver	733	989	1514 -
Mov Cap-2 Maneuver	733	-	- -
Stage 1	949	-	- -
Stage 2	837	-	- -

Approach	EB	NB	SB
HCM Control Delay, s	9	2.2	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1514	-	948	-	-
HCM Lane V/C Ratio	0.024	-	0.044	-	-
HCM Control Delay (s)	7.4	0	9	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0.1	-	0.1	-	-