

APPENDIX 1

TRAFFIC OPERATION ANALYSIS REPORT



Traffic Operation Analysis Final Report

Regional Road 81 (King Street) between Greenlane and Lincoln Avenue

January 2022

Prepared for:
Kerry T. Howe Engineering Limited
98 Church Street, P.O. Box 460
St. Catharines, ON
L2R 6V9



January 13, 2022

Our Ref: [476006]

Kerry T. Howe Engineering Limited.
98 Church Street, P.O. Box 460
St. Catharines, Ontario
L2R 6V9

**Re: Regional Road 81 (King Street) Road & Drainage Improvements –Traffic
Operation Analysis Final Report**

We are pleased to provide you (1) pdf copy of the completed 'Final' Traffic Operation Analysis Report as part of the Regional Road 81 (King Street) Road & Drainage Improvements between Greenlane and Lincoln Avenue in the Town of Lincoln.

If you would like any additional information or further clarifications on any aspect of our submission, please contact the undersigned at (905) 569-4122.

Yours truly,



Altaf Hussain, P. Eng.
Senior Transportation Engineer

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List of Revisions:

VERSION	DATE	DESCRIPTION
1	February 2017	Draft for Submission
2	January, 2022	Final Submission

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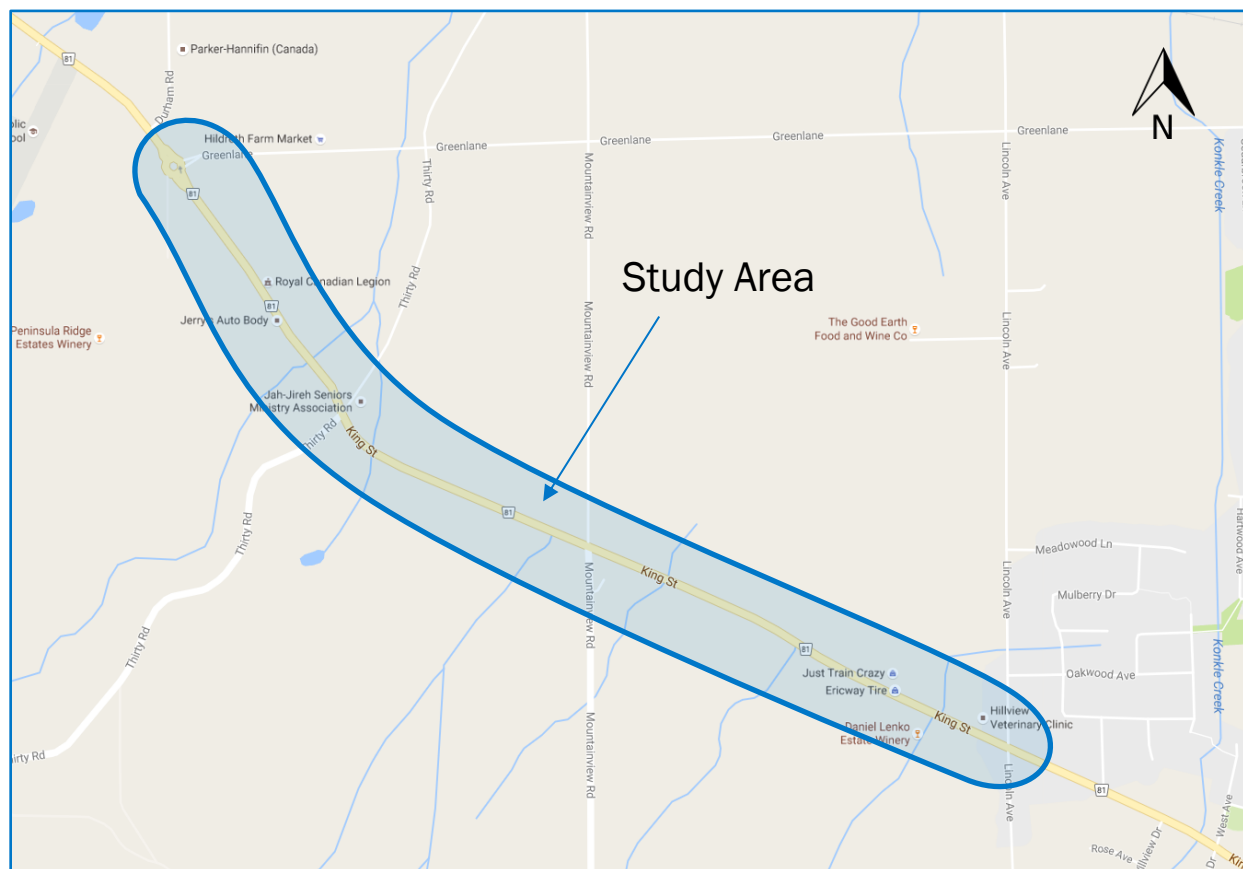
1. BACKGROUND

Parsons has been retained by Kerry T. Howe Engineering Ltd. to complete a Traffic Operation Analysis Study for the proposed Road and Drainage Improvements for Regional Road 81 (King Street) between Greenlane and Lincoln Avenue in the Town of Lincoln, Ontario. The purpose of the study is to review intersection operations within the study area and determine the need for improvements to accommodate existing and future traffic demands.

1.1 STUDY AREA AND ANALYSIS SCOPE

The proposed study area includes the section of Regional Road 81 (King Street) between Greenlane Road and Lincoln Avenue just east of the community of Beamsville Ontario. The study area includes three unsignalized intersections and a newly implemented roundabout at the intersection of King Street with Greenlane. The study area is presented in **Figure 1**.

Figure 1: Study Area



The scope of work included in the Traffic Operation Analysis included the following tasks:

- Review the existing (2016) traffic conditions for the study area intersections during the morning and afternoon peak hours;

- Undertake the existing (2016) intersection operations and summarize the measures of performance such as level of service, delays, and queues. Identify any operational issues if any.
- Develop the future (2026) traffic volumes using appropriate growth rate that is consistent with the Niagara Region traffic study guidelines;
- Conduct traffic signal and left turn lane warrant analysis and summarize the findings; and
- Undertake intersection operations for the future (2026) traffic conditions. Summarize the analysis results and identify solutions to remedy the issues if required.

2. EXISTING (2016) TRAFFIC CONDITIONS

2.1 ANALYSIS APPROACH AND TOOLS

The traffic analysis conducted for this study considers the capacity and level of service for individual intersections along the study corridor. Intersections were analyzed using the procedures of the Highway Capacity Manual (HCM) methodologies for unsignalized intersections and roundabouts, as implemented in the Synchro / SimTraffic 8.0 software developed by Trafficware and the Highway Capacity Software HCS 2010 Version 6.60.

Level of Service (LOS) can be characterized for each intersection approach and each lane group. Control delay alone is used to characterize LOS for the entire intersection or an approach. Control delay and volume-to-capacity (V/C) ratio are used to characterize LOS for a lane group. Delay quantifies the variations in travel time based on the intersection type of control. It is also a surrogate measure of driver discomfort and fuel consumption.

The LOS criteria for unsignalized intersections are somewhat different from the criteria for signalized intersections because perceptions of facility users differ. The expectation is that a signalized intersection is designed to carry higher traffic volumes and will present greater delay than an unsignalized intersection.

Unsignalized intersections are also associated with more uncertainty for users, as delays are less predictable than at signalized intersections. This uncertainty can reduce driver's delay tolerance. **Table 1** summarizes the characteristics of each level of service at unsignalized intersections. Level of service criteria for a roundabout type of intersection control is similar to what is used for unsignalized intersections.

Table 1: Unsignalized Intersection Level of Service Characteristics

CONTROL DELAY (S/VEH)	LOS BY VOLUME-TO-CAPACITY RATIO	
	V/C ≤ 1.0	V/C > 1.0
0 - 10	A	F
> 10 - 15	B	F
> 15 - 25	C	F
> 25 - 35	D	F

CONTROL DELAY (S/VEH)	LOS BY VOLUME-TO-CAPACITY RATIO	
	V/C ≤ 1.0	V/C > 1.0
> 35 - 50	E	F
> 50	F	F

Source: HCM 2010 Manual, Exhibit 19-1, V/C = Volume/Capacity

2.2 EXISTING (2016) TRAFFIC ANALYSIS

The existing (2016) traffic volumes for the study area intersections were established through a combination of Turning Movement Count (TMC) data received from the Niagara Region and collected by Parsons. Information regarding the traffic count data including count date and source are presented in **Table 2**. The raw count data is provided in **Appendix A**.

Table 2: Traffic Count Data Information

INTERSECTION	COUNT SOURCE & DATE
Regional Road 81 (King St.) & Greenlane	Parsons – Wednesday September 28 th , 2016
Regional Road 81 (King St.) & Thirty Rd.	Niagara Region – Tuesday May 24 th , 2016
Regional Road 81 (King St.) & Mountainview Rd.	Niagara Region – Wednesday May 25 th , 2016
Regional Road 81 (King St.) & Lincoln Ave.	Niagara Region – Tuesday May 24 th , 2016

Existing intersection volumes were approximately adjusted based on the intersection entering and exiting movements by only adding volume to the through movements. Summaries of the existing (2016) and adjusted existing (2016) intersection volumes for the AM and PM peak hours are shown in **Figure 1** and **Figure 2**, respectively, provided in **Appendix B**. The existing intersection lane configurations are also shown in **Figure 3** found in **Appendix B**.

2.3 EXISTING (2016) INTERSECTION OPERATIONS

Using the existing (2016) traffic volumes, Parsons completed operation analyses for the unsignalized intersections within the corridor using Synchro/SimTraffic (Version 8). The Weekday AM and PM Peak hours were selected for analysis as these time periods represent the greatest amount of traffic on Regional Road 81 (King Street). Roundabout operation analysis for the Greenlane and RR81 King Street intersection was completed using HCS 2010 software.

All analyses were completed using parameters outlined in the *Niagara Region Guidelines for Transportation Impact Studies May 2012*.

The results of the capacity analysis completed for the existing (2016) Weekday AM and PM peak hours are provided in **Table 3** for the study area intersections. The Synchro and HCS 2010 output sheets are provided in **Appendix C**.

Table 3: Existing (2016) Weekday AM and PM Intersection Operational Performance

INTERSECTION/ MOVEMENT	AM PEAK HOUR			PM PEAK HOUR		
	LOS [DELAY (S)*]	V/C	95TH TILE QUEUE (M)*	LOS [DELAY (S)*]	V/C	95TH TILE QUEUE (M)*
RR81 (King St.) & Greenlane (Roundabout)	A [8]	-	-	A [7]	-	-
EBL&T&R	A [9]	0.48	3	A [8]	0.46	3
WBL&T&R	A [7]	0.34	2	A [6]	0.28	1
NBL&T&R	A [5]	0.00	0	A [5]	0.01	0
SBL&T&R	A [6]	0.12	0	A [5]	0.06	0
RR81 (King St.) & Thirty Rd. (Unsignalized)	[4]	-	-	[5]	-	-
EBL&T&R	A [0]	0.01	0	A [0]	0.01	0
WBL&T&R	A [1]	0.04	1	A [3]	0.08	2
NBL&T&R	C [19]	0.34	11	C [18]	0.33	11
SBL&T&R	C [18]	0.08	2	C [22]	0.19	5
RR81 (King St.) & Mountainview Rd. (Unsignalized)	[1]	-	-	[1]	-	-
EBL&T&R	A [0]	0.01	0	A [0]	0.01	0
WBL&T&R	A [0]	0.01	0	A [0]	0.01	0
NBL&T&R	C [17]	0.05	1	C [18]	0.10	2
SBL&T&R	B [14]	0.06	1	C [17]	0.10	2
RR81 (King St.) & Lincoln Ave. (Unsignalized)	[3]	-	-	[3]	-	-
EBL&T&R	A [1]	0.04	1	A [1]	0.03	1
WBL&T&R	A [1]	0.02	0	A [1]	0.03	1
NBL&T&R	C [16]	0.13	3	A [17]	0.13	3
SBL&T&R	C [20]	0.24	7	A [23]	0.20	5

* rounded values.

As presented in **Table 3**, all of the unsignalized intersections analyzed are operating good under existing (2016) traffic conditions. The roundabout intersection of King Street and Greenlane is also operating well under existing conditions.

3. FUTURE (2026) TRAFFIC CONDITIONS

3.1 FUTURE (2026) TRAFFIC VOLUMES

The future (2026) traffic volumes were established by applying a 2% per annum growth rate to the existing (2016) traffic volumes. This growth rate was utilized based on criteria outlined in the *Niagara Region Guidelines for Transportation Impact Studies May 2012*. The resulting weekday AM and PM peak hour traffic volumes forecast for the future (2026) conditions are presented in **Figure 4** found in **Appendix D**.

3.2 LEFT TURN LANE WARRANT ANALYSIS

Currently, Regional Road 81 (King Street) has shared single lane approaches to each of the unsignalized intersections analyzed as part of the study area. As part of this traffic study, Parsons reviewed the need for dedicated left turn lanes for the eastbound and westbound approaches at each intersection.

In determining the need for dedicated left turn lanes, a Left Turn Warrant Analysis using methodology outlined in the Geometric Design Standards for Ontario Highways published by Ministry of Transportation Ontario (MTO) was performed at each intersection. This analysis was completed for Weekday AM and PM Peak hour traffic volumes under the ultimate horizon year scenario of (2026).

Table 4 presents the results of the Left Lane Warrant Analysis for each intersection under future (2026) traffic conditions. The warrant analysis sheets can be found in **Appendix E**.

Table 4: Left Turn Lane Warrant Requirements Based on Future (2026) Traffic Conditions

INTERSECTION	DIRECTION	LEFT TURN LANE WARRANTED	REQUIRED MINIMUM STORGE LENGTH (M)
Regional Road 81 (King St.) & Thirty Rd.	Eastbound	Yes	15
	Westbound	Yes	25
Regional Road 81 (King St.) & Mountainview Rd.	Eastbound	No	-
	Westbound	No	-
Regional Road 81 (King St.) & Lincoln Ave.	Eastbound	Yes	15
	Westbound	Yes	15

The results of the left turn lane warrants presented in **Table 4** indicate that exclusive left turn lanes with a minimum storage of 15 metres in the eastbound direction and a 25 metres in the westbound direction are warranted at the intersection of King Street and Thirty Road.

At the intersection of King Street and Lincoln Avenue, exclusive left turn lanes with a minimum storage length so 15 metres are warranted in both the eastbound and westbound directions while no left turn lanes are warranted at the intersection of King Street and Mountainview Road.

3.3 SIGNAL WARRANT ANALYSIS

As part of the Traffic Operations Analysis, Parsons performed signal warrant analyses using the Ontario Traffic Manual (OTM) Book 12 guidelines for the three minor street stop controlled intersections under future (2026) traffic conditions. The OTM Book 12 suggests that the signal warrant for the future year required to be met to 120% in the case of existing intersections. The results of the signal warrant analysis are presented in **Table 5**.

Table 5: Future (2026) Traffic Conditions – Signal Warrant Analysis Summary

INTERSECTION	% COMPLIANCE		SIGNAL WARRANTED
	WARRANT 1	WARRANT 2	
Regional Road 81 (King St.) & Thirty Rd	78%	76%	No
Regional Road 81 (King St.) & Mountainview Rd.	23%	34%	No
Regional Road 81 (King St.) & Lincoln Ave.	76%	17%	No

Based on the signal warrant results presented in **Table 5**, none of the stop controlled intersections are warranted for signalization under future total 2026 traffic conditions. The signal warrant analysis sheets can be found in **Appendix F**.

3.4 FUTURE (2026) INTERSECTION OPERATIONS

The completed capacity analyses for the unsignalized intersections within the corridor under future (2026) traffic conditions was completed with the left turn lane improvements warranted under **Section 4**. The results of the completed analysis are summarized in **Table 6**. The Synchro output sheets are placed in **Appendix G**.

Table 6: Future (2026) Weekday AM and PM Intersection Operational Performance

INTERSECTION/ MOVEMENT	AM PEAK HOUR			PM PEAK HOUR		
	LOS [DELAY (S)*]	V/C	95TH TILE QUEUE (M)*	LOS [DELAY (S)*]	V/C	95TH TILE QUEUE (M)*
RR81 (King St.) & Greenlane (Roundabout)	A [9]	-	-	A [9]	-	-
EBL&T&R	B [11]	0.57	4	A [10]	0.56	4
WBL&T&R	A [8]	0.42	2	A [7]	0.34	1
NBL&T&R	A [6]	0.00	0	A [6]	0.01	0
SBL&T&R	A [7]	0.16	1	A [5]	0.07	0
RR81 (King St.) & Thirty Rd. (Unsignalized)	[5]	-	-	[6]	-	-
EBL	A [8.3]	0.02	0	A [8]	0.01	0
EBT&R	A [0]	0.27	0	A [0]	0.30	0
WBL	A [8.6]	0.04	1	A [9]	0.11	3
WBT&R	A [0]	0.21	0	A [0]	0.20	0
NBL&T&R	D [28]	0.51	21	D [27]	0.50	20
SBL&T&R	C [23]	0.12	3	D [30]	0.30	9
RR81 (King St.) & Mountainview Rd. (Unsignalized)	[1]	-	-	[2]	-	-
EBL&T&R	A [0]	0.01	0	A [0]	0.01	0
WBL&T&R	A [0]	0.01	0	A [0]	0.01	0
NBL&T&R	C [20]	0.07	2	C [23]	0.16	4
SBL&T&R	C [17]	0.08	2	C [22]	0.16	4
RR81 (King St.) & Lincoln Ave. (Unsignalized)	[4]	-	-	[10]	-	-
EBL	A [9]	0.05	1	A [8]	0.04	1
EBT&R	A [0]	0.26	0	A [0]	0.32	0
WBL	A [8]	0.03	1	A [1]	0.03	1
WBT&R	A [0]	0.26	0	A [0]	0.28	0
NBL&T&R	C [20]	0.19	5	C [21]	0.20	6

INTERSECTION/ MOVEMENT	AM PEAK HOUR			PM PEAK HOUR		
	LOS [DELAY (S)*]	V/C	95TH TILE QUEUE (M)*	LOS [DELAY (S)*]	V/C	95TH TILE QUEUE (M)*
SBL&T&R	D [29]	0.39	13	F [74]	0.80	41

* rounded values.

Under the future (2026) traffic conditions presented in **Table 6**, the southbound shared left/through/right approach lane at King Street and Lincoln Avenue is forecast to operate with a level of service 'F' and v/c ratio of 0.80 during the PM peak hour. This level of delay for unsignalized intersection movements is not uncommon for minor side street approaches. As mentioned in Section 5, a traffic signal is not warranted for this location. All other unsignalized intersections are forecast to operate satisfactorily under future (2026) traffic conditions.

4. ANALYSIS CONCLUSIONS AND RECOMMENDATIONS

The results of the completed Traffic Operation Analysis completed for Regional Road 81 (King Street) between Greenlane and Lincoln Avenue is summarized below. The analysis included a review of existing (2016) and future (2026) traffic operations.

Existing (2016) Traffic Conditions

- All of the unsignalized intersections within the study area are operating good with no critical movements or V/C ratio issues.

Future (2026) Traffic Conditions

- Based on left turn lane warrant analysis, exclusive left turn lanes with a minimum storage of 15 metres in the eastbound direction and 25 metres in the westbound direction are warranted at the intersection of King Street and Thirty Road.
- Left turn lane warrants for the intersection of King Street and Lincoln Avenue indicate that exclusive left turn lanes with a minimum storage of 15 metres are warranted in both the eastbound and westbound directions
- At the intersection of King Street and Mountanview Road, no left turn lanes are warranted both in the eastbound and westbound directions.
- Based on the OTM Book 12 guidelines, none of the existing stop controlled intersections are warranted for signalization under future total (2026) traffic conditions.
- The southbound shared left, through and right approach lane at King Street and Lincoln Avenue is forecast to operate with a level of service 'F' with V/C ratio of 0.80 during the PM peak hour. This performance is not uncommon for minor street approaches entering a major roadway. A signal warrant analysis conducted for this intersection indicates a traffic signal is not warranted.
- All other study area intersections are forecast to operate satisfactory under future (2026) traffic conditions.

Traffic Operation Analysis

Regional Road 81 (King Street) between Greenlane and Lincoln Avenue

Kerry T. Howe Engineering Limited
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PARSONS

Appendix A

Existing Turning Movement Count Data



Intersection Count

Tel: (905) 356-7003
Fax: (905) 356-7008
Website: www.parsons.com

Morning Peak Diagram

Count Period
From:
To:

Peak Hour
From: 8:00 AM
To: 9:00 PM

Municipality: Town of Lincoln
Intersection: King St. & Greenlane
Control: Roundabout
Major Road: King St.

Weather conditions:

Person(s) who counted:

Project Name: RR81 King St. TIS
Project #: 476006
Count Date: Sept. 28th 2016

North Leg Total:	197	Heavys	0	0	0	0
North Entering:	90	Trucks	0	0	0	0
North Peds:	0	Cars	90	0	0	90
Peds Cross:	⌘	Total	90	0	0	90

Heavys	0
Trucks	3
Cars	104
Total	107

East Leg Total:	679
East Entering:	309
East Peds:	0
Peds Cross:	⌘

Heavys	Trucks	Cars	Total
0	6	391	397

Heavys	Trucks	Cars	Total
0	3	103	106
0	18	350	368
0	0	0	0
0	21	453	



King St.



Greenlane



Cars	Trucks	Heavys	Total
1	0	0	1
301	6	0	307
1	0	0	1
303	6	0	

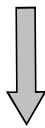
King St.



Cars	Trucks	Heavys	Total
352	18	0	370

Peds Cross:	⌘
West Peds:	0
West Entering:	474
West leg Total:	871

Heavys	0
Trucks	0
Cars	1
Total	1



Heavys	0	0	0
Trucks	0	0	0
Cars	0	0	2
Total	0	0	2

Peds Cross:	⌘
South Peds:	0
South Entering:	2
South leg Total:	3

Comments



Intersection Count

Tel: (905) 356-7003
Fax: (905) 356-7008
Website: www.parsons.com

Afternoon Peak Diagram

Count Period
From:
To:

Peak Hour
From: 4:15 PM
To: 5:15 PM

Municipality: Town of Lincoln
Intersection: King St. & Greenlane
Control: Roundabout
Major Road: King St.

Weather conditions:

Person(s) who counted:

Project Name: RR81 King St. TIS
Project #: 476006
Count Date: Sept. 28th 2016

North Leg Total: 129
North Entering: 44
North Peds: 0
Peds Cross: X

Heavys	0	0	0
Trucks	0	0	0
Cars	43	0	1
Total	43	0	1

0
0
44

Heavys	0
Trucks	0
Cars	85
Total	85

East Leg Total: 647
East Entering: 261
East Peds: 0
Peds Cross: X

Heavys	Trucks	Cars	Total
0	0	305	305

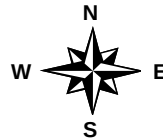


King St.

Heavys	Trucks	Cars	Total
0	0	81	81
0	0	385	385
0	0	6	6
0	0	472	



Greenlane



Cars	Trucks	Heavys	Total
3	0	0	3
258	0	0	258
0	0	0	0
261	0	0	

King St.

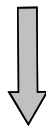


Cars	Trucks	Heavys	Total
386	0	0	386



Peds Cross: X
West Peds: 0
West Entering: 472
West leg Total: 777

Heavys	0
Trucks	0
Cars	6
Total	6



Heavys	0	0	0
Trucks	0	0	0
Cars	4	1	0
Total	4	1	0

Peds Cross: X
South Peds: 0
South Entering: 5
South leg Total: 11

Comments

Turning Movements Report - AM Period

Location..... King Street @ Thirty Road

GeoID..... 00188

Municipality. LINCOLN

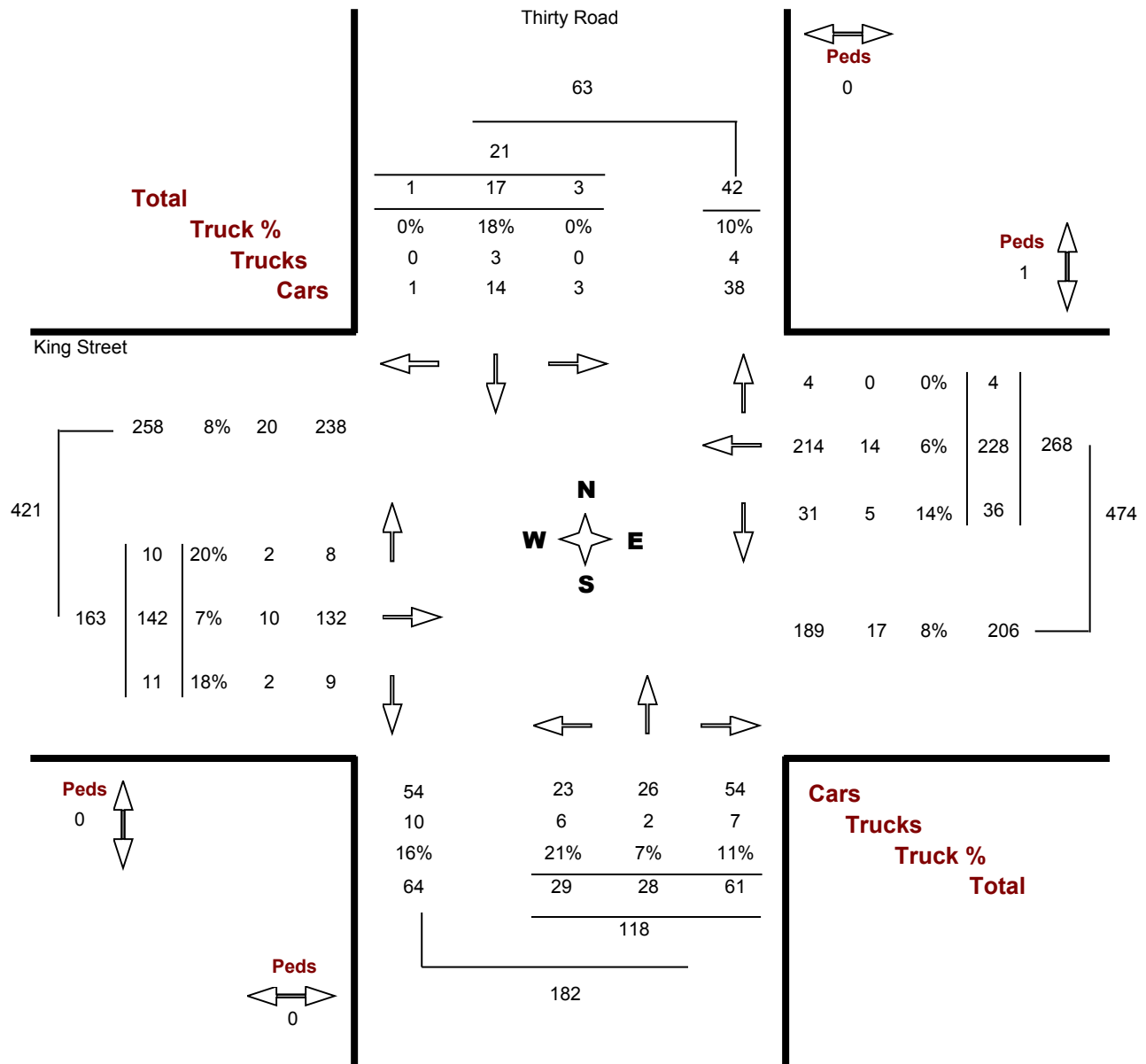
Count Date. Tuesday, 24 May, 2016

Traffic Cont.

Count Time. 07:00 AM — 09:00 AM

Major Dir..... None

Peak Hour.. 08:00 AM — 09:00 AM



Turning Movements Report - PM Period

Location..... King Street @ Thirty Road

GeoID..... 00188

Municipality. LINCOLN

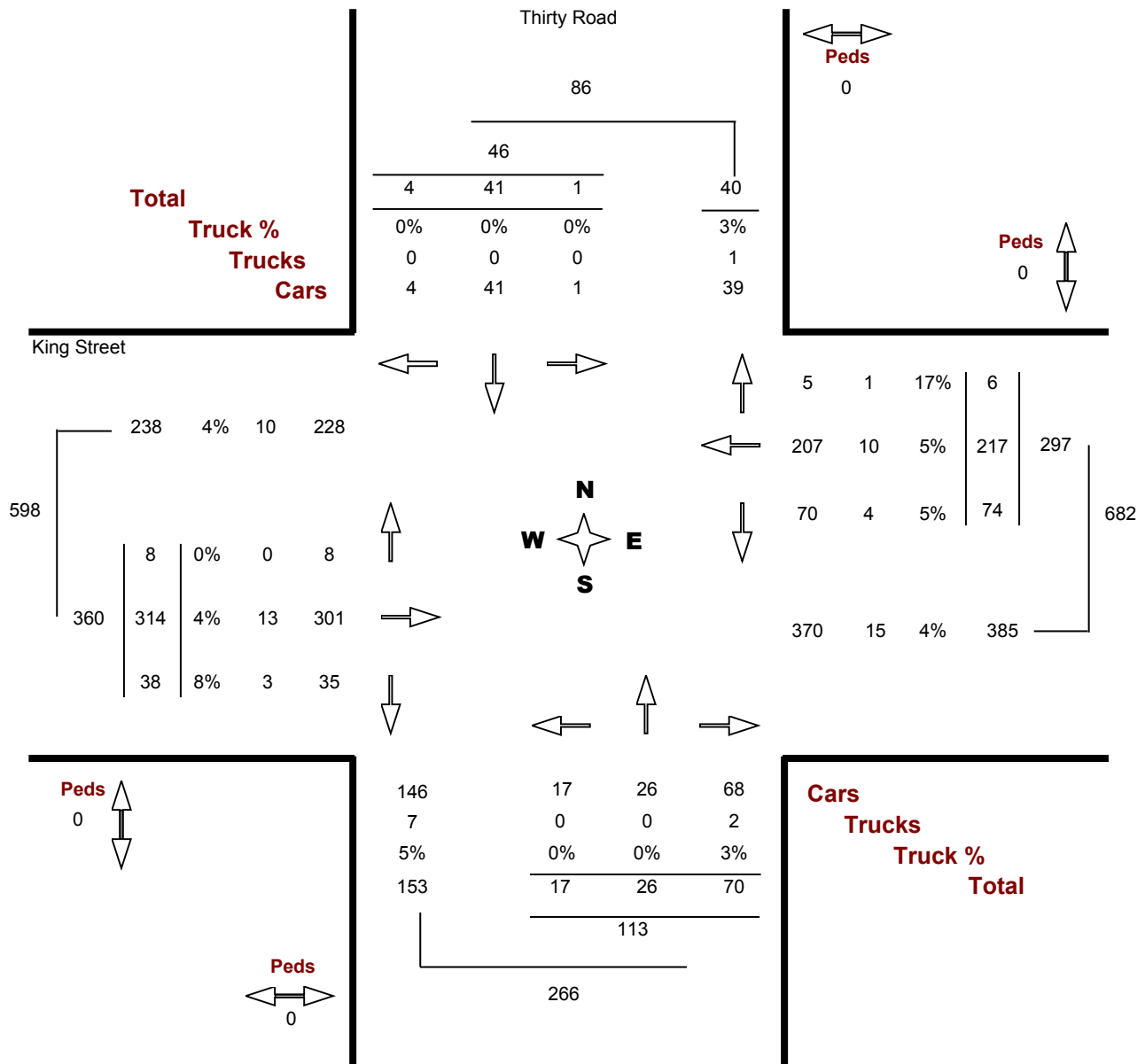
Count Date. Tuesday, 24 May, 2016

Traffic Cont.

Count Time. 03:00 PM — 06:00 PM

Major Dir..... None

Peak Hour.. 04:15 PM — 05:15 PM



Turning Movements Report - AM Period

Location..... King Street @ Mountainview Road

GeoID..... 00001

Municipality. LINCOLN

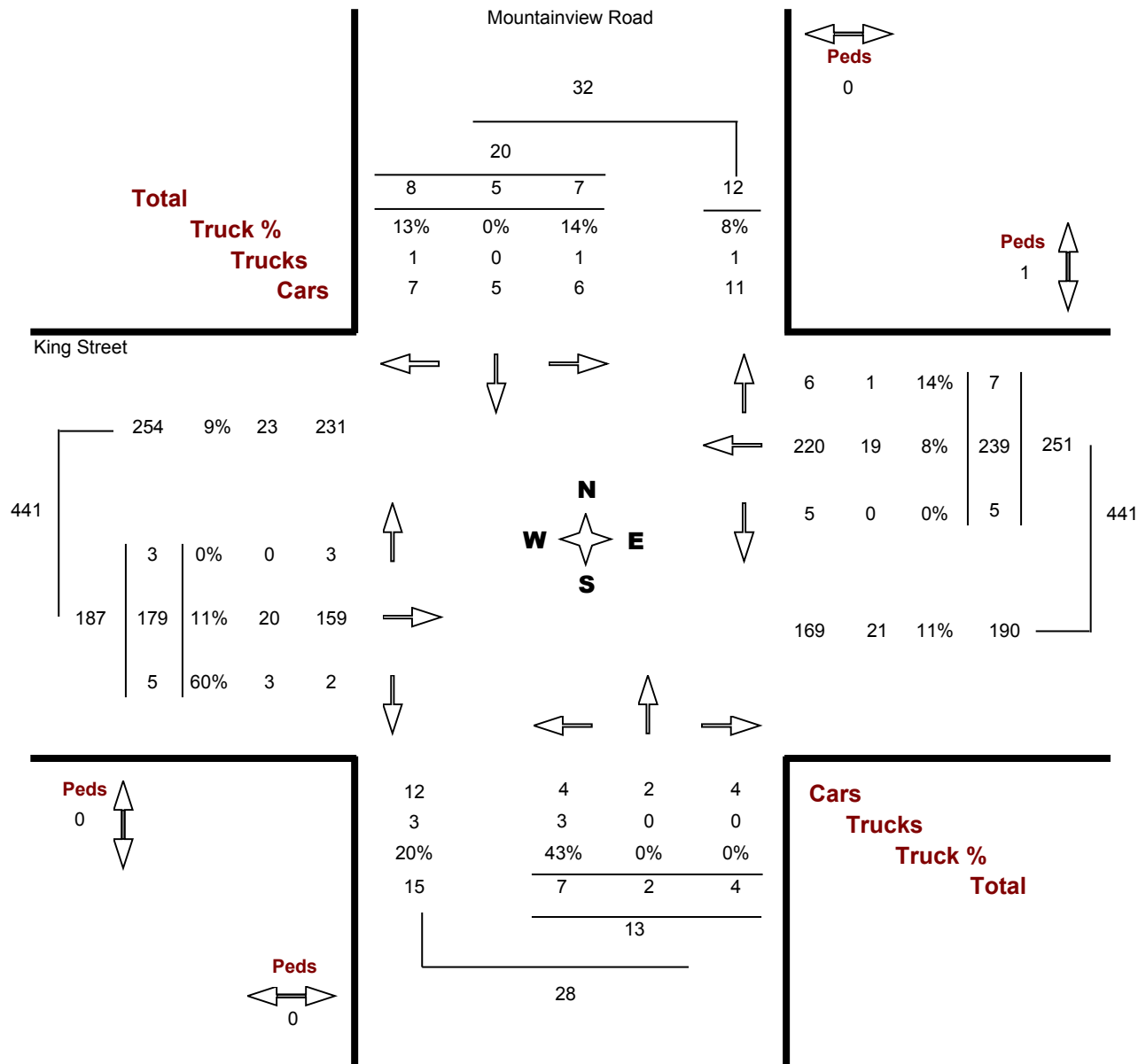
Count Date. Wednesday, 25 May, 2016

Traffic Cont. Two-way Stop

Count Time. 07:00 AM — 09:00 AM

Major Dir..... East west

Peak Hour.. 08:00 AM — 09:00 AM



Turning Movements Report - PM Period

Location..... King Street @ Mountainview Road

GeoID..... 00001

Municipality. LINCOLN

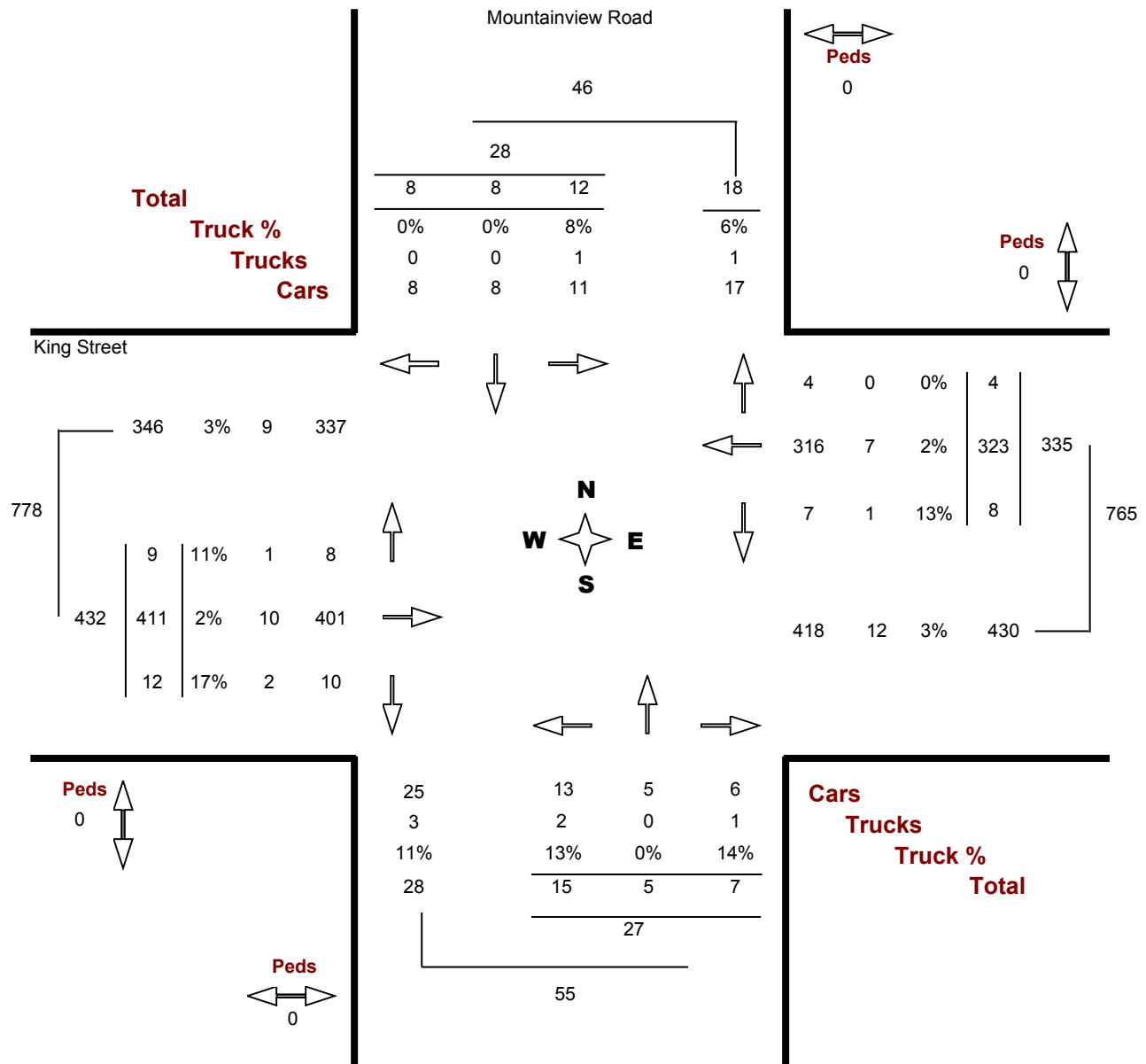
Count Date. Wednesday, 25 May, 2016

Traffic Cont. Two-way Stop

Count Time. 03:00 PM — 06:00 PM

Major Dir..... East west

Peak Hour.. 05:00 PM — 06:00 PM



Location..... King Street @ Lincoln Avenue

GeoID..... 00002

Municipality. LINCOLN

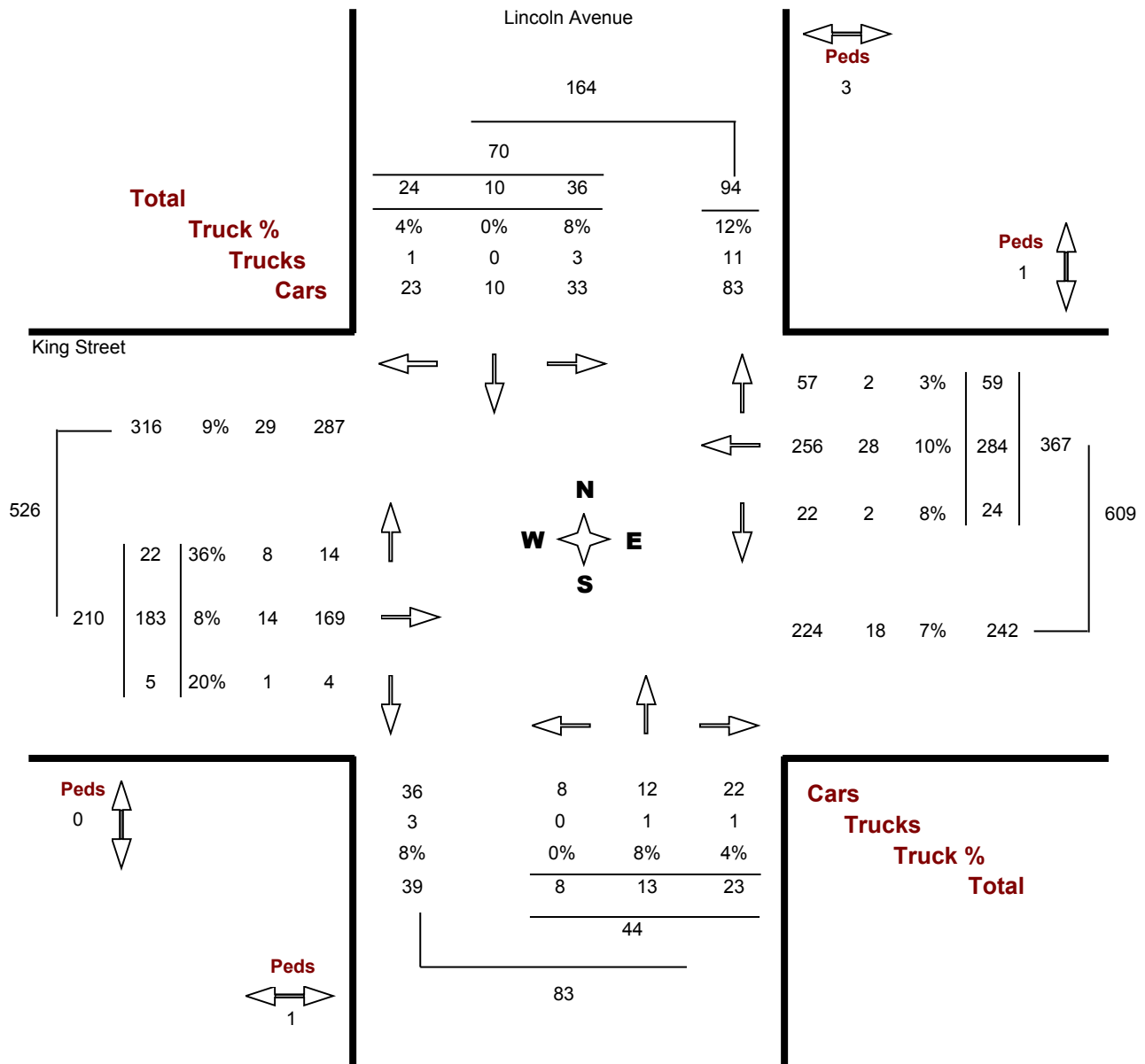
Count Date. Friday, 29 April, 2016

Traffic Cont.

Count Time. 07:00 AM — 09:00 AM

Major Dir..... None

Peak Hour.. 08:00 AM — 09:00 AM



Location..... King Street @ Lincoln Avenue

GeoID..... 00002

Municipality. LINCOLN

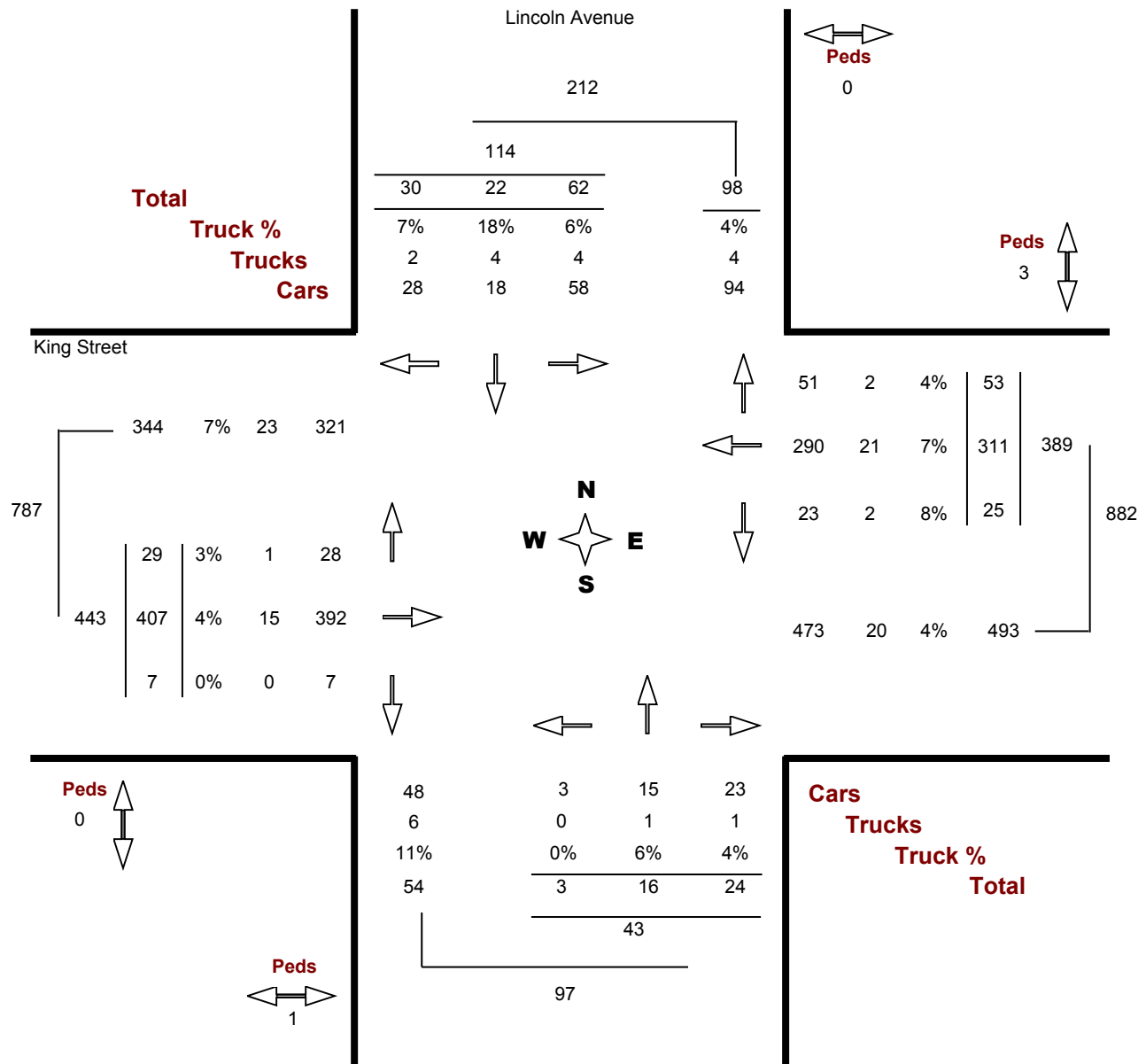
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Traffic Cont.

Count Time. 03:00 PM — 06:00 PM

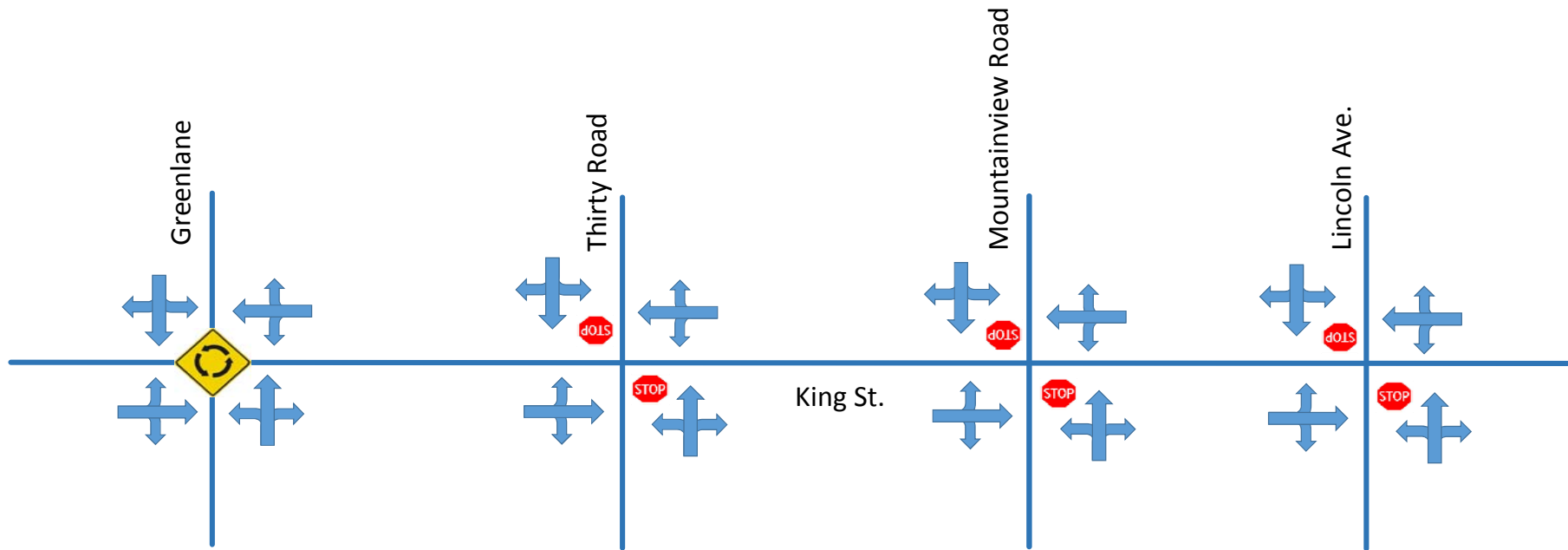
Major Dir..... None

Peak Hour.. 03:15 PM — 04:15 PM



Appendix B

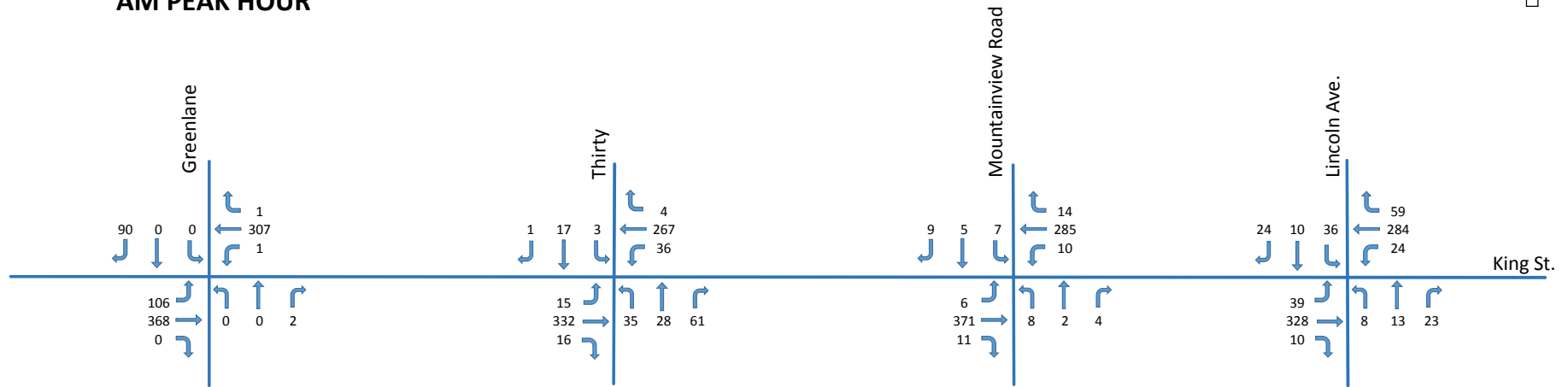
Existing (2016) Weekday AM and PM Traffic Volumes and Lane Configurations



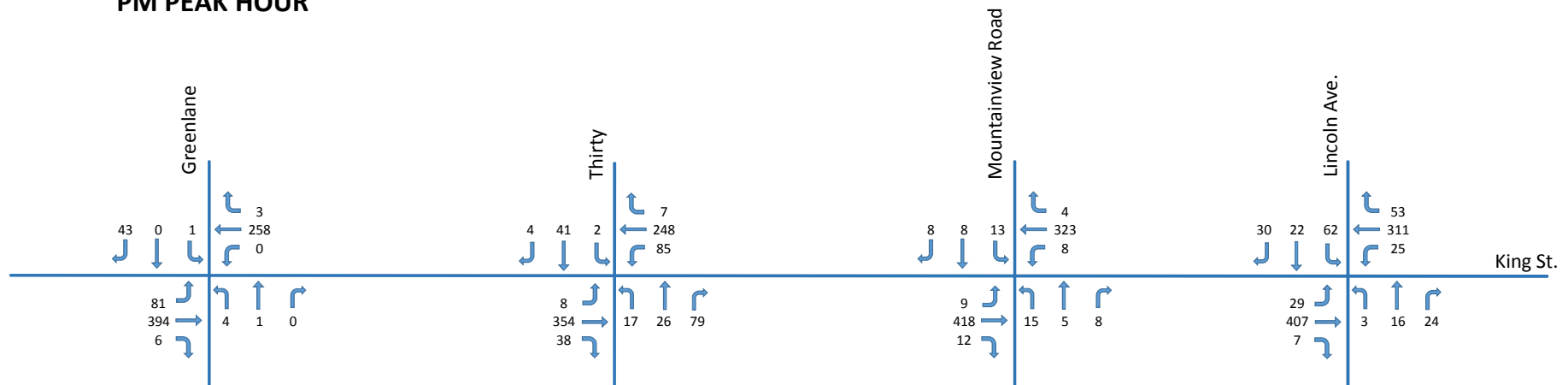
Not to Scale



AM PEAK HOUR



PM PEAK HOUR



Not to Scale

Appendix C

Existing (2016) Weekday AM and PM Traffic Analysis Output Sheets

ROUNABOUT REPORT																
General Information								Site Information								
Analyst	Parsons							Intersection	RR81 King St. & Greenlane							
Agency or Co.	Parsons							E/W Street Name	RR81 King St.							
Date Performed	12/6/2016							N/S Street Name	Greenlane							
Time Period	AM Peak Hour							Analysis Year	Existing 2016							
Peak Hour Factor	0.92							Project ID	RR81 King Street Traffic Study							
Project Description:																
Volume Adjustment and Site Characteristics																
	EB				WB				NB				SB			
	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R	U
Number of Lanes (N)	0	1	0		0	1	0		0	1	0		0	1	0	
Lane Assignment	LTR				LTR				LTR				LTR			
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				1				1			
Volume (V), veh/h	106	368	0	0	1	307	1	0	0	0	2	0	0	0	90	0
Heavy Veh. Adj. (f_{HV}), %	3	5	0	3	0	2	0	3	0	0	0	3	0	0	2	3
Pedestrians Crossing	0				0				0				0			
Critical and Follow-Up Headway Adjustment																
	EB			WB			NB			SB						
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass				
Critical Headway (sec)	5.1929	5.1929	5.1929	5.1929	5.1929	5.1929	5.1929	5.1929	5.1929	5.1929	5.1929	5.1929				
Follow-Up Headway (sec)	3.1858	3.1858	3.1858	3.1858	3.1858	3.1858	3.1858	3.1858	3.1858	3.1858	3.1858	3.1858				
Flow Computations																
	EB			WB			NB			SB						
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass				
Circulating Flow (V_c), pc/h	1			119			539			341						
Exiting Flow (V_{ex}), pc/h	422			440			120			1						
Entry Flow (V_e), pc/h		539			343			2			100					
Entry Volume veh/h		516			336			2			98					
Capacity and v/c Ratios																
	EB			WB			NB			SB						
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass				
Capacity (c_{PCE}), pc/h		1129			1004			659			803					
Capacity (c), veh/h		1080			984			659			787					
v/c Ratio (X)		0.48			0.34			0.00			0.12					
Delay and Level of Service																
	EB			WB			NB			SB						
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass				
Lane Control Delay (d), s/veh		8.7			7.3			5.5			5.8					
Lane LOS		A			A			A			A					
Lane 95% Queue		2.6			1.5			0.0			0.4					
Approach Delay, s/veh	8.73			7.26			5.49			5.85						
Approach LOS, s/veh	A			A			A			A						
Intersection Delay, s/veh	7.90															
Intersection LOS	A															

RR81 Traffic Study
1: Lincoln Ave. & RR81 King St.

Existing 2016 Traffic Analysis
AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	39	328	10	24	284	59	8	13	23	36	10	24
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	42	357	11	26	309	64	9	14	25	39	11	26
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	373			367			871	872	362	872	845	341
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	373			367			871	872	362	872	845	341
tC, single (s)	4.5			4.2			7.1	6.6	6.2	7.2	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.5			2.3			3.5	4.1	3.3	3.6	4.0	3.3
p0 queue free %	96			98			96	95	96	83	96	96
cM capacity (veh/h)	1021			1159			243	265	678	233	283	697
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	410	399	48	76								
Volume Left	42	26	9	39								
Volume Right	11	64	25	26								
cSH	1021	1159	380	312								
Volume to Capacity	0.04	0.02	0.13	0.24								
Queue Length 95th (m)	1.0	0.5	3.3	7.1								
Control Delay (s)	1.3	0.8	15.8	20.2								
Lane LOS	A	A	C	C								
Approach Delay (s)	1.3	0.8	15.8	20.2								
Approach LOS			C	C								
Intersection Summary												
Average Delay			3.4									
Intersection Capacity Utilization			49.0%		ICU Level of Service				A			
Analysis Period (min)			15									

RR81 Traffic Study
5: Mountainview Rd. & RR81 King St.

Existing 2016 Traffic Analysis

AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	6	371	11	10	285	14	8	2	4	7	5	9
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	7	403	12	11	310	15	9	2	4	8	5	10
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	325			415			774	769	409	767	767	317
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	325			415			774	769	409	767	767	317
tC, single (s)	4.1			4.1			7.5	6.5	6.2	7.2	6.5	6.3
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.9	4.0	3.3	3.6	4.0	3.4
p0 queue free %	99			99			97	99	99	97	98	99
cM capacity (veh/h)	1246			1155			261	329	647	298	330	698
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	422	336	15	23								
Volume Left	7	11	9	8								
Volume Right	12	15	4	10								
cSH	1246	1155	326	407								
Volume to Capacity	0.01	0.01	0.05	0.06								
Queue Length 95th (m)	0.1	0.2	1.1	1.3								
Control Delay (s)	0.2	0.4	16.6	14.4								
Lane LOS	A	A	C	B								
Approach Delay (s)	0.2	0.4	16.6	14.4								
Approach LOS			C	B								
Intersection Summary												
Average Delay			1.0									
Intersection Capacity Utilization			34.6%	ICU Level of Service					A			
Analysis Period (min)			15									

RR81 Traffic Study
8: Thirty Rd. & RR81 King St.

Existing 2016 Traffic Analysis

AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	15	332	16	36	267	4	35	28	61	3	17	1
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	16	361	17	39	290	4	38	30	66	3	18	1
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	295			378			783	775	370	854	782	292
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	295			378			783	775	370	854	782	292
tC, single (s)	4.3			4.2			7.3	6.6	6.3	7.1	6.7	6.2
tC, 2 stage (s)												
tF (s)	2.4			2.3			3.7	4.1	3.4	3.5	4.2	3.3
p0 queue free %	99			96			86	90	90	99	94	100
cM capacity (veh/h)	1171			1117			265	307	656	225	293	752
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	395	334	135	23								
Volume Left	16	39	38	3								
Volume Right	17	4	66	1								
cSH	1171	1117	392	289								
Volume to Capacity	0.01	0.04	0.34	0.08								
Queue Length 95th (m)	0.3	0.8	11.4	1.9								
Control Delay (s)	0.5	1.3	18.9	18.5								
Lane LOS	A	A	C	C								
Approach Delay (s)	0.5	1.3	18.9	18.5								
Approach LOS			C	C								
Intersection Summary												
Average Delay			4.1									
Intersection Capacity Utilization			51.7%		ICU Level of Service				A			
Analysis Period (min)			15									

ROUNABOUT REPORT																
General Information								Site Information								
Analyst	Parsons							Intersection	RR81 King St. & Greenlane							
Agency or Co.	Parsons							E/W Street Name	RR81 King St.							
Date Performed	12/6/2016							N/S Street Name	Greenlane							
Time Period	PM Peak Hour							Analysis Year	Existing 2016							
Peak Hour Factor	0.92							Project ID	RR81 King Street Traffic Study							
Project Description:																
Volume Adjustment and Site Characteristics																
	EB				WB				NB				SB			
	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R	U
Number of Lanes (N)	0	1	0		0	1	0		0	1	0		0	1	0	
Lane Assignment	LTR				LTR				LTR				LTR			
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				1				1			
Volume (V), veh/h	81	394	6	0	0	258	3	0	4	1	0	0	1	0	43	0
Heavy Veh. Adj. (f_{HV}), %	0	0	0	3	0	0	0	3	0	0	0	3	0	0	0	3
Pedestrians Crossing	0				0				0				0			
Critical and Follow-Up Headway Adjustment																
	EB			WB			NB			SB						
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass				
Critical Headway (sec)	5.1929	5.1929	5.1929	5.1929	5.1929	5.1929	5.1929	5.1929	5.1929	5.1929	5.1929	5.1929				
Follow-Up Headway (sec)	3.1858	3.1858	3.1858	3.1858	3.1858	3.1858	3.1858	3.1858	3.1858	3.1858	3.1858	3.1858				
Flow Computations																
	EB			WB			NB			SB						
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass				
Circulating Flow (V_c), pc/h	1			93			517			284						
Exiting Flow (V_{ex}), pc/h	429			332			92			7						
Entry Flow (V_e), pc/h		523			284			5			48					
Entry Volume veh/h		523			284			5			48					
Capacity and v/c Ratios																
	EB			WB			NB			SB						
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass				
Capacity (c_{PCE}), pc/h		1129			1029			674			850					
Capacity (c), veh/h		1129			1029			674			850					
v/c Ratio (X)		0.46			0.28			0.01			0.06					
Delay and Level of Service																
	EB			WB			NB			SB						
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass				
Lane Control Delay (d), s/veh		8.2			6.2			5.4			4.8					
Lane LOS		A			A			A			A					
Lane 95% Queue		2.5			1.1			0.0			0.2					
Approach Delay, s/veh	8.23			6.21			5.42			4.77						
Approach LOS, s/veh	A			A			A			A						
Intersection Delay, s/veh	7.35															
Intersection LOS	A															

RR81 Traffic Study
1: Lincoln Ave. & RR81 King St.

Existing 2016 Traffic Analysis
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	29	407	7	25	311	53	3	16	24	1	41	4
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	32	442	8	27	338	58	3	17	26	1	45	4
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	396			450			957	959	446	965	934	367
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	396			450			957	959	446	965	934	367
tC, single (s)	4.1			4.2			7.1	6.6	6.2	7.2	6.7	6.3
tC, 2 stage (s)												
tF (s)	2.2			2.3			3.5	4.1	3.3	3.6	4.2	3.4
p0 queue free %	97			97			98	93	96	99	81	99
cM capacity (veh/h)	1157			1079			196	240	608	200	237	667
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	482	423	47	50								
Volume Left	32	27	3	1								
Volume Right	8	58	26	4								
cSH	1157	1079	354	250								
Volume to Capacity	0.03	0.03	0.13	0.20								
Queue Length 95th (m)	0.6	0.6	3.4	5.5								
Control Delay (s)	0.8	0.8	16.7	23.0								
Lane LOS	A	A	C	C								
Approach Delay (s)	0.8	0.8	16.7	23.0								
Approach LOS			C	C								
Intersection Summary												
Average Delay			2.7									
Intersection Capacity Utilization			44.0%		ICU Level of Service				A			
Analysis Period (min)			15									

RR81 Traffic Study
5: Mountainview Rd. & RR81 King St.

Existing 2016 Traffic Analysis

PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	9	418	12	8	323	4	15	5	8	13	8	8
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	10	454	13	9	351	4	16	5	9	14	9	9
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None				None							
Median storage veh												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	355			467			864	853	461	862	858	353
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	355			467			864	853	461	862	858	353
tC, single (s)	4.2			4.2			7.2	6.5	6.3	7.2	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.3			2.3			3.6	4.0	3.4	3.6	4.0	3.3
p0 queue free %	99			99			93	98	98	95	97	99
cM capacity (veh/h)	1155			1039			250	293	576	257	292	695
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	477	364	30	32								
Volume Left	10	9	16	14								
Volume Right	13	4	9	9								
cSH	1155	1039	308	324								
Volume to Capacity	0.01	0.01	0.10	0.10								
Queue Length 95th (m)	0.2	0.2	2.5	2.4								
Control Delay (s)	0.3	0.3	18.0	17.3								
Lane LOS	A	A	C	C								
Approach Delay (s)	0.3	0.3	18.0	17.3								
Approach LOS			C	C								
Intersection Summary												
Average Delay			1.5									
Intersection Capacity Utilization			39.3%	ICU Level of Service				A				
Analysis Period (min)			15									

RR81 Traffic Study
8: Thirty Rd. & RR81 King St.

Existing 2016 Traffic Analysis

PM Peak Hour

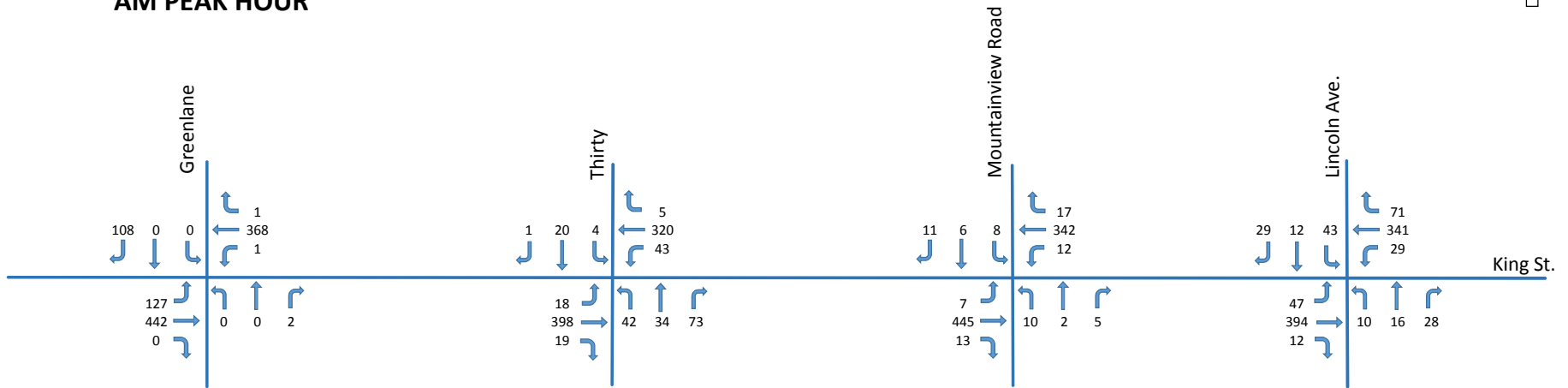
												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	8	354	38	85	248	7	17	26	79	2	41	4
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	9	385	41	92	270	8	18	28	86	2	45	4
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	277			426			908	885	405	981	902	273
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	277			426			908	885	405	981	902	273
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			92			91	89	87	99	83	99
cM capacity (veh/h)	1297			1117			208	261	643	171	255	770
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	435	370	133	51								
Volume Left	9	92	18	2								
Volume Right	41	8	86	4								
cSH	1297	1117	401	264								
Volume to Capacity	0.01	0.08	0.33	0.19								
Queue Length 95th (m)	0.2	2.1	10.8	5.3								
Control Delay (s)	0.2	2.8	18.4	21.8								
Lane LOS	A	A	C	C								
Approach Delay (s)	0.2	2.8	18.4	21.8								
Approach LOS			C	C								
Intersection Summary												
Average Delay			4.7									
Intersection Capacity Utilization			67.4%	ICU Level of Service						C		
Analysis Period (min)			15									

Appendix D

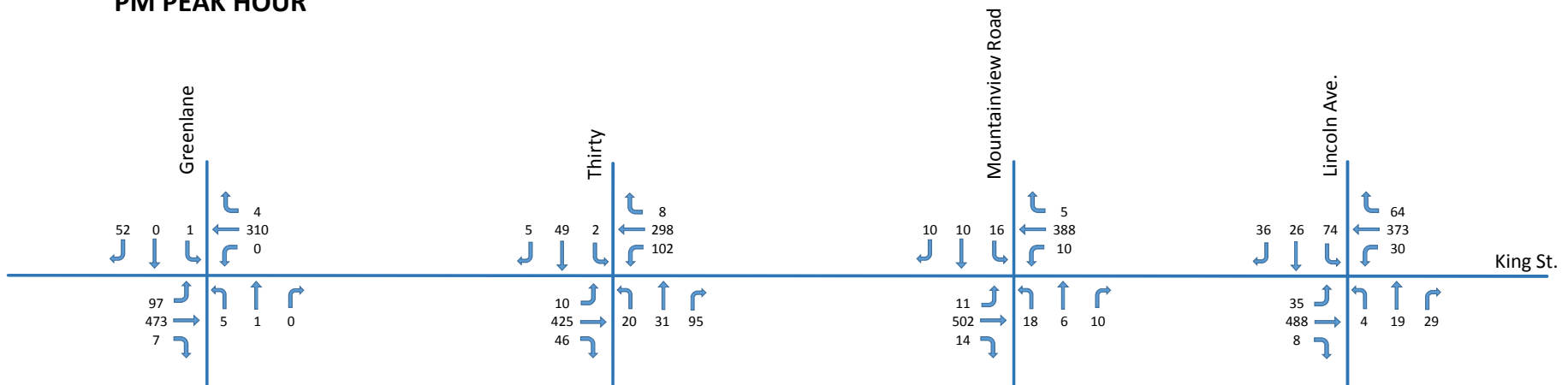
Future (2026) Weekday AM and PM Traffic Volumes



AM PEAK HOUR



PM PEAK HOUR



Not to Scale

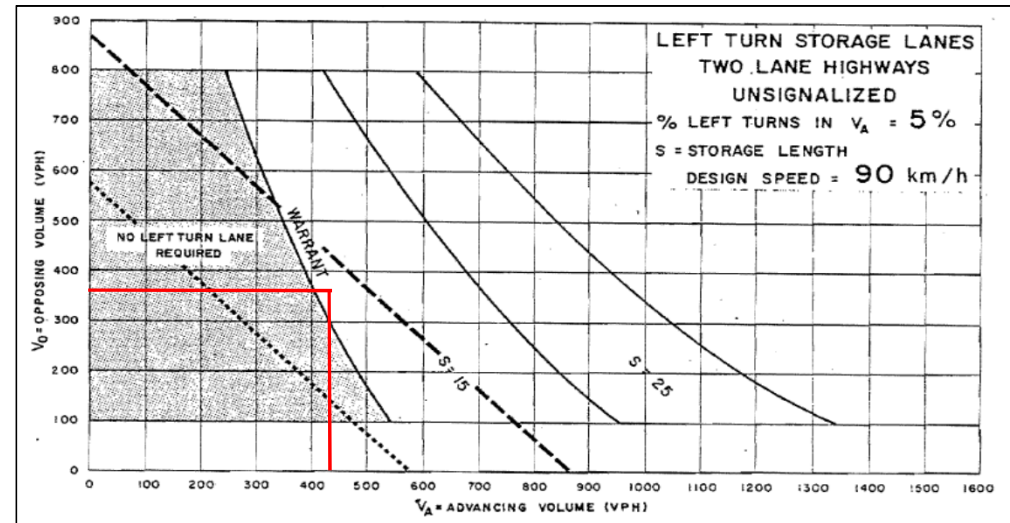
Appendix E

Left Turn Lane Warrant Analysis Sheets

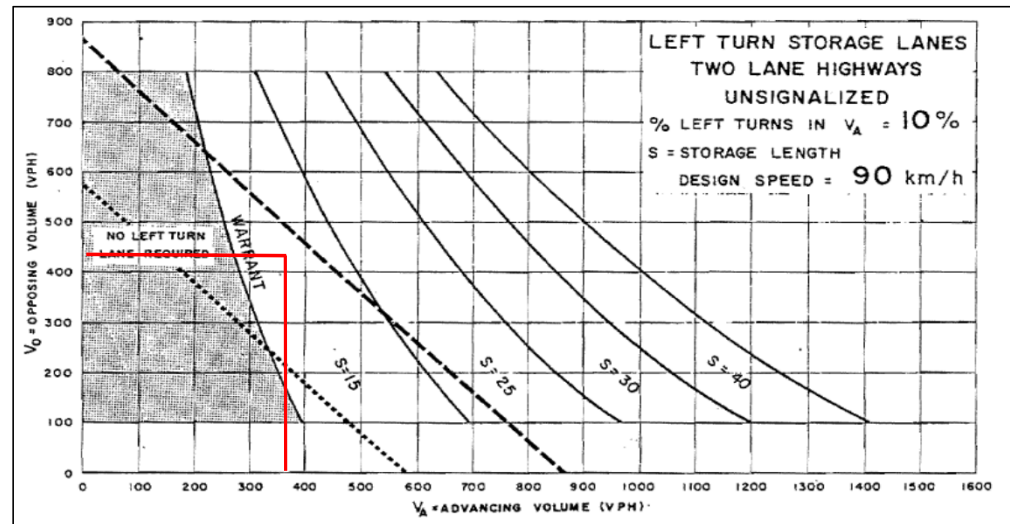
Regional Road 81 (King Street) & Thirty Road

MTO Geometric Design Standards for Ontario Highways - Left Turn Storage Lane Warrants

Direction:	Eastbound Left
Analysis Year:	Future 2026
Peak Hour:	AM Peak Hour
Posted Speed:	70 km/hr
Design Speed:	90 km/hr
V_A =	435
V_O =	368
V_L =	18
Percentage of Left Turning Traffic	4%
Left Turn Lane Warranted:	Yes
Required Length:	15 m



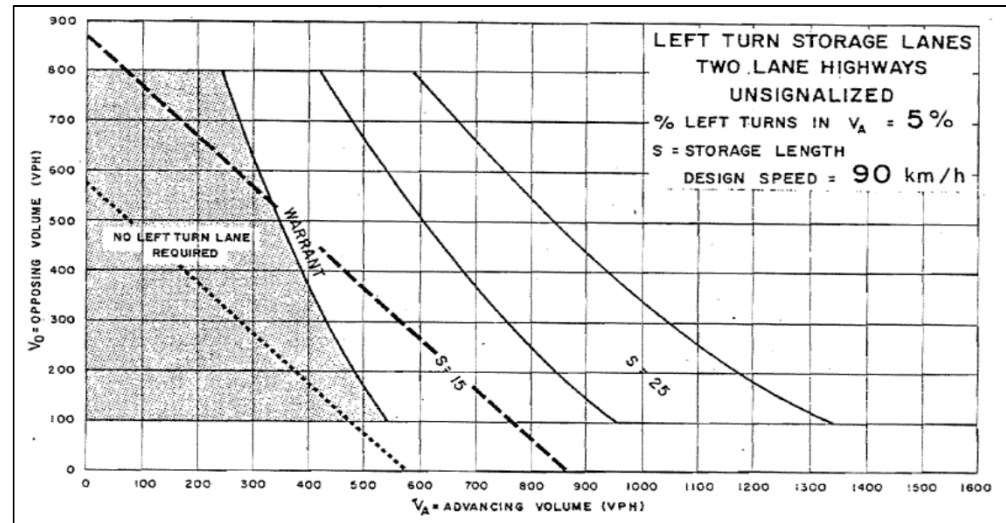
Direction:	Westbound Left
Analysis Year:	Future 2026
Peak Hour:	AM Peak Hour
Posted Speed:	70 km/hr
Design Speed:	90 km/hr
V_A =	368
V_O =	435
V_L =	43
Percentage of Left Turning Traffic	12%
Left Turn Lane Warranted:	Yes
Required Length:	15 m



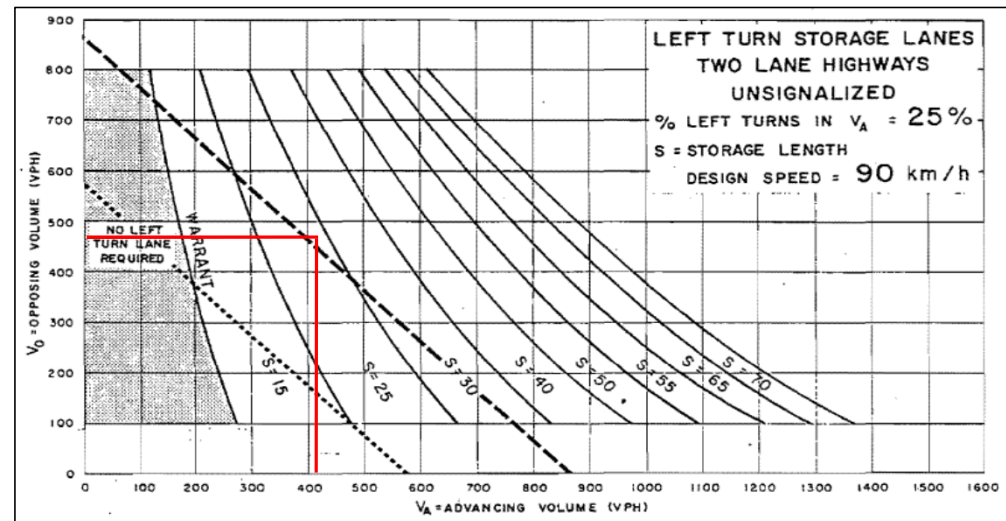
Regional Road 81 (King Street) & Thirty Road

MTO Geometric Design Standards for Ontario Highways - Left Turn Storage Lane Warrants

Direction:	Eastbound Left
Analysis Year:	Future 2026
Peak Hour:	PM Peak Hour
Posted Speed:	70 km/hr
Design Speed:	90 km/hr
V_A =	481
V_O =	408
V_L =	10
Percentage of Left Turning Traffic	2%
Left Turn Lane Warranted:	No
Required Length:	-



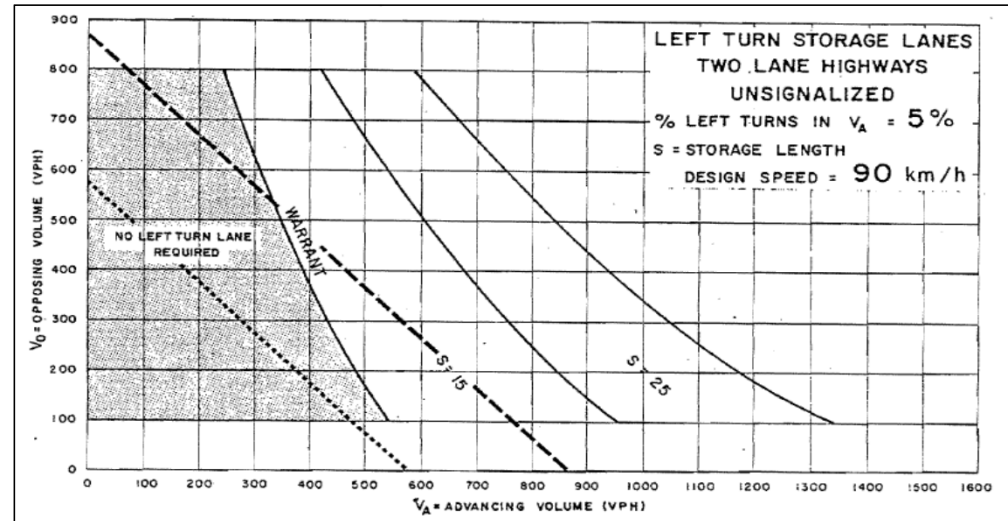
Direction:	Westbound Left
Analysis Year:	Future 2026
Peak Hour:	PM Peak Hour
Posted Speed:	70 km/hr
Design Speed:	90 km/hr
V_A =	408
V_O =	481
V_L =	102
Percentage of Left Turning Traffic	25%
Left Turn Lane Warranted:	Yes
Required Length:	25 m



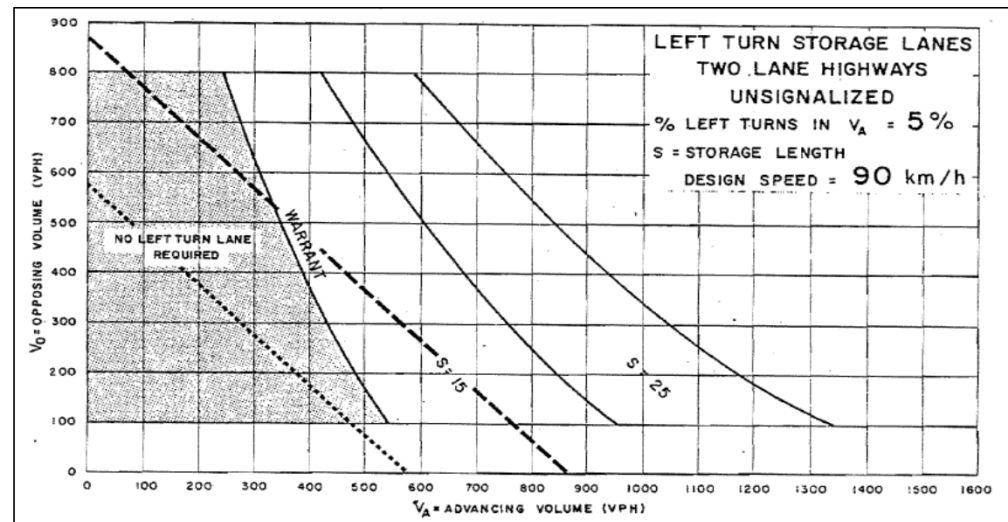
Regional Road 81 (King Street) & Mountainview Road

MTO Geometric Design Standards for Ontario Highways - Left Turn Storage Lane Warrants

Direction:	Eastbound Left
Analysis Year:	Future 2026
Peak Hour:	AM Peak Hour
Posted Speed:	70 km/hr
Design Speed:	90 km/hr
V_A =	465
V_O =	371
V_L =	7
Percentage of Left Turning Traffic	2%
Left Turn Lane Warranted:	No
Required Length:	-



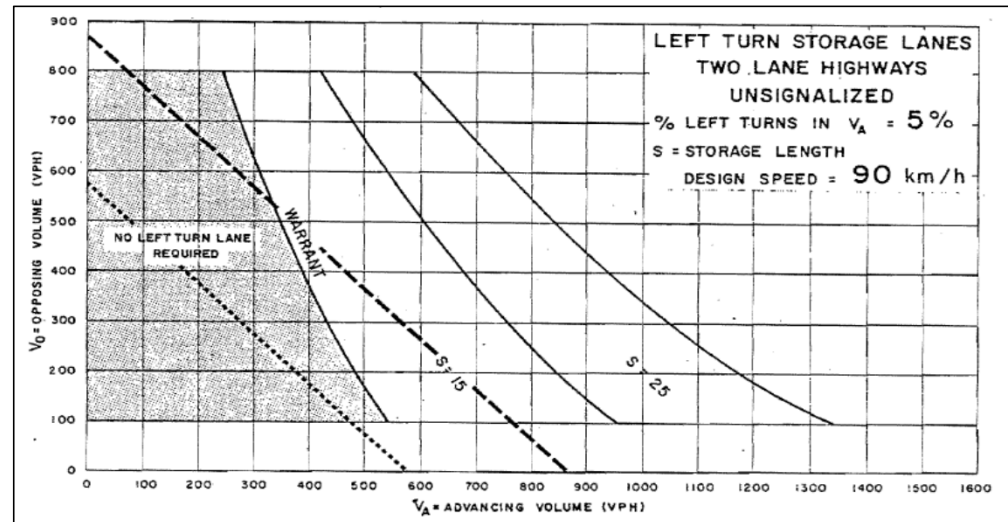
Direction:	Westbound Left
Analysis Year:	Future 2026
Peak Hour:	AM Peak Hour
Posted Speed:	70 km/hr
Design Speed:	90 km/hr
V_A =	371
V_O =	465
V_L =	12
Percentage of Left Turning Traffic	3%
Left Turn Lane Warranted:	No
Required Length:	-



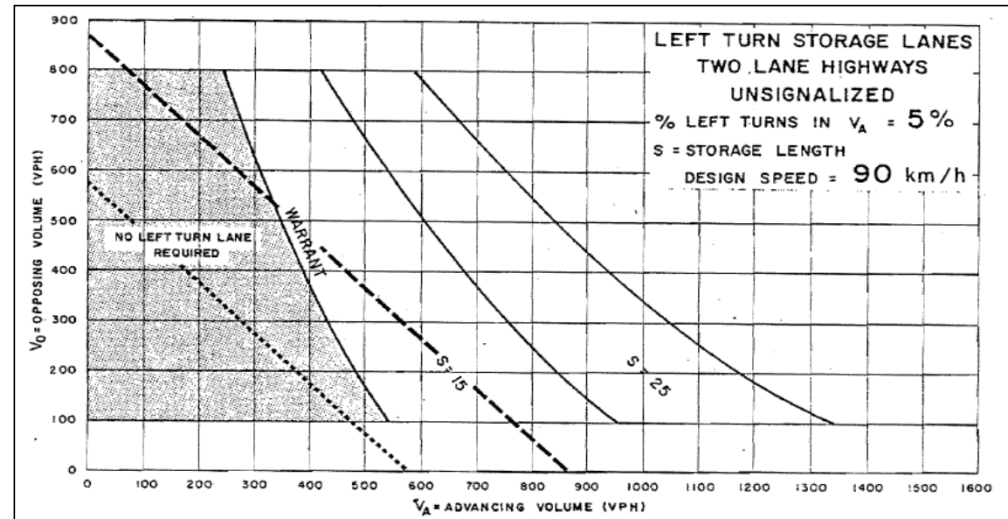
Regional Road 81 (King Street) & Mountainview Road

MTO Geometric Design Standards for Ontario Highways - Left Turn Storage Lane Warrants

Direction:	Eastbound Left
Analysis Year:	Future 2026
Peak Hour:	PM Peak Hour
Posted Speed:	70 km/hr
Design Speed:	90 km/hr
V_A =	527
V_O =	403
V_L =	11
Percentage of Left Turning Traffic	2%
Left Turn Lane Warranted:	No
Required Length:	-



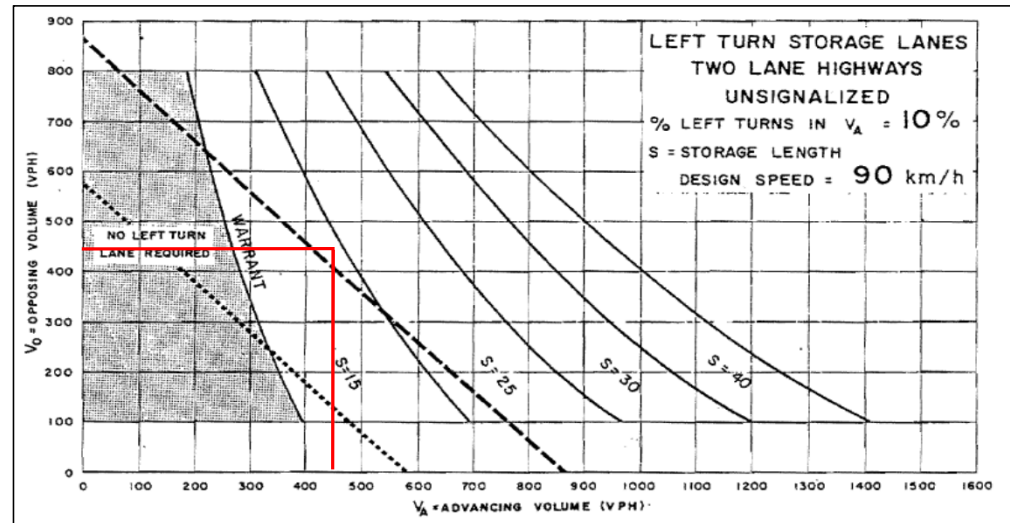
Direction:	Westbound Left
Analysis Year:	Future 2026
Peak Hour:	PM Peak Hour
Posted Speed:	70 km/hr
Design Speed:	90 km/hr
V_A =	403
V_O =	527
V_L =	10
Percentage of Left Turning Traffic	2%
Left Turn Lane Warranted:	No
Required Length:	-



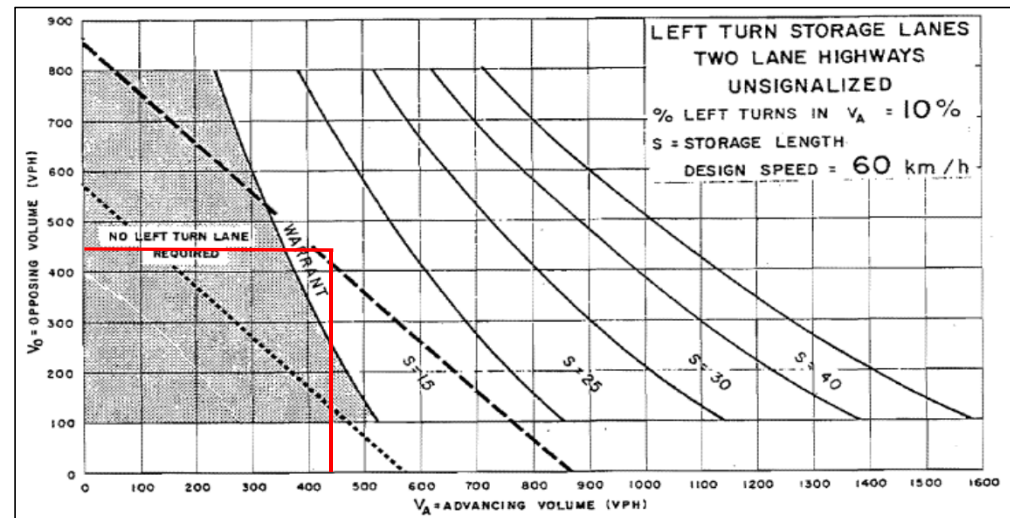
Regional Road 81 (King Street) & Lincoln Avenue

MTO Geometric Design Standards for Ontario Highways - Left Turn Storage Lane Warrants

Direction:	Eastbound Left
Analysis Year:	Future 2026
Peak Hour:	AM Peak Hour
Posted Speed:	70 km/hr
Design Speed:	90 km/hr
V_A =	453
V_O =	441
V_L =	47
Percentage of Left Turning Traffic	10%
Left Turn Lane Warranted:	Yes
Required Length:	15 m



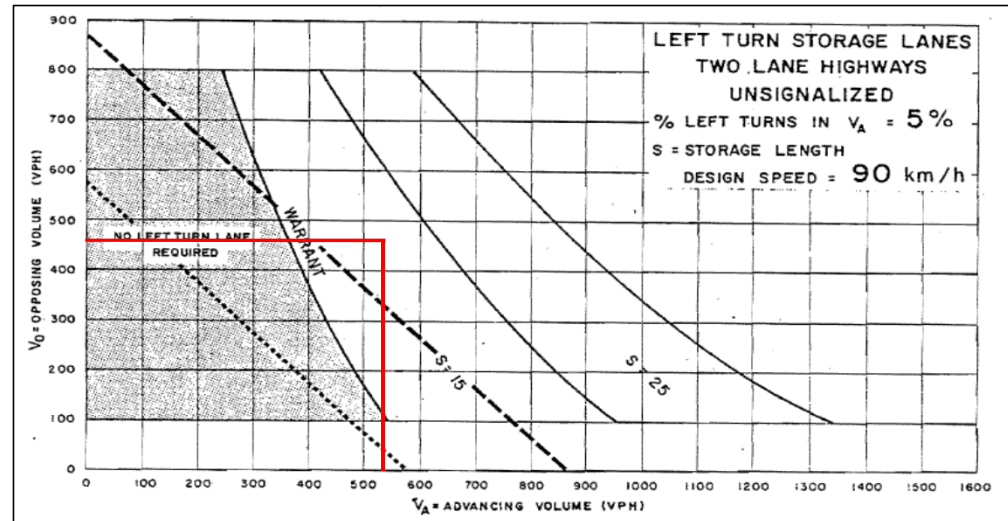
Direction:	Westbound Left
Analysis Year:	Future 2026
Peak Hour:	AM Peak Hour
Posted Speed:	50 km/hr
Design Speed:	60 km/hr
V_A =	441
V_O =	453
V_L =	29
Percentage of Left Turning Traffic	7%
Left Turn Lane Warranted:	Yes
Required Length:	15 m



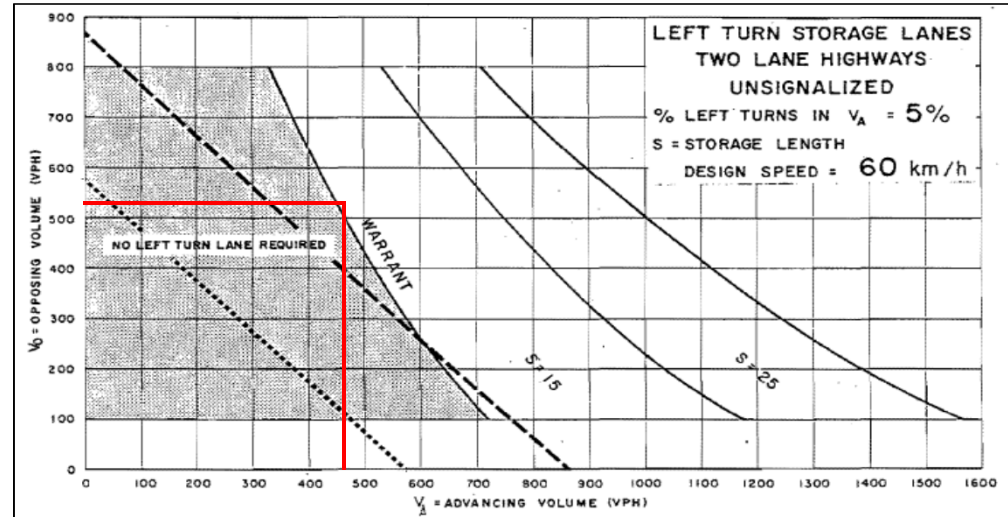
Regional Road 81 (King Street) & Lincoln Avenue

MTO Geometric Design Standards for Ontario Highways - Left Turn Storage Lane Warrants

Direction:	Eastbound Left
Analysis Year:	Future 2026
Peak Hour:	PM Peak Hour
Posted Speed:	70 km/hr
Design Speed:	90 km/hr
V_A =	531
V_O =	467
V_L =	35
Percentage of Left Turning Traffic	7%
Left Turn Lane Warranted:	Yes
Required Length:	15 m



Direction:	Westbound Left
Analysis Year:	Future 2026
Peak Hour:	PM Peak Hour
Posted Speed:	50 km/hr
Design Speed:	60 km/hr
V_A =	467
V_O =	531
V_L =	30
Percentage of Left Turning Traffic	6%
Left Turn Lane Warranted:	Yes
Required Length:	15 m



Appendix F

Signal Warrant Analysis Sheets

Signal Warrant Calculation

PARSONS

Major Street:

RR81 King Street

Minor Street:

Thirty Road

Comment

Future (2026) Traffic

Number of Approach Lanes:

1 ☒ 2 ☐

Tee Intersection Configuration:

Yes ☐ No ☒

Flow Condition:

Free Flw (Rural) ☒
Restricted Flow (Urban) ☐

VOLUME	AM	PM	FACTOR *	
1A - All	977	1,091	n/a	517
1B - Minor	174	202	25%	94
2A - Major	803	889	25%	423
2B - Crossing	80	71	25%	38

* This factor relates average of the "peak eight hours" to the average of the "am and pm peak hours"

OVERALL WARRANT

150% Satisfied:

Yes ☐

No ☒

Warrant for new intersection with forecast traffic

120% Satisfied:

Yes ☐

No ☒

Warrant for existing intersection with forecast traffic

100% Satisfied:

Yes ☐

No ☒

Warrant for existing intersection with existing traffic *

80% Satisfied:

Yes ☐

No ☒

Warrant for existing intersection with existing traffic

* Consider full underground provisions if 100% for forecast traffic

WARRANT 1 - MINIMUM VEHICULAR VOLUME

APPROACH LANES		1		2 OR MORE		AVERAGE HOUR PERIOD
FLOW CONDITION		FREE FLOW X	REST. FLOW	FREE FLOW	REST. FLOW	
ALL APPROACHES		480	720	600	900	517
		% FULFILLED				108%
APPROACH LANES		1		2 OR MORE		AVERAGE HOUR PERIOD
FLOW CONDITION		FREE FLOW X	REST. FLOW	FREE FLOW	REST. FLOW	
MINOR STREET APPROACHES		120	170	120	170	94
		% FULFILLED				78%

150% Satisfied:

Yes ☐

No ☒

120% Satisfied:

Yes ☐

No ☒

100% Satisfied:

Yes ☐

No ☒

80% Satisfied:

Yes ☐

No ☒

WARRANT 2 - DELAY TO CROSS TRAFFIC

APPROACH LANES		1		2 OR MORE		AVERAGE HOUR PERIOD
FLOW CONDITION		FREE FLOW X	REST. FLOW	FREE FLOW	REST. FLOW	
MAJOR STREET APPROACHES		480	720	600	900	423
		% FULFILLED				88%
APPROACH LANES		1		2 OR MORE		AVERAGE HOUR PERIOD
FLOW CONDITION		FREE FLOW X	REST. FLOW	FREE FLOW	REST. FLOW	
TRAFFIC CROSSING MAJOR STREET		50	75	50	75	38
		% FULFILLED				76%

150% Satisfied:

Yes ☐

No ☒

120% Satisfied:

Yes ☐

No ☒

100% Satisfied:

Yes ☐

No ☒

80% Satisfied:

Yes ☐

No ☒

1A - MINIMUM VEHICULAR VOLUME: Total vehicle volume on all approaches for average day

1B - MINIMUM VEHICULAR VOLUME: Total vehicle volume on minor streets

2A - DELAY TO CROSS TRAFFIC: Total vehicle volume on major street for average day

2B - DELAY TO CROSS TRAFFIC: Total vehicle and pedestrian volume crossing major street; comprising: (1) lefts from both minor streets, (2) heaviest through from minor street, (3) 50% of heavier left turn from major street when following criteria met: (a) left turn volume >120 and (b) left turn volume plus opposing volume > 720, (4) pedestrians crossing the major street.

Signal Warrant Calculation

PARSONS

Major Street:

RR81 King Street

Minor Street:

Mountainview Road

Comment

Future (2026) Traffic

Number of Approach Lanes:

1 ☒ 2 ☐

Tee Intersection Configuration:

Yes ☐ No ☒

Flow Condition:

Free Flow (Rural) ☒
Restricted Flow (Urban) ☐

VOLUME	AM	PM	FACTOR *	
1A - All	878	1,000	n/a	470
1B - Minor	42	70	25%	28
2A - Major	836	930	25%	442
2B - Crossing	24	44	25%	17

* This factor relates average of the "peak eight hours" to the average of the "am and pm peak hours"

OVERALL WARRANT

150% Satisfied:

Yes ☐

No ☒

Warrant for new intersection with forecast traffic

120% Satisfied:

Yes ☐

No ☒

Warrant for existing intersection with forecast traffic

100% Satisfied:

Yes ☐

No ☒

Warrant for existing intersection with existing traffic *

80% Satisfied:

Yes ☐

No ☒

Warrant for existing intersection with existing traffic

* Consider full underground provisions if 100% for forecast traffic

WARRANT 1 - MINIMUM VEHICULAR VOLUME

APPROACH LANES		1		2 OR MORE		AVERAGE HOUR PERIOD
FLOW CONDITION		FREE FLOW X	REST. FLOW	FREE FLOW	REST. FLOW	
ALL APPROACHES		480	720	600	900	470
		% FULFILLED				98%
APPROACH LANES		1		2 OR MORE		AVERAGE HOUR PERIOD
FLOW CONDITION		FREE FLOW X	REST. FLOW	FREE FLOW	REST. FLOW	
MINOR STREET APPROACHES		120	170	120	170	28
		% FULFILLED				23%

150% Satisfied:

Yes ☐

No ☒

120% Satisfied:

Yes ☐

No ☒

100% Satisfied:

Yes ☐

No ☒

80% Satisfied:

Yes ☐

No ☒

WARRANT 2 - DELAY TO CROSS TRAFFIC

APPROACH LANES		1		2 OR MORE		AVERAGE HOUR PERIOD
FLOW CONDITION		FREE FLOW X	REST. FLOW	FREE FLOW	REST. FLOW	
MAJOR STREET APPROACHES		480	720	600	900	442
		% FULFILLED				92%
APPROACH LANES		1		2 OR MORE		AVERAGE HOUR PERIOD
FLOW CONDITION		FREE FLOW X	REST. FLOW	FREE FLOW	REST. FLOW	
TRAFFIC CROSSING MAJOR STREET		50	75	50	75	17
		% FULFILLED				34%

150% Satisfied:

Yes ☐

No ☒

120% Satisfied:

Yes ☐

No ☒

100% Satisfied:

Yes ☐

No ☒

80% Satisfied:

Yes ☐

No ☒

1A - MINIMUM VEHICULAR VOLUME: Total vehicle volume on all approaches for average day

1B - MINIMUM VEHICULAR VOLUME: Total vehicle volume on minor streets

2A - DELAY TO CROSS TRAFFIC: Total vehicle volume on major street for average day

2B - DELAY TO CROSS TRAFFIC: Total vehicle and pedestrian volume crossing major street; comprising: (1) lefts from both minor streets, (2) heaviest through from minor street, (3) 50% of heavier left turn from major street when following criteria met: (a) left turn volume >120 and (b) left turn volume plus opposing volume > 720, (4) pedestrians crossing the major street.

Signal Warrant Calculation

PARSONS

Major Street:

RR81 King Street

Minor Street:

Lincoln Avenue

Comment

Future (2026) Traffic

Number of Approach Lanes:

1 ☒ 2 ☐

Tee Intersection Configuration:

Yes ☐ No ☒

Flow Condition:

Free Flow (Rural) ☒
Restricted Flow (Urban) ☐

VOLUME	AM	PM	FACTOR *	
1A - All	276	1,186	n/a	366
1B - Minor	138	998	25%	284
2A - Major	138	188	25%	82
2B - Crossing	69	104	25%	43

* This factor relates average of the "peak eight hours" to the average of the "am and pm peak hours"

OVERALL WARRANT

150% Satisfied:

Yes ☐

No ☒

Warrant for new intersection with forecast traffic

120% Satisfied:

Yes ☐

No ☒

Warrant for existing intersection with forecast traffic

100% Satisfied:

Yes ☐

No ☒

Warrant for existing intersection with existing traffic *

80% Satisfied:

Yes ☐

No ☒

Warrant for existing intersection with existing traffic

* Consider full underground provisions if 100% for forecast traffic

WARRANT 1 - MINIMUM VEHICULAR VOLUME

APPROACH LANES	1		2 OR MORE		AVERAGE HOUR PERIOD
FLOW CONDITION	FREE FLOW X	REST. FLOW	FREE FLOW	REST. FLOW	
ALL APPROACHES	480	720	600	900	366
	% FULFILLED				76%
APPROACH LANES	1		2 OR MORE		AVERAGE HOUR PERIOD
FLOW CONDITION	FREE FLOW X	REST. FLOW	FREE FLOW	REST. FLOW	
MINOR STREET APPROACHES	120	170	120	170	284
	% FULFILLED				237%

150% Satisfied:

Yes ☐

No ☒

120% Satisfied:

Yes ☐

No ☒

100% Satisfied:

Yes ☐

No ☒

80% Satisfied:

Yes ☐

No ☒

WARRANT 2 - DELAY TO CROSS TRAFFIC

APPROACH LANES	1		2 OR MORE		AVERAGE HOUR PERIOD
FLOW CONDITION	FREE FLOW X	REST. FLOW	FREE FLOW	REST. FLOW	
MAJOR STREET APPROACHES	480	720	600	900	82
	% FULFILLED				17%
APPROACH LANES	1		2 OR MORE		AVERAGE HOUR PERIOD
FLOW CONDITION	FREE FLOW X	REST. FLOW	FREE FLOW	REST. FLOW	
TRAFFIC CROSSING MAJOR STREET	50	75	50	75	43
	% FULFILLED				86%

150% Satisfied:

Yes ☐

No ☒

120% Satisfied:

Yes ☐

No ☒

100% Satisfied:

Yes ☐

No ☒

80% Satisfied:

Yes ☐

No ☒

1A - MINIMUM VEHICULAR VOLUME: Total vehicle volume on all approaches for average day

1B - MINIMUM VEHICULAR VOLUME: Total vehicle volume on minor streets

2A - DELAY TO CROSS TRAFFIC: Total vehicle volume on major street for average day

2B - DELAY TO CROSS TRAFFIC: Total vehicle and pedestrian volume crossing major street; comprising: (1) lefts from both minor streets, (2) heaviest through from minor street, (3) 50% of heavier left turn from major street when following criteria met: (a) left turn volume >120 and (b) left turn volume plus opposing volume > 720, (4) pedestrians crossing the major street.

Appendix G

Future (2026) Weekday AM and PM Traffic Analysis Output Sheets

ROUNABOUT REPORT																
General Information								Site Information								
Analyst	Parsons							Intersection	RR81 King St. & Greenlane							
Agency or Co.	Parsons							E/W Street Name	RR81 King St.							
Date Performed	12/6/2016							N/S Street Name								
Time Period	AM Peak Hour							Analysis Year	Future 2026							
Peak Hour Factor	0.92							Project ID	RR81 King Street Traffic Study							
Project Description:																
Volume Adjustment and Site Characteristics																
	EB				WB				NB				SB			
	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R	U
Number of Lanes (N)	0	1	0		0	1	0		0	1	0		0	1	0	
Lane Assignment	LTR				LTR				LTR				LTR			
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				1				1			
Volume (V), veh/h	127	442	0	0	1	368	1	0	0	0	2	0	0	0	108	0
Heavy Veh. Adj. (f_{HV}), %	3	5	0	3	0	2	0	3	0	0	0	3	0	0	2	3
Pedestrians Crossing	0				0				0				0			
Critical and Follow-Up Headway Adjustment																
	EB			WB			NB			SB						
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass				
Critical Headway (sec)	5.1929	5.1929	5.1929	5.1929	5.1929	5.1929	5.1929	5.1929	5.1929	5.1929	5.1929	5.1929				
Follow-Up Headway (sec)	3.1858	3.1858	3.1858	3.1858	3.1858	3.1858	3.1858	3.1858	3.1858	3.1858	3.1858	3.1858				
Flow Computations																
	EB			WB			NB			SB						
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass				
Circulating Flow (V_c), pc/h	1			142			646			409						
Exiting Flow (V_{ex}), pc/h	507			528			143			1						
Entry Flow (V_e), pc/h		647			410			2			120					
Entry Volume veh/h		619			402			2			118					
Capacity and v/c Ratios																
	EB			WB			NB			SB						
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass				
Capacity (c_{PCE}), pc/h		1129			980			592			751					
Capacity (c), veh/h		1080			961			592			736					
v/c Ratio (X)		0.57			0.42			0.00			0.16					
Delay and Level of Service																
	EB			WB			NB			SB						
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass				
Lane Control Delay (d), s/veh		10.6			8.5			6.1			6.6					
Lane LOS		B			A			A			A					
Lane 95% Queue		3.8			2.1			0.0			0.6					
Approach Delay, s/veh	10.57			8.50			6.12			6.62						
Approach LOS, s/veh	B			A			A			A						
Intersection Delay, s/veh	9.43															
Intersection LOS	A															

RR81 Traffic Study
1: Lincoln Ave. & RR81 King St.

Future 2026 Traffic Analysis
AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	47	394	12	29	341	71	10	16	28	43	12	29
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	51	428	13	32	371	77	11	17	30	47	13	32
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	448			441			1009	1048	435	1042	1016	409
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	448			441			1009	1048	435	1042	1016	409
tC, single (s)	4.5			4.2			7.1	6.6	6.2	7.2	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.5			2.3			3.5	4.1	3.3	3.6	4.0	3.3
p0 queue free %	95			97			94	91	95	72	94	95
cM capacity (veh/h)	954			1088			188	204	617	169	220	638
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1						
Volume Total	51	441	32	448	59	91						
Volume Left	51	0	32	0	11	47						
Volume Right	0	13	0	77	30	32						
cSH	954	1700	1088	1700	305	237						
Volume to Capacity	0.05	0.26	0.03	0.26	0.19	0.39						
Queue Length 95th (m)	1.3	0.0	0.7	0.0	5.3	13.1						
Control Delay (s)	9.0	0.0	8.4	0.0	19.6	29.4						
Lane LOS	A		A		C	D						
Approach Delay (s)	0.9		0.6		19.6	29.4						
Approach LOS					C	D						
Intersection Summary												
Average Delay			4.1									
Intersection Capacity Utilization			49.4%		ICU Level of Service		A					
Analysis Period (min)			15									

RR81 Traffic Study
5: Mountainview Rd. & RR81 King St.

Future 2026 Traffic Analysis

AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	7	445	13	12	342	17	10	2	5	8	6	11
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	8	484	14	13	372	18	11	2	5	9	7	12
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	390			498			928	922	491	920	920	381
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	390			498			928	922	491	920	920	381
tC, single (s)	4.1			4.1			7.5	6.5	6.2	7.2	6.5	6.3
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.9	4.0	3.3	3.6	4.0	3.4
p0 queue free %	99			99			95	99	99	96	98	98
cM capacity (veh/h)	1179			1077			200	267	582	233	268	643
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	505	403	18	27								
Volume Left	8	13	11	9								
Volume Right	14	18	5	12								
cSH	1179	1077	257	338								
Volume to Capacity	0.01	0.01	0.07	0.08								
Queue Length 95th (m)	0.1	0.3	1.8	2.0								
Control Delay (s)	0.2	0.4	20.1	16.6								
Lane LOS	A	A	C	C								
Approach Delay (s)	0.2	0.4	20.1	16.6								
Approach LOS			C	C								
Intersection Summary												
Average Delay			1.1									
Intersection Capacity Utilization			39.4%		ICU Level of Service				A			
Analysis Period (min)			15									

RR81 Traffic Study
8: Thirty Rd. & RR81 King St.

Future 2026 Traffic Analysis

AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	18	398	19	43	320	5	42	34	73	4	20	1
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	20	433	21	47	348	5	46	37	79	4	22	1
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	353			453			935	929	443	1014	936	351
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	353			453			935	929	443	1014	936	351
tC, single (s)	4.3			4.2			7.3	6.6	6.3	7.1	6.7	6.2
tC, 2 stage (s)												
tF (s)	2.4			2.3			3.7	4.1	3.4	3.5	4.2	3.3
p0 queue free %	98			96			77	85	87	97	91	100
cM capacity (veh/h)	1112			1047			201	246	596	160	234	697
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1						
Volume Total	20	453	47	353	162	27						
Volume Left	20	0	47	0	46	4						
Volume Right	0	21	0	5	79	1						
cSH	1112	1700	1047	1700	317	223						
Volume to Capacity	0.02	0.27	0.04	0.21	0.51	0.12						
Queue Length 95th (m)	0.4	0.0	1.1	0.0	20.8	3.1						
Control Delay (s)	8.3	0.0	8.6	0.0	27.6	23.3						
Lane LOS	A		A		D	C						
Approach Delay (s)	0.3		1.0		27.6	23.3						
Approach LOS					D	C						
Intersection Summary												
Average Delay			5.3									
Intersection Capacity Utilization			53.1%		ICU Level of Service		A					
Analysis Period (min)			15									

ROUNABOUT REPORT																
General Information								Site Information								
Analyst	Parsons							Intersection	RR81 King St. & Greenlane							
Agency or Co.	Parsons							E/W Street Name	RR81 King St.							
Date Performed	12/6/2016							N/S Street Name	Greenlane							
Time Period	PM Peak Hour							Analysis Year	Future 2026							
Peak Hour Factor	0.92							Project ID	RR81 King Street Traffic Study							
Project Description:																
Volume Adjustment and Site Characteristics																
	EB				WB				NB				SB			
	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R	U
Number of Lanes (N)	0	1	0		0	1	0		0	1	0		0	1	0	
Lane Assignment	LTR				LTR				LTR				LTR			
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				1				1			
Volume (V), veh/h	97	473	7	0	0	310	4	0	5	1	0	0	1	0	52	0
Heavy Veh. Adj. (f_{HV}), %	0	0	0	3	0	0	0	3	0	0	0	3	0	0	0	3
Pedestrians Crossing	0				0				0				0			
Critical and Follow-Up Headway Adjustment																
	EB			WB			NB			SB						
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass				
Critical Headway (sec)	5.1929	5.1929	5.1929	5.1929	5.1929	5.1929	5.1929	5.1929	5.1929	5.1929	5.1929	5.1929				
Follow-Up Headway (sec)	3.1858	3.1858	3.1858	3.1858	3.1858	3.1858	3.1858	3.1858	3.1858	3.1858	3.1858	3.1858				
Flow Computations																
	EB			WB			NB			SB						
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass				
Circulating Flow (V_c), pc/h	1			111			620			342						
Exiting Flow (V_{ex}), pc/h	515			399			111			8						
Entry Flow (V_e), pc/h		627			341			7			58					
Entry Volume veh/h		627			341			7			58					
Capacity and v/c Ratios																
	EB			WB			NB			SB						
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass				
Capacity (c_{PCE}), pc/h		1129			1010			607			802					
Capacity (c), veh/h		1129			1010			607			802					
v/c Ratio (X)		0.56			0.34			0.01			0.07					
Delay and Level of Service																
	EB			WB			NB			SB						
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass				
Lane Control Delay (d), s/veh		9.9			7.1			6.1			5.2					
Lane LOS		A			A			A			A					
Lane 95% Queue		3.5			1.5			0.0			0.2					
Approach Delay, s/veh	9.87			7.06			6.06			5.20						
Approach LOS, s/veh	A			A			A			A						
Intersection Delay, s/veh	8.65															
Intersection LOS	A															

RR81 Traffic Study
1: Lincoln Ave. & RR81 King St.

Future 2026 Traffic Analysis
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	35	488	8	30	373	64	4	19	29	74	26	36
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	38	530	9	33	405	70	4	21	32	80	28	39
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	475			539			1135	1151	535	1154	1121	440
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	475			539			1135	1151	535	1154	1121	440
tC, single (s)	4.1			4.2			7.1	6.6	6.2	7.2	6.7	6.3
tC, 2 stage (s)												
tF (s)	2.2			2.3			3.5	4.1	3.3	3.6	4.2	3.4
p0 queue free %	96			97			97	89	94	42	84	94
cM capacity (veh/h)	1082			1000			142	182	542	140	180	607
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1						
Volume Total	38	539	33	475	57	148						
Volume Left	38	0	33	0	4	80						
Volume Right	0	9	0	70	32	39						
cSH	1082	1700	1000	1700	279	185						
Volume to Capacity	0.04	0.32	0.03	0.28	0.20	0.80						
Queue Length 95th (m)	0.8	0.0	0.8	0.0	5.6	41.5						
Control Delay (s)	8.4	0.0	8.7	0.0	21.2	73.9						
Lane LOS	A		A		C	F						
Approach Delay (s)	0.6		0.6		21.2	73.9						
Approach LOS					C	F						
Intersection Summary												
Average Delay			9.9									
Intersection Capacity Utilization			53.2%		ICU Level of Service		A					
Analysis Period (min)			15									

RR81 Traffic Study
5: Mountainview Rd. & RR81 King St.

Future 2026 Traffic Analysis
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	11	502	14	10	388	5	18	6	10	16	10	10
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	12	546	15	11	422	5	20	7	11	17	11	11
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	427			561			1040	1026	553	1038	1031	424
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	427			561			1040	1026	553	1038	1031	424
tC, single (s)	4.2			4.2			7.2	6.5	6.3	7.2	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.3			2.3			3.6	4.0	3.4	3.6	4.0	3.3
p0 queue free %	99			99			89	97	98	91	95	98
cM capacity (veh/h)	1086			958			185	231	510	192	230	634
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	573	438	37	39								
Volume Left	12	11	20	17								
Volume Right	15	5	11	11								
cSH	1086	958	238	252								
Volume to Capacity	0.01	0.01	0.16	0.16								
Queue Length 95th (m)	0.3	0.3	4.1	4.1								
Control Delay (s)	0.3	0.3	22.9	21.9								
Lane LOS	A	A	C	C								
Approach Delay (s)	0.3	0.3	22.9	21.9								
Approach LOS			C	C								
Intersection Summary												
Average Delay			1.9									
Intersection Capacity Utilization			45.2%		ICU Level of Service				A			
Analysis Period (min)			15									

RR81 Traffic Study
8: Thirty Rd. & RR81 King St.

Future 2026 Traffic Analysis

PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	10	425	46	102	298	8	20	31	95	2	49	5
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	11	462	50	111	324	9	22	34	103	2	53	5
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	333			512			1086	1063	487	1154	1084	328
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	333			512			1086	1063	487	1154	1084	328
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			89			84	83	82	98	73	99
cM capacity (veh/h)	1238			1038			140	199	579	115	194	718
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1						
Volume Total	11	512	111	333	159	61						
Volume Left	11	0	111	0	22	2						
Volume Right	0	50	0	9	103	5						
cSH	1238	1700	1038	1700	316	202						
Volume to Capacity	0.01	0.30	0.11	0.20	0.50	0.30						
Queue Length 95th (m)	0.2	0.0	2.7	0.0	20.3	9.2						
Control Delay (s)	7.9	0.0	8.9	0.0	27.4	30.3						
Lane LOS	A		A		D	D						
Approach Delay (s)	0.2		2.2		27.4	30.3						
Approach LOS					D	D						
Intersection Summary												
Average Delay			6.1									
Intersection Capacity Utilization			59.4%		ICU Level of Service				B			
Analysis Period (min)			15									