Altona Group

1294 KINGSTON ROAD, 1848 & 1852 LIVERPOOL ROAD

CITY OF PICKERING

Transportation Impact Assessment

May 2019

19225

LEA Consulting Ltd.
625 Cochrane Drive, 9th Floor
Markham, ON, L3R 9R9 Canada
T | 905 470 0015 F | 905 470 0030
WWW.LEA.CA

May 24th, 2019

Reference Number: 19225.210

Mr. Muky Rajadurai
Project Manager
Altona Group
11 Progress Ave., Unit #5.
Toronto, ON
M1P 4S7

Dear Mr. Rajadurai:

RE: Transportation Impact Assessment
Proposed Mixed-Use Development
1294 Kingston Road, 1848 & 1852 Liverpool Road
City of Pickering

LEA Consulting Ltd. is pleased to present the findings of our Transportation Impact Assessment for the proposed mixed-use development at 1294 Kingston Road, 1848 & 1852 Liverpool Road in the City of Pickering.

Should you have any questions regarding this letter, please do not hesitate to contact the undersigned.

Yours truly,
LEA CONSULTING LTD.

Nixon Chan, M.A.Sc., P.Eng., PTOE, PMP
Manager, Transportation Engineering

Anatole Kung, B.A
Senior Transportation Analyst

Encl.

Disclaimer

This Report represents the work of LEA Consulting Ltd ("LEA"). This Report may not be relied upon for detailed implementation or any other purpose not specifically identified within this Report. Neither LEA, its sub-consultants nor their respective employees assume any liability for any reason, including, but not limited to, negligence, to any party for any information or representation herein.

.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

APPENDICES

1 INTRODUCTION

LEA Consulting Ltd. (LEA) was retained by the Altona Group to prepare a Traffic Impact Study (TIS) to support a Zoning By-law Amendment application for the proposed mixed-use development at 1294 Kingston Road, 1848 Liverpool Road, and 1852 Liverpool Road (herein referred to as the "subject site") located on the northwest corner of Liverpool Road and Kingston Road in the City of Pickering. Altona Group, owner of the subject site, is proposing the redevelopment and intensification of the subject site with a mixed-use development that incorporates a 25-storey tower, a 12-storey midrise building, and a row of 3-storey townhouses. The proposal also commits to the restoration and adaptive reuse of the Old Liverpool House as well as new publicly accessible open space and improvements to the public realm.

The proposed development adds 391 units to the 0.91 hectare site with a total residential gross floor area of 32,350 m^2. Active at grade retail and commercial uses make up to 850 m^2 along the Liverpool and Kingston Road frontages of the new buildings and the retained Old Liverpool House. A total gross floor area of 33,200 m^2 is proposed at a density of 3.6 FSI over the subject site. A total of 512 parking spaces will be provided, mostly within 3 levels of underground parking with 10 spaces provided at-grade to support the retail. Figure 1.1 shows the subject site and study area while Figure 1.2 illustrates the proposed site plan.

Figure 1.1: Site Location and Study Area

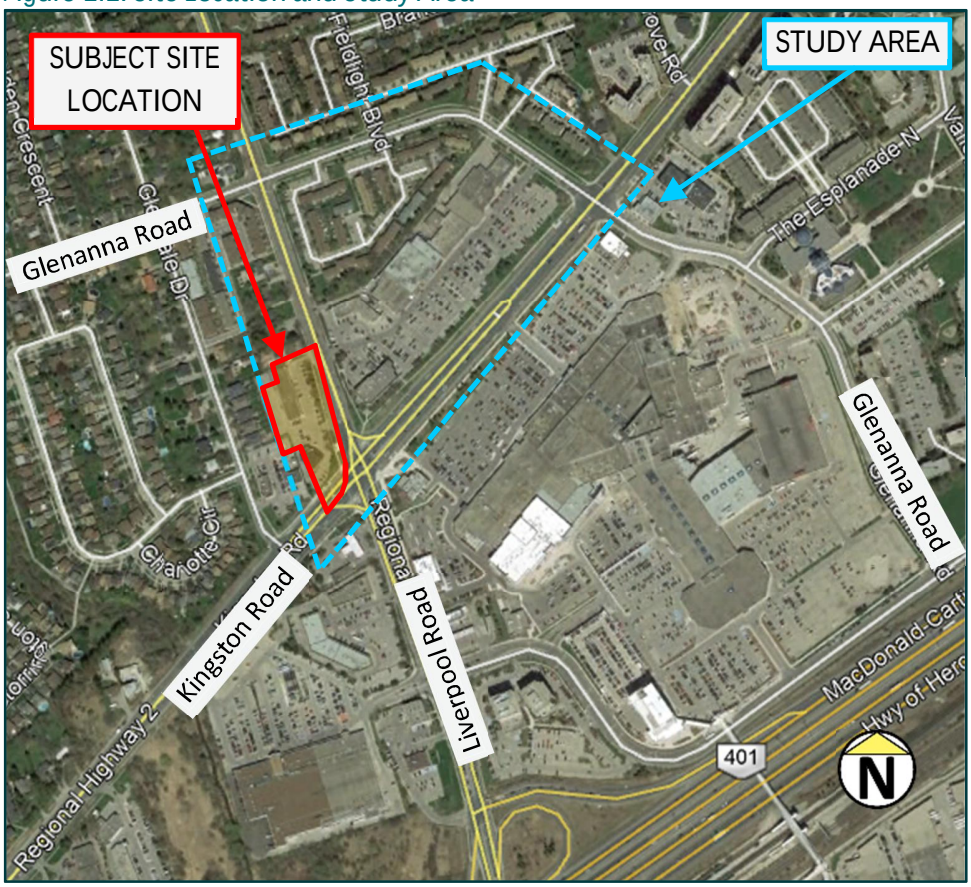
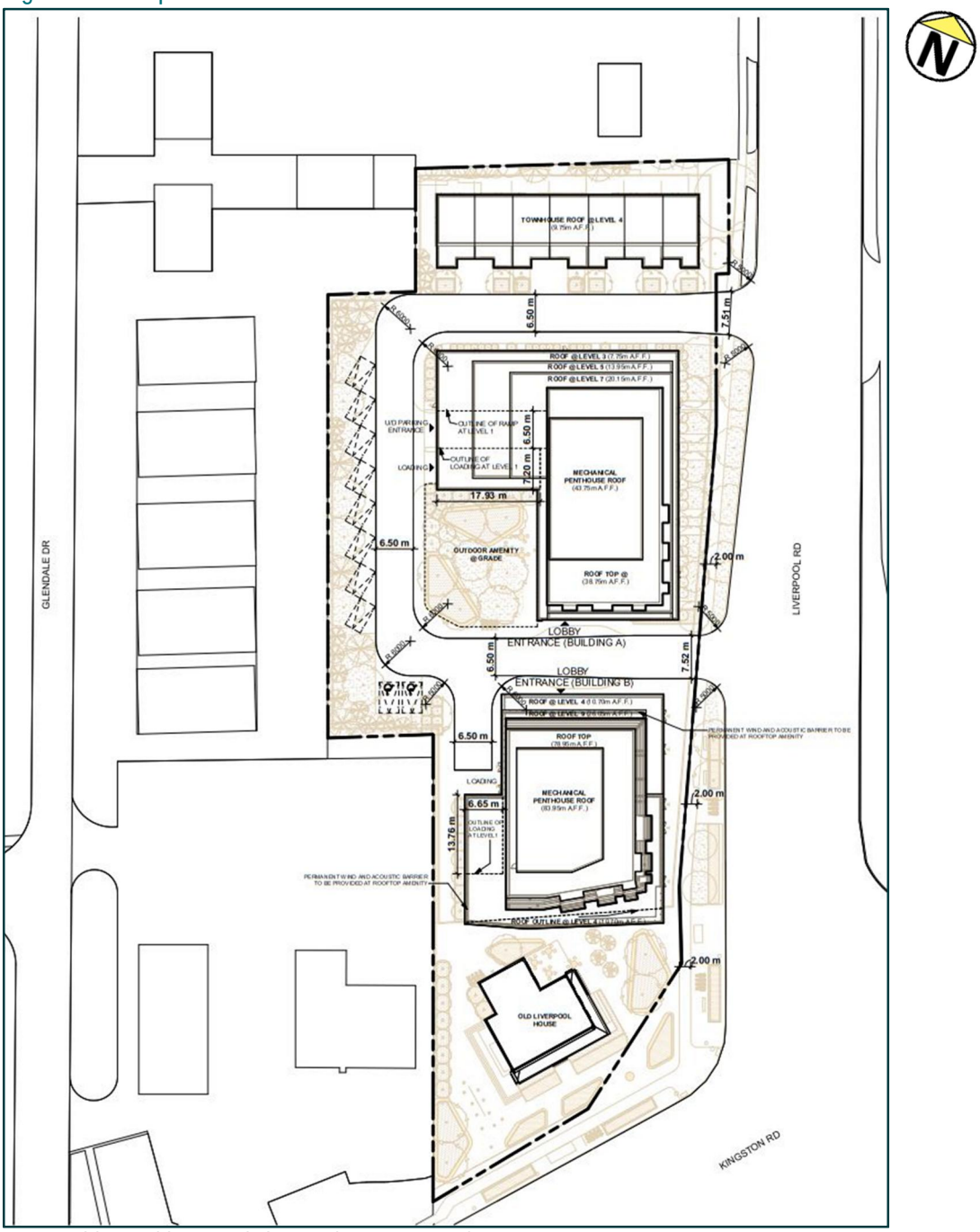


Figure 1.2: Proposed Site Plan



Source: Kirkor Architects and Planners (May 16th, 2019)

2 EXISTING TRANSPORTATION CONDITIONS

2.1 ROAD NETWORK AND SITE ACCESSES

The following provides an overview of the existing road network surrounding the subject site.

Kingston Road (Highway 2) is a Type B Arterial Regional Road under the jurisdiction of Durham Region. This road runs generally in the east-west direction between Woodbine Avenue in the City of Toronto and the Ajax-Whitby municipalities, turning into Dundas Street West at Lake Ridge Road. Near the subject site, Kingston Road has a general seven-lane cross-section including bus-only lanes and bicycle lanes within the study area. The posted speed limit is 60 km/hr. At approximately 300 metres west of the Liverpool Road intersection, there are no bus or bicycle lanes available.

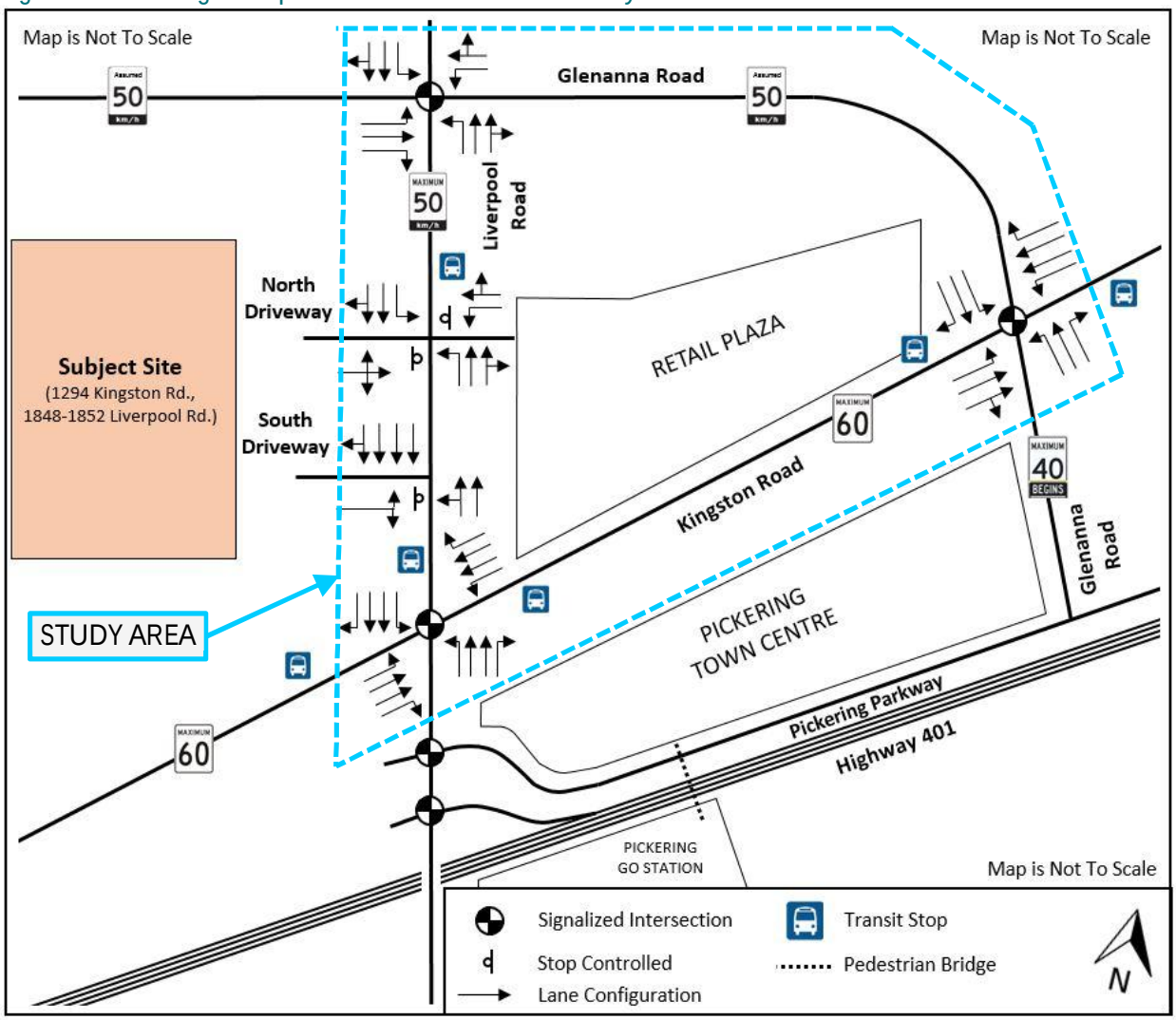
Liverpool Road (Regional Road 29) is a Type B Regional Road that extends from Lake Ontario to north of Finch Avenue. It has a general five-lane cross-section within the study area. The posted speed limit near the subject site is 50 km/hr.

Glenanna Road is a Type C Arterial Road that has a two-lane cross section. This road runs east west from its westerly end to east of Liverpool Road and runs north-south to its south limits at Pickering Parkway. The road section north and west of Kingston Road does not have a posted speed limit and is assumed to be 50 km/hr. South of Kingston Road, the posted speed limit is 40 km/hr.

The subject site currently has two access driveways. The south driveway forms a t-shaped intersection at Liverpool Road with all eastbound traffic under stop control. The north driveway is a four-way unsignalized intersection with stop control for the east and west directions.

Figure 2.1 illustrates the lane configurations, type of traffic control, and transit stops in the study area.

Figure 2.1: Existing Transportation Elements in the Study Area



2.2 TRAFFIC DATA COLLECTION

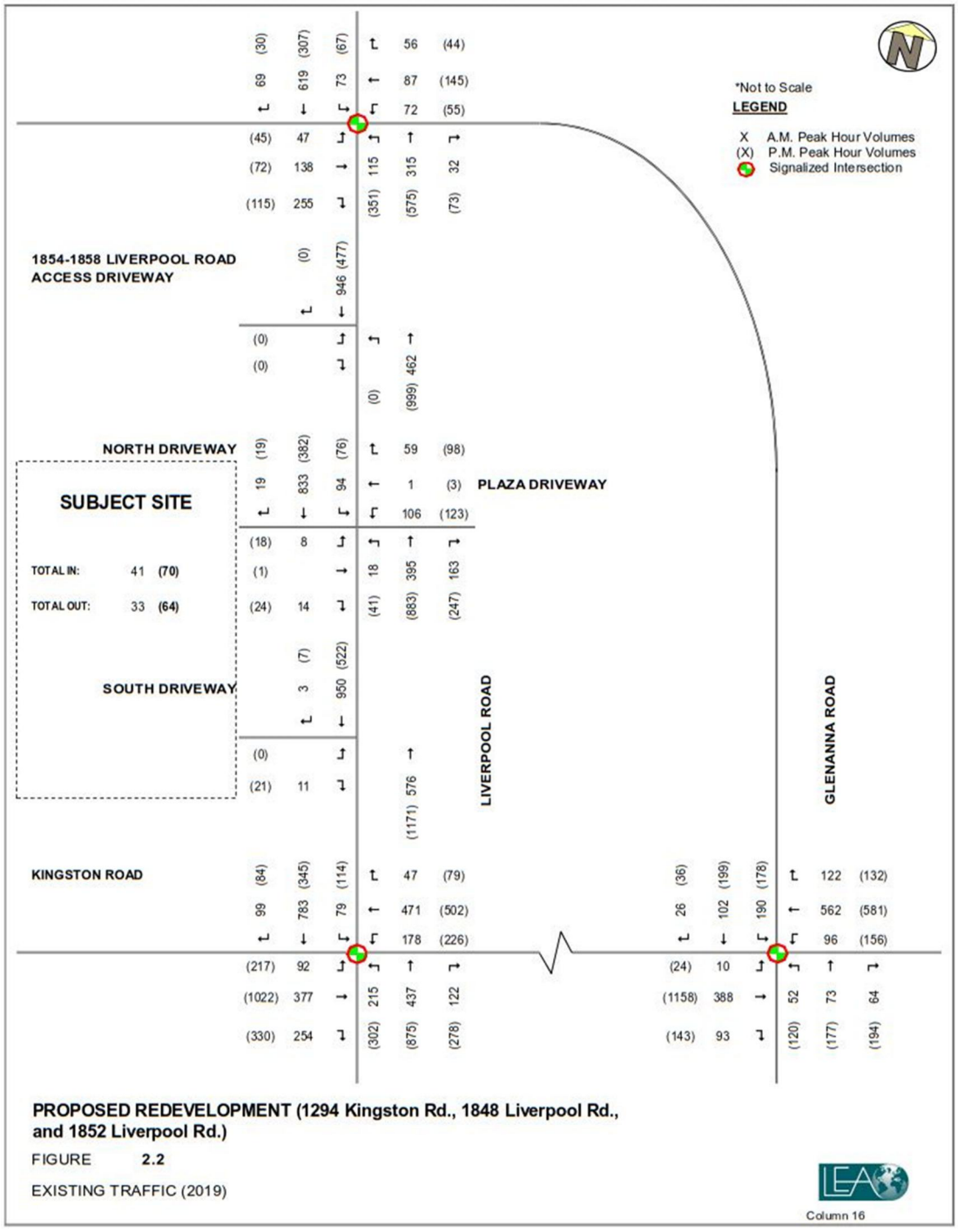
Existing traffic volumes in the study area combined counts from Durham Region's Traffic Engineering and Operations interactive map and LEA Consulting Ltd. Table 2.1 summarizes the traffic data details.

Table 2-1: Traffic Data Dates and Sources

Intersection	Date of Survey	Source
Liverpool Road (RR29) and Glenanna Road	Wednesday, June 14th 2017	Durham Region
Liverpool Road (RR29) and North Site Driveway / Plaza Access	Thursday, November 8th, 2018	LEA Consulting Ltd.
Liverpool Road (RR29) and South Site Driveway	Thursday, November 8th, 2018	LEA Consulting Ltd.
Liverpool Road (RR29) and Kingston Road (Highway 2)	Thursday, June 15th 2017	Durham Region
Glenanna Road and Kingston Road (Highway 2)	Wednesday, June 14th 2017	Durham Region

The subject site currently has two access points. In and out movements at each access were counted to determine the existing site trip generation. Since the Durham Region counts were conducted in 2017, these volumes were adjusted to reflect 2019 volumes. In discussion with Region staff, growth in the general area was stagnant and a 0.5% growth rate was recommended. Figure 2.2 shows the existing traffic volumes. Detailed traffic count data can be found in Appendix A.

Figure 2.2: Existing Traffic Volumes



2.3 EXISTING INTERSECTION CAPACITY ANALYSIS

Intersection capacity analysis was conducted for the existing traffic conditions using Synchro Version 9.0 software, following the methodology outlined in the Highway Capacity Manual (2000) and the Region of Durham's Synchro software parameters as outlined in the Design Specifications for Traffic Control Devices, Pavement Markings, Signage and Roadside Protection (April 2017).

Signal timing plans were obtained from the Region of Durham for the three signalized intersections located in the study area (See Appendix A). The current posted speed limits and the default peak hour factor value of 0.92 were applied in capacity analyses. The existing capacity analysis is summarized in Table 2-2 with detailed outputs found in Appendix B.

Table 2-2: Existing Conditions – Signalized Intersection Capacity Analysis

Intersection	Weekday AM Peak Hour									Weekday PM Peak Hour								
	Overall			Movement of Interest				Queue (m)		Overall			Movement of Interest				Queue (m)	
	V/C	Delay (s)	LOS	Move-ment	V/C	Delay (s)	LOS	50th	95th	V/C	Delay (s)	LOS	Move-ment	V/C	Delay (s)	LOS	50th	95th
Glenanna Road at Kingston Road	0.46	24	C	EBL	0.07	19	B	1	2	0.82	24	C	EBL	0.08	7	A	1	2
				EBT	0.73	30	C	21	24				EBT	0.94	20	B	155	203
				WBL	0.41	26	C	14	22				WBL	0.60	24	C	16	40
				WBT	0.54	28	C	52	59				WBT	0.30	10	A	30	48
				WBR	0.27	25	C	20	30				WBR	0.12	9	A	3	13
				NBL	0.10	16	B	5	13				NBL	0.46	33	C	17	28
				NBT	0.11	20	C	10	26				NBT	0.59	46	D	37	55
				NBR	0.05	20	B	0	6				NBR	0.17	37	D	1	19
				SBL	0.31	11	B	20	50				SBL	0.74	46	D	35	44
				SBT	0.14	15	B	18	34				SBT	0.69	52	D	44	63
				SBR	0.02	16	B	0	2				SBR	0.03	35	C	0	0
Liverpool Road at Kingston Road	0.76	36	D	EBL	0.35	26	C	12	21	0.98	44	D	EBL	0.63	25	C	27	44
				EBT	0.52	36	D	38	50				EBT	0.97	54	D	117	163
				EBR	0.81	55	D	52	79				EBR	0.78	43	D	66	111
				WBL	0.55	56	E	39	61				WBL	1.00	99	F	46	88
				WBT	0.58	62	E	58	75				WBT	0.44	38	D	57	75
				WBR	0.13	55	E	11	23				WBR	0.17	34	C	16	29
				NBL	0.75	27	C	26	69				NBL	0.87	46	D	44	79
				NBT	0.34	22	C	37	56				NBT	0.87	41	D	94	120
				NBR	0.10	20	B	0	13				NBR	0.41	28	C	14	42
				SBL	0.21	16	B	8	15				SBL	0.73	41	D	14	34
				SBT	0.71	29	C	85	94				SBT	0.35	27	C	29	42
				SBR	0.08	18	B	1	8				SBR	0.07	36	D	0	9
Liverpool Road at Glenanna Road	0.35	19	B	EBL	0.38	41	D	10	20	0.58	12	B	EBL	0.39	40	D	9	20
				EBT	0.60	45	D	29	47				EBT	0.27	37	D	14	26
				EBR	0.35	40	D	8	32				EBR	0.08	36	D	0	15
				WBL	0.56	57	E	17	33				WBL	0.29	26	C	6	22
				WBT	0.54	58	E	27	49				WBT	0.67	36	D	16	63
				NBL	0.27	5	A	5	11				NBL	0.56	7	A	20	85
				NBTR	0.15	3	A	6	13				NBTR	0.28	3	A	17	9
				SBL	0.12	4	A	4	11				SBL	0.15	5	A	4	11
				SBTR	0.30	5	A	22	38				SBTR	0.14	5	A	10	19

Analysis of existing conditions indicates generally acceptable levels of service (LOS) for most movements at the signalized intersections for both the AM and PM peak hours. However, some movements are experiencing capacity constraints during the PM peak hour. This includes the eastbound through movement at both Kingston Road intersections at Glenanna and Liverpool Roads. The volume-to-capacity (v/c) ratios are around 0.95 at both intersections; however, the delay time is acceptable with a value of about 55

seconds. The westbound left movement at Liverpool Road at Kingston Road is right on capacity (v/c ratio) during the PM peak hour; the overall intersection v/c ratio is below capacity.

The existing capacity analysis for unsignalized intersections for the AM and PM peak hours is summarized in Table 2.3.

Table 2.3: Existing Conditions – Unsignalized Intersection Capacity Analysis

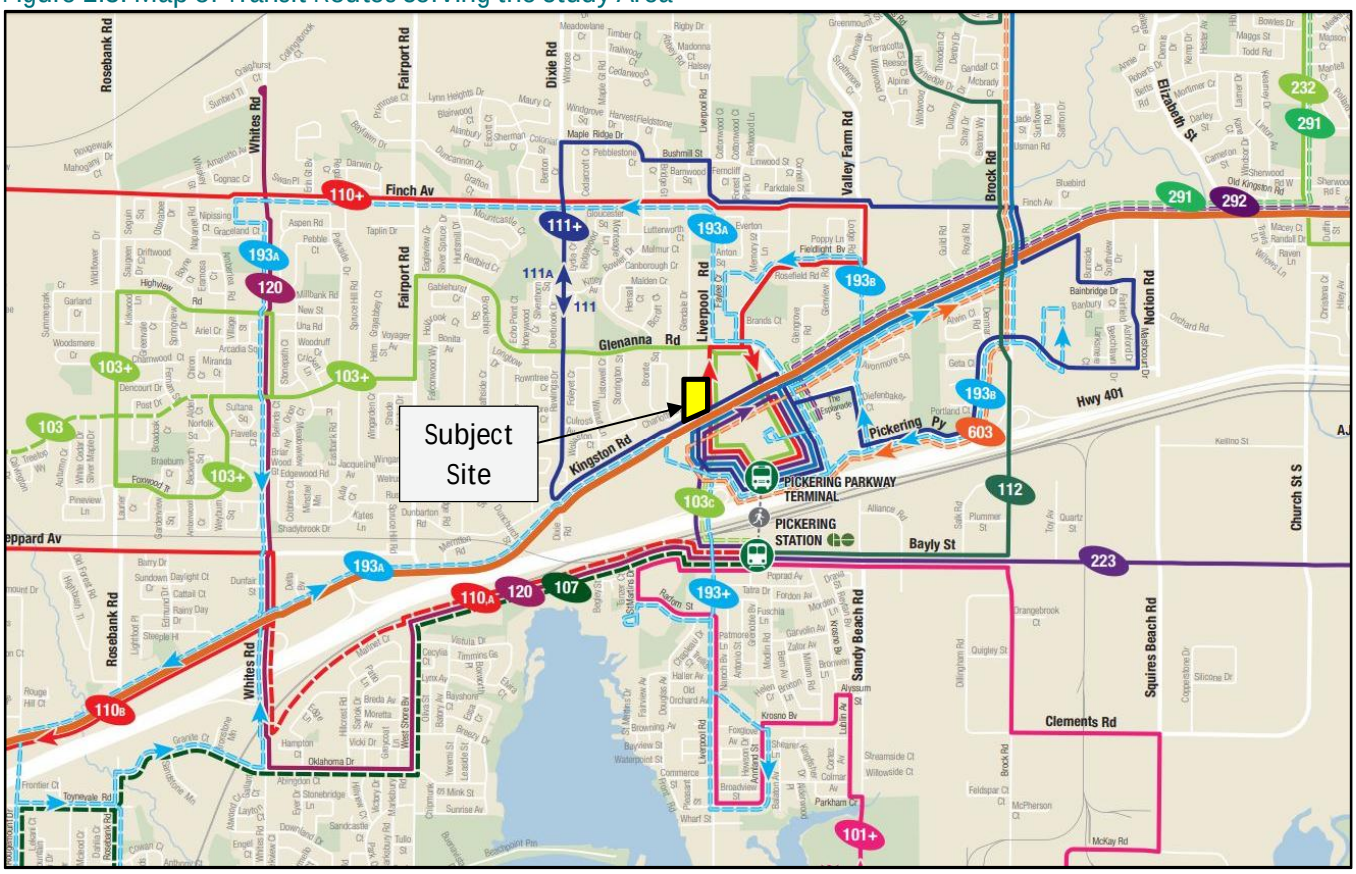
Intersection	Move-ment	Weekday AM Peak Hour						Weekday PM Peak Hour					
		Flow Rate (vph)	Capacity (vph)	Control Delay (s)	Vol/Cap Ratio (v/c)	Queue Length 95th (m)	LOS	Flow Rate (vph)	Capacity (vph)	Control Delay (s)	Vol/Cap Ratio (v/c)	Queue Length 95th (m)	LOS
Liverpool Road at South Site Access	EBR	12	718	10	0.02	0	B	23	881	9.2	0.03	1	A
Liverpool Road at North Site Access/Plaza Access	EBLTR	24	336	17	0.07	2	C	47	505	12.9	0.09	3	B
	WBL	115	332	22	0.35	12	C	134	288	27.9	0.46	19	D
	WBTR	65	885	9	0.07	2	A	110	771	10.4	0.14	4	B
	NBL	20	761	10	0.03	1	A	45	1134	8.3	0.04	1	A
	SBL	102	1073	9	0.10	3	A	83	720	10.6	0.12	3	B

The analysis shows that both unsignalized accesses are operating at acceptable LOS during both peak hours. The westbound left movement at the north site access driveway experiences the highest delay at 28 seconds; these delays result from the continuous volume of cross traffic on Liverpool Road.

2.4 EXISTING TRANSIT SERVICE

The subject site is serviced by Durham Region Transit which includes a bus rapid transit (BRT) system along Kingston Road (a high order transit corridor) and two community bus routes. The Durham Region transit terminal is located on the south side of the nearby Pickering Town Centre with a walking distance of approximately 750 metres from the subject site. The Pickering GO Station, which is a Metrolinx Anchor Mobility Hub, is located south of Highway 401 at the northeast corner of Liverpool Road and Bayly Street. The subject site is within an 800-metre radius of the GO Station with a walking distance of approximately one kilometre. Figure 2.5 shows the local transit routes serving the general area.

Figure 2.3: Map of Transit Routes Serving the Study Area



The bus routes servicing the subject site are as follows:

- 103 Glenanna Bus operates predominately east-west along Glenanna Road from Pickering Parkway Terminal (i.e. Pickering Town Centre) to Rouge Hill GO Station (Toronto). This route operates 7 days a week, exclusively during rush hour on weekdays with a peak headway of 30 minutes. During the weekday midday, the routes 103B and 103C operate once an hour. On weekends, service interval times is 60 minutes between Pickering Parkway Terminal and Rossbank Road.
- 110 Finch West Bus is a circle route between Pickering Town Centre and Pickering GO Station travelling via Finch Avenue, Altona Road, Sheppard Avenue, Whites Road and Bayly Street. On weekends, the bus route travels between Pickering Parkway Terminal to Whites Road at Kingston Road intersection. Service frequency ranges between 16-30 minutes during the AM peak period and 27-40 during the PM peak period. Outside of weekday peak periods and on weekends, the route operates every 30 minutes but only to the Whites Road/Kingston Road intersection.
- 111 East Pickering Bus is a circle route around the Pickering City Centre area. It travels in a clockwise manner to as far west as Dixie Road at Kingston Road, before returning towards Pickering Parkway Terminal via Finch Avenue, Brock Road, and Pickering Parkway to the bus terminal. The route 111A operates in the opposing direction (counter clockwise) as route 111. The Monday-Friday AM peak period operates with a 12-18-minute headway whereas the PM peak period operates at a 17-30-minute headway. Hourly service is available on weekends.

- 193 Community Bus Route operates as a circuitous route to several communities in the area bounded by Finch Avenue to the north, Brock Road to the east, Liverpool Road at Annland Street to the southeast and Kingston Road at Roughmount Drive and Rossbank Road to the southwest. The route operates midday from Monday-Saturday between 10:30AM to about 4:30PM, with a headway of 2 hours offering 3 runs.
- 223 Bayly Bus operates generally in an east-west route, travelling between Pickering Parkway Bus Terminal and Ashbury Avenue and Audley Road. This route operates along Liverpool Road, Bayly Road and Audley Road. A 30-minute headway is scheduled for much of Monday to Saturday between 5:00 AM and 8:30 PM. Outside of these times, the headway is generally 60 minutes, including all-day Sunday.
- 291 & 292 Ajax Community Bus travels east-west between from Pickering Parkway Bus Terminal and Harwood Avenue and Lake Driveway, travelling in general along Kingston Road and Harwood Avenue. Like the 193 Community Bus Route, a circuitous route serves local communities to as far east as Salem Road. The route operates Monday-Saturday from 8:40AM to about 6:30PM with a headway of 60 minutes. On Sunday, only midday service is available between 11:30AM to 5:30PM with a headway of 2 hours.
- 603 Pickering-Uxbridge Bus operates north-south from Pickering Parkway Bus Terminal to Main Street North and Brock Street E. in the Township of Uxbridge. Service is provided Monday to Friday as a one-directional commuter service. Two trips from Uxbridge occur during the AM Peak and midday period. Northbound bus service begins during the midday with a 2-hour headway. During the PM peak period, service departs for Uxbridge between 3:30 and 6:00 PM.
- 900 Pulse Bus operates east-west along Kingston Road from the University of Toronto (Scarborough) to Mary Street at Dundas Street (City of Oshawa). This route is designed as a Rapid Transit Corridor with dedicated bus lanes on sections near Liverpool Road, Brock Road, and between Westney and Salem Roads. Service operates 7 days a week, with peak headways of 10-15 minutes on weekdays, 15-30 minutes on Saturday, and 30 minutes on Sundays.
- 916 Rossland Bus operates primarily east-west along Rossland Road from Pickering Parkway Terminal to Harmony Bus Terminal within the SmartCentres Oshawa North shopping complex. The route operates 7 days a week, with peak headways of 15 minutes on weekdays, 10-20 minutes on Saturdays, and 30 minutes on Sunday.
- 51 Highway 407 East (GO Transit) operates primarily along Highway 407 between the Highway 407 Bus Terminal at Yonge Street and the Oshawa Bus Terminal. This route passes by the subject site on Kingston Road to the Pickering GO Station. Branch routes A, C and D divert from Highway 407, Highway 404, Highway 401 with stops at the Scarborough Centre Bus Terminal, Centennial College, and the University of Toronto-Scarborough. The route then travels via Highway 401, Whites Road, Kingston Road, Liverpool Road to the Pickering GO Station. The route then travels west to Oshawa GO Bus terminal via Bayly Street, Brock Road, Highway 407/Highway 7, and Simcoe Street. Branch route 51B by-passes these stops and travels directly to the Pickering GO Station via Highway 407 and Brock Road. Afterwards, the bus follows the branch routes A, C and D path to the Oshawa Bus Terminal. Service frequency is 25-35 minutes during the weekday AM peak and PM peak period. There is no service during the weekend.

A summary of the transit service is provided in Table 2.4.

Table 2.4: Existing Transit Service Summary

Route Name	Direction	From	To	Weekday Hours of Operation	Peak Weekday Headway (Minutes)
103 Glenanna	E-W	Pickering Parkway Terminal (Liverpool Rd. at Kingston Rd.)	Rouge GO Hill Station	6:00AM-7:30PM	30
110, 110A Finch West	N-S		Pickering GO Station	6:15AM-11:00PM	16-30
111, 111A East Pickering	N-S		Finch Av., Brock Rd., Dixie Rd.	9:00AM-8:00PM	12-30
193A, 193B Community Route	N-S		Whites Rd. at Finch Av., Rougemount Dr. at Kingston Rd., Brock Rd. at Kingston Rd., and Liverpool Rd. at Annland St.	10:30AM-4:30PM	60
223 Bayly	E-W		Audley Rd./Ashburn Blvd.	5:15AM-Midnight	30
291 & 292 Ajax Community	N-S		Salem Rd. at Kingston Rd., Harwood Av. at Lake Driveway	8:40AM-6:30PM	120
603 Pickering-Uxbridge	N-S		Main St. N. at Brock St. East.	6:30AM-6:30PM	90-120
916, 916C Rossland	E-W		Harmony Bus Terminal Oshawa)	6:00AM-11:30PM	15-20
900 Pulse	E-W	University of Toronto Scarborough (Morningside Av. at Ellesmere Rd.)	Mary St at Dundas Street (Oshawa)	4:30AM-2:00AM	10-15
GO Transit 51 407 East Bus	E-W	Highway 407 Bus Terminal (Richmond Hill)	Oshawa Bus Terminal	5:00AM-MIdnight	25-30

3 FUTURE BACKGROUND TRAFFIC CONDITIONS

3.1 BACKGROUND TRIP GENERATION

In consultation with Durham Region staff, it was determined that the only potential background development in the study area is located immediately north of the subject site at 1854-1858 Liverpool Road. During the preparation of this report, it was suggested that the proposed neighbouring development will be a 120-unit residential building with site access made possible from a full movement driveway at Liverpool Road.

Background trip generation was calculated using the Institute of Transportation Engineers (ITE), Land Use Code 222 (Multifamily Housing/High-Rise). The ITE trip generation assumes all site trips are vehicle trips using a private vehicle. It does not factor in other modes of travel including transit, bicycle, and walking.

Section 2.3.5 of the 2017 Durham Region Transportation Master Plan specifies a targeted increase in transit mode share from 10.7% in 2011 to 12.2% by 2031. The study area is located within a higher order transit corridor with service provided by Durham Region Transit (DRT) and GO Transit. A Bus Rapid Transit lane is located on Kingston Road with a transit stop located on the southern edge of the property and across Kingston Road on the southeast corner of Liverpool Road. There is a DRT bus terminal at the south end of Pickering Town Centre with access to nine bus routes. Pickering GO Station is located on the south side of Highway 401, which also includes several bus bays dedicated for some Durham Region transit routes. This railway station is within 800 metres of the subject site (1-kilometre walk). The GO Station contributes to transit mode share where the Lakeshore East GO train line provides access to downtown Toronto via train or bus.

A review of the other modal share was undertaken to determine if further reduction to site trips is possible. We reviewed the modal share In the Transportation Tomorrow Survey (TTS) for the zone to which the subject site lies in. It was determined that auto drivers accounted for 73% of site trips and other modes at 27% as outlined in Exhibit 1 in Appendix C and summarized in Table 3.1. As noted above, the Durham Region Transportation Master Plan aims to decrease auto use and promote other modes of travel. The report acknowledges other modes including carshare but there is lack of additional information regarding the promotion of this program.

Table 3.1: Modal Split

Travel Modes	Percentage
Auto driver	73%
Transit Excluding GO	5%
GO Rail Only	1%
Joint Go Rail and Local Transit	1%
Auto Passenger	19%
Walk	1%

There are bicycle lanes on Kingston Road near the subject site as part of a larger plan as stated in the Regional Cycling Plan (November 2012). The goal is to complete connectivity of bicycle lanes on Kingston Road and on Liverpool Road from Highway 401 to Finch Avenue. The cycling plan is to be developed in phases by 2031. There is no specific timeline for expansion of the bicycle network within the study area. As such, a site trip reduction by bicycle mode is difficult to establish.

From the above conditions, we can only conservatively decrease the background generated trips related to the proposed development to the north by 10% to account for transit trips. The net decrease is 5 less site trips for both peak periods. The two-way trips for AM and PM peak hour are 41 and 44, respectively. Table 3.2 summarizes the future background generated trips.

Table 3.2: Background Trip Generation

ITE LC222 Multi-Family Housing (High-Rise)	Units	AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
Fitted Curve Equation		T=0.28(X)+12.86			T=0.34(X)+8.56		
Trip Rate	120	0.09	0.29	0.38	0.25	0.16	0.41
Site Trips		11	35	46	30	19	49
Transit Reduction (10%)		-1	-4	-5	-3	-2	-5
Net Site Trips		10	31	41	27	17	44

The distribution of new background trips was estimated using Transportation Tomorrow Survey (TTS) data from 2016. For the background development, it is expected that most vehicular trips will occur between home and work. Therefore, home-based work trips were used to estimate the directional distribution of vehicular traffic. The distribution of vehicular trips for AM and PM peak hour inbound and outbound trips is shown in Exhibit 2 in Appendix C. Table 3.3 summarizes the directional distribution of new trips. For the PM peak hour, we applied the same distribution rates as the AM peak hour.

Table 3.3: Background Trip Distribution

Direction	To/From
North	38%
South	58%
East	1%
West	3%

Figures C1 and C2 in Appendix C show the background site trip distribution and site trips; respectively.

3.2 CORRIDOR GROWTH RATE AND OTHER ROAD IMPROVEMENTS

In discussion with Region staff, it was determined that growth in the general area has remained stagnant. Therefore, a growth rate of 0.5% for a 5 and 10-year analysis period was recommended by Region staff for this study.

An environmental assessment is scheduled to address a proposed widening of Liverpool Road from 5 to 7 lanes from Kingston Road to Highway 401. This study was to commence in 2019 with construction starting in 2022. Regional staff indicated that the EA study has not begun yet. To be conservative, our analysis assumes this widening will be operational by the year 2024. When completed, a shared through/right turn lane is expected to replace the current exclusive right-turn lane in the southbound direction at the Liverpool/Kingston Road intersection. No change to the northbound lane is expected.

Figures C3 and C4 in Appendix C show the background growth in corridor traffic on Liverpool and Kingston Roads for 2024 and 2029; respectively. Future total traffic for 2024 is the sum of existing traffic, plus corridor growth and future site traffic. Figures 3.1 and 3.2 show the 2024 and 2029 background traffic volumes, respectively.

As requested by the Region, we also assessed the traffic conditions with only one access driveway. For this scenario, the existing north access driveway is maintained. Please note that this is a hypothetical scenario and is only included as a benchmark comparison between future background and total traffic conditions. Figures 3.3 and 3.4 show the 2024 and 2029 background traffic volumes, respectively.

Figure 3.1: 2024 Background Traffic Volumes

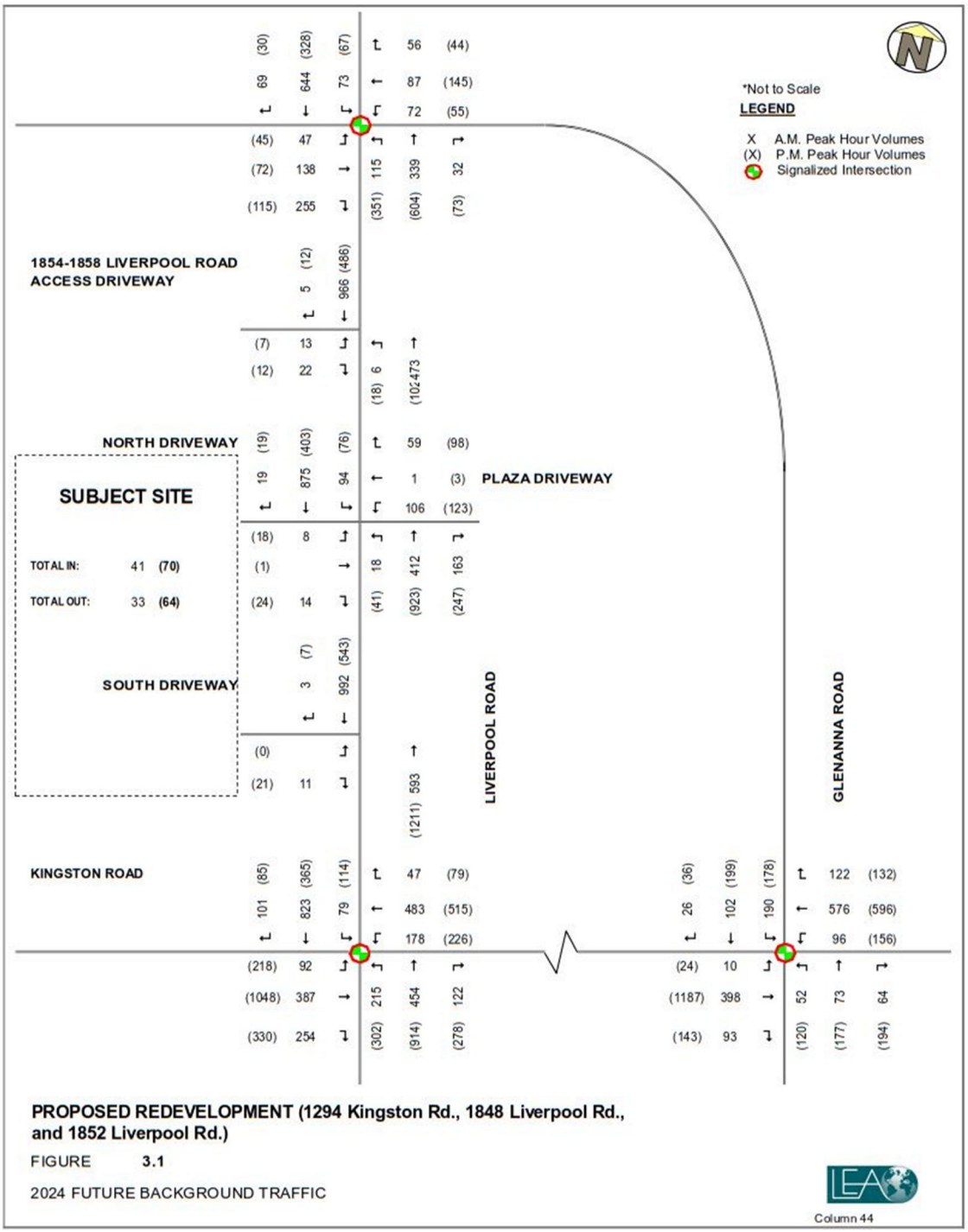


Figure 3.2: 2029 Background Traffic Volumes

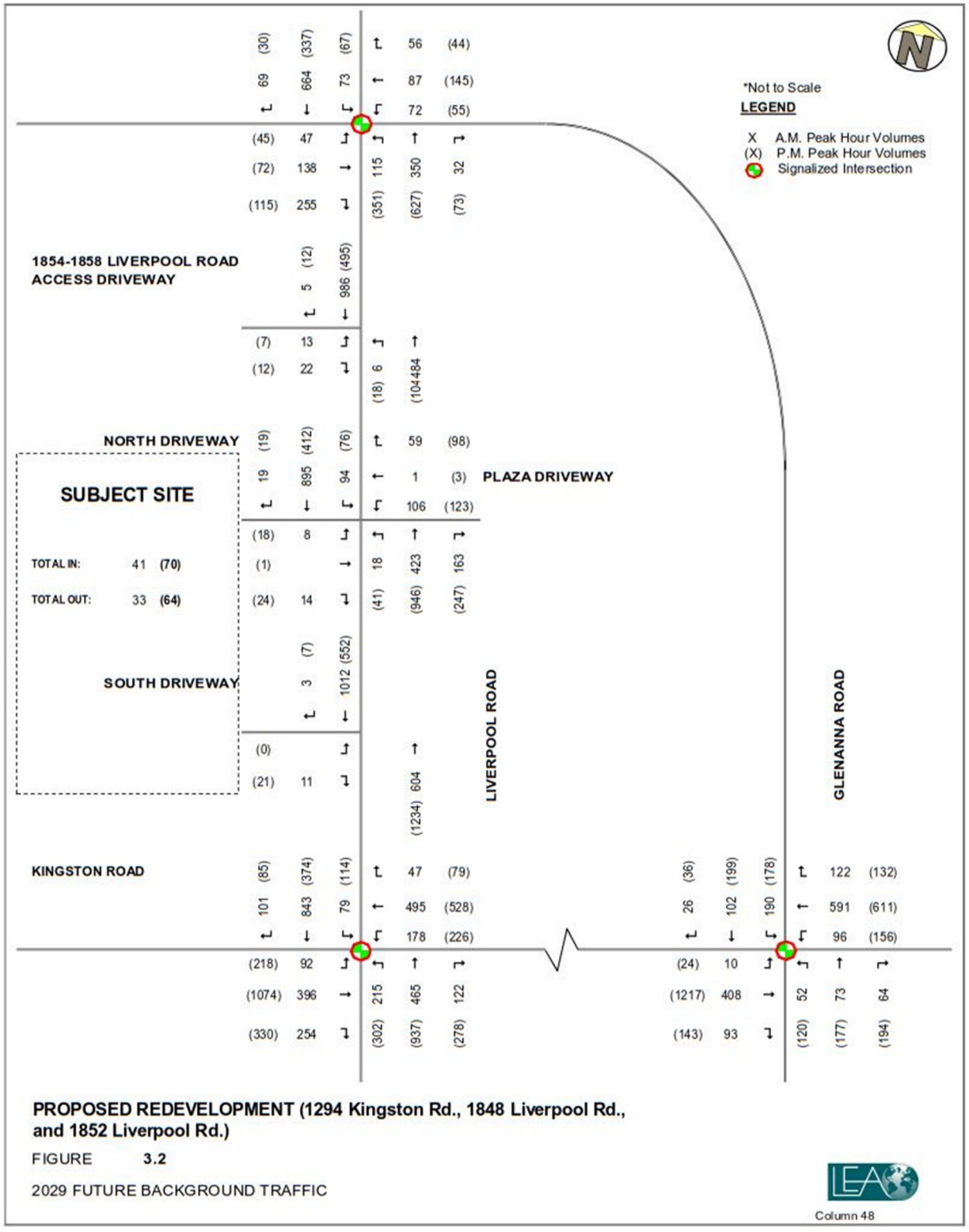


Figure 3.3: 2024 Background Traffic Volumes (One-Access)

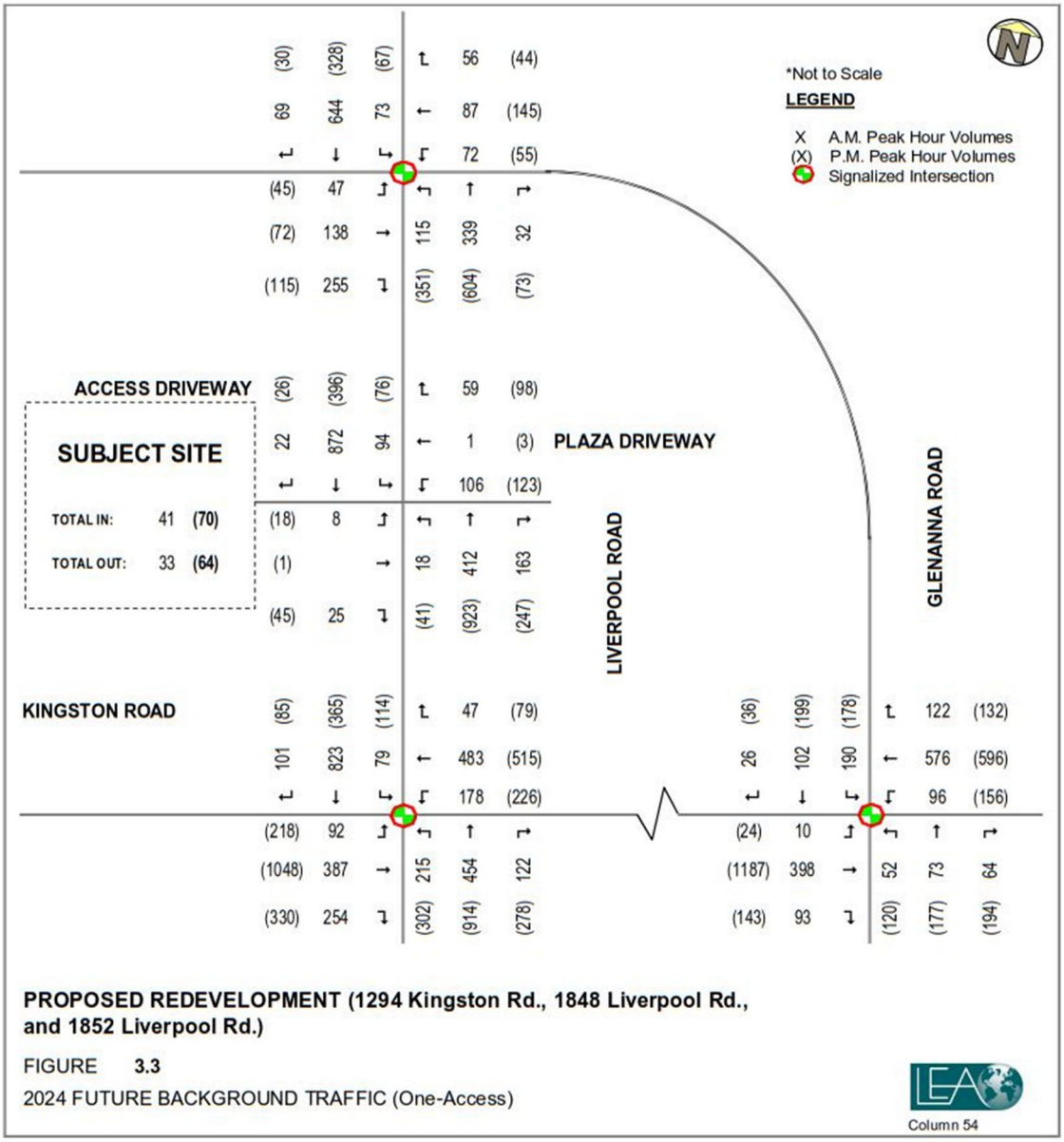
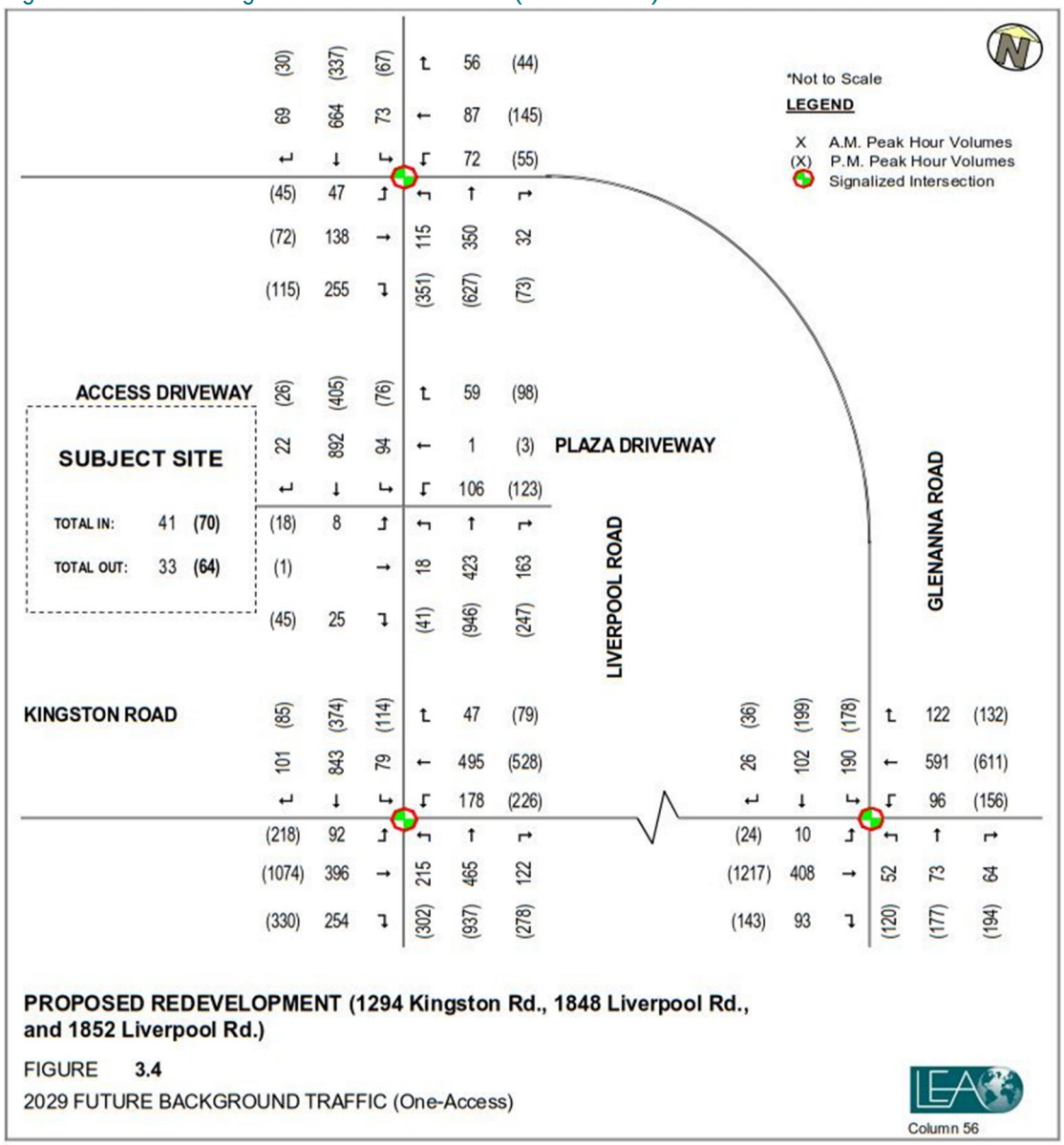


Figure 3.4: 2029 Background Traffic Volumes (One-Access)



3.3 FUTURE BACKGROUND TRAFFIC ANALYSES

The results of the signalized intersection capacity analysis for 2024 are provided in Table 3.4 with detailed outputs found in Appendix D.

Table 3.4: 2024 Background Traffic Conditions – Signalized Intersection Capacity Analysis

Intersection	Weekday AM Peak Hour									Weekday PM Peak Hour								
	Overall			Movement of Interest						Overall			Movement of Interest					
	V/C	Delay (s)	LOS	Move-ment	V/C	Delay (s)	LOS	Queue (m)		V/C	Delay (s)	LOS	Move-ment	V/C	Delay (s)	LOS	Queue (m)	
								50th	95th								50th	95th
Glenanna Road at Kingston Road	0.47	24	C	EBL	0.07	18	B	1	2	0.84	26	C	EBL	0.08	8	A	1	3
				EBT	0.73	30	C	21	24				EBT	0.96	23	C	160	211
				WBL	0.42	25	C	14	22				WBL	0.60	24	C	16	40
				WBT	0.55	28	C	53	61				WBT	0.31	10	A	31	49
				WBR	0.27	25	C	19	29				WBR	0.12	9	A	3	13
				NBL	0.10	16	B	5	13				NBL	0.56	36	D	20	32
				NBT	0.11	20	C	10	26				NBT	0.59	46	D	37	55
				NBR	0.05	20	B	0	6				NBR	0.17	37	D	1	19
				SBL	0.31	11	B	20	49				SBL	0.74	47	D	35	42
				SBT	0.14	15	B	18	34				SBT	0.69	53	D	44	65
				SBR	0.02	16	B	0	2				SBR	0.03	35	C	0	0
Liverpool Road at Kingston Road	0.81	36	D	EBL	0.43	28	C	13	23	0.98	45	D	EBL	0.57	19	B	25	41
				EBT	0.54	36	D	39	51				EBT	0.95	49	D	118	164
				EBR	0.81	55	D	52	79				EBR	0.74	39	D	64	103
				WBL	0.56	59	E	39	61				WBL	0.98	85	F	41	82
				WBT	0.64	65	E	60	77				WBT	0.49	40	D	62	77
				WBR	0.14	57	E	11	23				WBR	0.18	36	D	15	29
				NBL	0.76	27	C	26	72				NBL	0.86	42	D	47	85
				NBT	0.36	22	C	39	58				NBT	0.95	52	D	107	150
				NBR	0.10	20	B	0	10				NBR	0.39	28	C	13	41
				SBL	0.21	15	B	8	16				SBL	0.77	55	D	14	34
				SBTR	0.55	23	C	52	70				SBTR	0.42	35	D	26	41
Liverpool Road at Glenanna Road	0.36	19	B	EBL	0.38	41	D	10	20	0.59	12	B	EBL	0.39	40	D	9	20
				EBT	0.60	45	D	29	46				EBT	0.27	37	D	14	26
				EBR	0.41	41	D	10	35				EBR	0.08	36	D	0	15
				WBL	0.56	56	E	17	31				WBL	0.29	26	C	6	22
				WBTR	0.54	56	E	27	46				WBTR	0.67	36	D	21	61
				NBL	0.28	5	A	4	10				NBL	0.57	7	A	19	88
				NBTR	0.16	3	A	6	13				NBTR	0.30	3	A	17	10
				SBL	0.12	4	A	4	11				SBL	0.15	5	A	4	12
				SBTR	0.31	5	A	23	40				SBTR	0.15	5	A	11	20

Similar conditions occur under future traffic conditions as with existing conditions during the AM peak hour. During the PM peak hour, the eastbound through on Kingston Road continues to experience a v/c ratio just below 1.00 with the highest delay time at 50 seconds. The delay to the westbound left at Liverpool Road at Kingston Road decreases to below one and a half minutes and a v/c ratio just under 1.00.

The results of the signalized intersection capacity analysis for 2029 are provided in Table 3.5 with full capacity outputs located in Appendix D.

Table 3.5: 2029 Background Traffic Conditions – Signalized Intersection Capacity Analysis

Intersection	Weekday AM Peak Hour									Weekday PM Peak Hour								
	Overall			Movement of Interest						Overall			Movement of Interest					
	V/C	Delay (s)	LOS	Move-ment	V/C	Delay (s)	LOS	Queue (m)		V/C	Delay (s)	LOS	Move-ment	V/C	Delay (s)	LOS	Queue (m)	
								50th	95th								50th	95th
Glenanna Road at Kingston Road	0.47	24	C	EBL	0.07	18	B	1	2	0.85	27	C	EBL	0.08	8	A	1	2
				EBT	0.73	30	C	21	23				EBT	0.98	25	C	164	212
				WBL	0.42	25	C	14	22				WBL	0.60	25	C	16	40
				WBT	0.56	28	C	55	62				WBT	0.31	10	A	32	51
				WBR	0.27	24	C	19	29				WBR	0.13	9	A	3	13
				NBL	0.10	17	B	5	13				NBL	0.56	36	D	20	32
				NBT	0.11	21	C	10	26				NBT	0.59	46	D	37	55
				NBR	0.05	20	B	0	6				NBR	0.17	37	D	1	19
				SBL	0.32	11	B	20	44				SBL	0.74	48	D	35	41
				SBT	0.14	15	B	18	39				SBT	0.69	53	D	44	67
				SBR	0.02	16	B	0	2				SBR	0.03	35	C	0	1
Liverpool Road at Kingston Road	0.82	36	D	EBL	0.44	28	C	13	23	0.99	47	D	EBL	0.58	19	B	26	41
				EBT	0.55	37	D	40	52				EBT	0.98	54	D	123	170
				EBR	0.81	55	D	52	79				EBR	0.74	39	D	64	103
				WBL	0.57	59	E	40	61				WBL	0.98	85	F	41	83
				WBT	0.65	66	E	62	79				WBT	0.50	41	D	63	79
				WBR	0.14	57	E	11	23				WBR	0.18	36	D	16	30
				NBL	0.77	28	C	26	74				NBL	0.86	43	D	47	86
				NBT	0.37	22	C	40	59				NBT	0.96	52	D	107	150
				NBR	0.10	20	B	0	10				NBR	0.39	28	C	13	41
				SBL	0.21	16	B	8	18				SBL	0.81	62	E	14	38
				SBTR	0.56	24	C	53	76				SBTR	0.43	36	D	27	43
Liverpool Road at Glenanna Road	0.36	18	B	EBL	0.37	41	D	10	20	0.59	12	B	EBL	0.39	40	D	9	20
				EBT	0.60	44	D	29	46				EBT	0.27	27	D	14	26
				EBR	0.45	41	D	12	37				EBR	0.08	36	D	0	15
				WBL	0.55	53	D	17	28				WBL	0.29	27	C	6	23
				WBTR	0.53	54	D	27	42				WBTR	0.67	36	D	29	61
				NBL	0.28	5	A	4	10				NBL	0.58	8	A	19	86
				NBTR	0.17	9	A	6	12				NBTR	0.31	3	A	18	10
				SBL	0.12	4	A	4	11				SBL	0.16	5	A	4	12
				SBTR	0.32	5	A	24	43				SBTR	0.16	5	A	11	21

In 2029, the eastbound movement on Kingston Road approaches capacity with a v/c ratio below 1.00. The westbound left at Liverpool Road at Kingston Road operates with a v/c ratio below 1.00 during the PM peak hour with a delay time about one and a half minutes. Further monitoring of this intersection is recommended.

The unsignalized intersection operations under future background conditions in 2024 and 2029 (assuming two site accesses are maintained) are summarized in Tables 3.6 and 3.7, respectively, below. Detailed outputs can be found in Appendix D.

Table 3.6: 2024 Future Background Traffic Conditions – Unsignalized Intersection Capacity Analysis

Intersection	Move-ment	Weekday AM Peak Hour						Weekday PM Peak Hour					
		Flow Rate (vph)	Capacity (vph)	Control Delay (s)	Vol/Cap Ratio (v/c)	Queue Length 95th (m)	LOS	Flow Rate (vph)	Capacity (vph)	Control Delay (s)	Vol/Cap Ratio (v/c)	Queue Length 95th (m)	LOS
Liverpool Road at South Site Access	EBR	12	706	10	0.02	0	B	25	879	9	0.03	1	A
Liverpool Road at North Site Access/Plaza Access	EBLTR	24	322	17	0.07	2	C	48	468	14	0.10	3	B
	WBL	115	325	22	0.35	12	C	134	267	31	0.50	21	D
	WBTR	65	883	9	0.07	2	A	108	771	10	0.14	4	B
	NBL	20	734	10	0.03	1	B	62	1102	9	0.06	1	A
	SBL	102	1060	9	0.10	3	A	83	708	11	0.12	3	B

Table 3.7: 2029 Future Background Traffic Conditions – Unsignalized Intersection Capacity Analysis

Intersection	Move-ment	Weekday AM Peak Hour						Weekday PM Peak Hour					
		Flow Rate (vph)	Capacity (vph)	Control Delay (s)	Vol/Cap Ratio (v/c)	Queue Length 95th (m)	LOS	Flow Rate (vph)	Capacity (vph)	Control Delay (s)	Vol/Cap Ratio (v/c)	Queue Length 95th (m)	LOS
Liverpool Road at South Site Access	EBR	12	700	10	0.02	1	B	23	871	9	0.03	1	A
Liverpool Road at North Site Access/Plaza Access	EBLTR	24	318	17	0.08	2	C	47	483	13	0.10	3	B
	WBL	115	324	22	0.36	13	C	134	274	30	0.49	20	D
	WBTR	65	884	9	0.07	2	A	110	744	11	0.15	4	B
	NBL	20	723	10	0.03	1	B	45	1103	8	0.04	1	A
	SBL	102	1053	9	0.10	3	A	83	689	11	0.12	3	B

Good LOS are expected at both intersections. The westbound left movement delay time experiences a minor increase of 2 seconds from the 2024 results, which is not significant.

The results of the signalized intersection capacity analysis for 2024 with the one-access scenario are shown in Table 3.8 with detailed outputs found in Appendix D.

Table 3.8: 2024 Background Traffic Conditions (One-Access) – Signalized Intersection Capacity Analysis

Intersection	Weekday AM Peak Hour									Weekday PM Peak Hour								
	Overall			Movement of Interest						Overall			Movement of Interest					
	V/C	Delay (s)	LOS	Move-ment	V/C	Delay (s)	LOS	Queue (m)		V/C	Delay (s)	LOS	Move-ment	V/C	Delay (s)	LOS	Queue (m)	
								50th	95th								50th	95th
Glenanna Road at Kingston Road	0.47	24	C	EBL	0.07	18.0	B	1	2	0.84	26	C	EBL	0.08	8.0	A	1	3
				EBT	0.73	30.0	C	21	24				EBT	0.96	23.0	C	158	218
				WBL	0.42	25.0	C	14	22				WBL	0.60	24.0	C	16	40
				WBT	0.55	28.0	C	53	61				WBT	0.31	10.0	A	31	49
				WBR	0.27	25.0	C	19	29				WBR	0.12	9.0	A	3	13
				NBL	0.10	16.0	B	5	13				NBL	0.56	36.0	D	20	32
				NBT	0.11	20.0	C	10	26				NBT	0.59	46.0	D	37	55
				NBR	0.05	20.0	B	0	6				NBR	0.17	37.0	D	1	19
				SBL	0.31	11.0	B	20	49				SBL	0.74	47.0	D	34	42
				SBT	0.14	15.0	B	18	34				SBT	0.69	53.0	D	44	65
				SBR	0.02	16.0	B	0	2				SBR	0.03	35.0	C	0	1
Liverpool Road at Kingston Road	0.77	36	D	EBL	0.35	26.0	C	12	21	0.97	45	D	EBL	0.57	19.0	B	26	41
				EBT	0.54	36.0	D	39	51				EBT	0.95	49.0	D	118	164
				EBR	0.81	55.0	D	52	79				EBR	0.74	39.0	D	64	103
				WBL	0.56	56.0	E	39	61				WBL	0.96	79.0	E	41	83
				WBT	0.59	62.0	E	60	77				WBT	0.48	40.0	D	62	77
				WBR	0.13	55.0	D	11	23				WBR	0.18	35.0	D	16	29
				NBL	0.75	26.0	C	26	68				NBL	0.86	42.0	D	47	85
				NBT	0.36	22.0	C	39	58				NBT	0.94	50.0	D	103	144
				NBR	0.10	20.0	B	0	13				NBR	0.39	29.0	C	12	39
				SBL	0.21	17.0	B	8	16				SBL	0.81	62.0	E	14	37
				SBT	0.58	26.0	C	56	76				SBT	0.42	35.0	D	26	41
Liverpool Road at Glenanna Road	0.36	19	B	SBR	0.38	41.0	D	10	20	0.59	12	B	SBR	0.39	40.0	D	9	20
				EBL	0.60	45.0	D	29	46				EBL	0.27	37.0	D	14	26
				EBT	0.41	41.0	D	10	35				EBT	0.08	36.0	D	0	15
				EBR	0.56	56.0	E	17	31				EBR	0.29	26.0	C	6	22
				WBL	0.54	56.0	E	27	46				WBL	0.67	36.0	D	20	61
				WBT	0.28	5.0	A	5	10				WBT	0.57	7.0	A	14	77
				NBL	0.16	3.0	A	6	12				NBL	0.30	3.0	A	13	8
				NBTR	0.12	4.0	A	4	11				NBTR	0.15	5.0	A	4	12
				SBL	0.31	5.0	A	23	40				SBL	0.15	5.0	A	11	20

Similar conditions occur under future traffic conditions as with existing conditions during the AM peak hour. During the PM peak hour, the eastbound through on Kingston Road continues to experience a v/c ratio below 1.00 with a maximum delay time of about 50 seconds. The westbound left movement delay at Liverpool Road at Kingston Road is about 80 seconds with a v/c ratio under 1.00.

The results of the signalized intersection capacity analysis for 2029 for one-access scenario are provided in Table 3.9 with full capacity outputs located in Appendix D.

Table 3.9: 2029 Background Traffic Conditions (One-Access) – Signalized Intersection Capacity Analysis

Intersection	Weekday AM Peak Hour									Weekday PM Peak Hour								
	Overall			Movement of Interest						Overall			Movement of Interest					
	V/C	Delay (s)	LOS	Move-ment	V/C	Delay (s)	LOS	Queue (m)		V/C	Delay (s)	LOS	Move-ment	V/C	Delay (s)	LOS	Queue (m)	
								50th	95th								50th	95th
Glenanna Road at Kingston Road	0.47	24	C	EBL	0.07	18	B	1	2	0.85	27	C	EBL	0.08	8	A	1	3
				EBT	0.73	30	C	21	24				EBT	0.98	27	C	162	219
				WBL	0.42	25	C	14	22				WBL	0.60	25	C	16	40
				WBT	0.56	28	C	55	62				WBT	0.31	10	A	32	51
				WBR	0.27	24	C	19	29				WBR	0.13	9	A	3	13
				NBL	0.11	17	B	5	13				NBL	0.56	36	D	20	32
				NBT	0.11	21	C	10	26				NBT	0.59	46	D	37	55
				NBR	0.05	20	B	0	6				NBR	0.17	37	D	1	19
				SBL	0.32	11	B	20	45				SBL	0.74	47	D	34	41
				SBT	0.14	15	B	18	34				SBT	0.69	53	D	44	67
				SBR	0.02	16	B	0	2				SBR	0.03	35	C	0	2
Liverpool Road at Kingston Road	0.77	36	D	EBL	0.36	26	C	12	21	0.99	47	D	EBL	0.58	19	B	26	41
				EBT	0.55	37	D	40	52				EBT	0.98	54	D	123	170
				EBR	0.81	55	D	52	79				EBR	0.74	39	D	64	103
				WBL	0.57	56	E	40	61				WBL	0.98	85	F	41	83
				WBT	0.60	62	E	61	79				WBT	0.50	41	D	63	79
				WBR	0.13	55	D	11	23				WBR	0.18	36	D	16	30
				NBL	0.75	26	C	26	70				NBL	0.86	43	D	47	86
				NBT	0.37	22	C	40	59				NBT	0.96	52	D	107	150
				NBR	0.10	20	B	0	13				NBR	0.39	28	C	13	41
				SBL	0.22	18	B	8	18				SBL	0.81	62	E	14	38
				SBT	0.60	27	C	58	82				SBT	0.43	35	D	27	43
Liverpool Road at Glenanna Road	0.36	18	B	SBR	0.37	41	D	10	20	0.59	12	B	SBR	0.39	40	D	9	20
				EBL	0.60	44	D	29	46				EBL	0.27	37	D	14	26
				EBT	0.45	41	D	12	37				EBT	0.08	36	D	0	15
				EBR	0.55	53	D	17	29				EBR	0.29	27	C	7	23
				WBL	0.53	54	D	27	42				WBL	0.67	37	D	37	60
				WBT	0.28	5	A	5	10				WBT	0.58	7	A	11	76
				NBL	0.17	3	A	6	12				NBL	0.31	3	A	11	15
				NBTR	0.12	4	A	4	11				NBTR	0.16	5	A	4	12
				SBL	0.32	5	A	24	43				SBL	0.16	5	A	11	21

For the analysis year 2029, the eastbound through on Kingston Road operates at below capacity with a v/c ratio below 1.00 during the PM peak hour. The westbound left at Liverpool Road at Kingston Road operates with a delay time just under about one and a half minutes, and with a v/c ratio below 1.00.

Unsignalized levels of service for the future background conditions in 2024 and 2029 with one site access scenario access are summarized in Table 3.10 and 3.11, respectively. Detailed capacity outputs can be found in Appendix D.

Table 3.10: 2024 Future Background Traffic Conditions (One-Access) – Unsignalized Intersection Capacity Analysis

Intersection	Move-ment	Weekday AM Peak Hour						Weekday PM Peak Hour					
		Flow Rate (vph)	Capacity (vph)	Control Delay (s)	Vol/Cap Ratio (v/c)	Queue Length 95th (m)	LOS	Flow Rate (vph)	Capacity (vph)	Control Delay (s)	Vol/Cap Ratio (v/c)	Queue Length 95th (m)	LOS
Liverpool Road at North Site Access/Plaza Access	EBLTR	36	367	15.9	0.10	2.6	C	70	560	12.3	0.12	3.4	B
	WBL	115	313	23.0	0.37	13.1	C	134	274	30.1	0.49	20.1	D
	WBTR	65	883	9.4	0.07	1.9	A	110	751	10.6	0.15	4.1	B
	NBL	20	734	10.0	0.03	0.7	B	45	1114	8.4	0.04	1.0	A
	SBL	102	1060	8.8	0.10	2.5	A	83	704	10.8	0.12	3.2	B

Table 3.11: 2029 Future Background Traffic Conditions (One-Access) – Unsignalized Intersection Capacity Analysis

Intersection	Move-ment	Weekday AM Peak Hour						Weekday PM Peak Hour					
		Flow Rate (vph)	Capacity (vph)	Control Delay (s)	Vol/Cap Ratio (v/c)	Queue Length 95th (m)	LOS	Flow Rate (vph)	Capacity (vph)	Control Delay (s)	Vol/Cap Ratio (v/c)	Queue Length 95th (m)	LOS
Liverpool Road at North Site Access/Plaza Access	EBLTR	36	363	16.0	0.10	2.6	C	70	553	12.5	0.13	3.5	B
	WBL	115	312	23.1	0.37	13.1	C	134	267	31.3	0.50	20.9	D
	WBTR	65	884	9.4	0.07	1.9	A	110	744	10.7	0.15	4.1	B
	NBL	20	723	10.1	0.03	0.7	B	45	1104	8.4	0.04	1.0	A
	SBL	102	1053	8.8	0.10	2.6	A	83	689	10.9	0.12	3.3	B

Good LOS are expected at both intersections. The westbound left movement delay time experiences a minor increase of 3 seconds in comparison to the 2024 results.

4 SITE-GENERATED TRAFFIC VOLUMES

4.1 TRIP GENERATION

The subject site is proposed to be redeveloped with a mixed-use development that incorporates a 25-storey tower, a 12-storey midrise building, and a row of 3-storey townhouses. Active at-grade retail and commercial uses make up 850 m^2 along the Liverpool and Kingston Road frontages of the new buildings and the retained Old Liverpool House. A total gross floor area of 33,200 m^2 is proposed at a density of 3.6 FSI over the subject site. The detailed building statistics are summarized in Table 4.1.

Table 4-1: Subject Site Building Statistics

Buildings	Retail GFA (m^2)	Number of Residential Units
Block Townhouses (including at-grade units in Building A)	--	18
Building A Apartment Units	--	119
Building B Apartment Units	--	254
Building B at-grade Retail	430	--
Retained Old Liverpool House (Retail)	420	--
TOTAL	**850**	**391**

Trip generation for the 18 townhouse units was calculated based on the 10th Edition Institute of Transportation Engineers Multifamily Housing (Low Rise) Land use Code 220. Trip generation for the 373 condominium units was calculated based on the 10th Edition ITE Multifamily Housing (High Rise) Land use Code 222. Trip generation for the site retail was generated by applying the ITE 10th edition Shopping Center (Land Use Code 820).

Typically, pass-by traffic occurs with retail land uses. The site layout features 10 at-grade parking stalls west of Building A, including 2 accessible stalls. These surface parking stalls are located at the rear of the site. All other on-site parking is underground and therefore not visible by traffic. Therefore, it is our opinion that the subject site would not generate any pass-by traffic.

The mix of residential and retail use is subject to site interaction traffic. We applied the interaction rates specified in Tables 7.1 and 7.2 in the 2nd Edition of the ITE Trip Generation Handbook (see Appendix E). Total proposed development generates about 120-160 of net peak hour two-way trips. Table 4.2 summarizes the site trip generation values.

Table 4-2: Site Trip Generation

Land Use	Number of Units	Size (m^2)	AM Peak Hour			PM Peak Hour		
			In	Out	Total	In	Out	Total
Block Townhouse	18		2	7	9	8	5	13
Apartment	373		28	89	117	82	53	135
Retail		850 m^2	6	3	9	17	19	36
Site Interaction	-		-1	-1	-2	-4	-4	-8
Transit Reduction (10%)	-		-3	-10	-13	-9	-6	-15
Total	***391***	***850***	***32***	***88***	***120***	***94***	***67***	***161***

4.2 TRIP DISTRIBUTION

Existing site trips were removed from the analysis and the site distribution of residential site trips was estimated using the 2016 Transportation Tomorrow Survey (TTS) data. The residential site traffic distribution is summarized in Exhibit 3 of Appendix E and summarized in Table 4.3.

Table 4.3: Subject Site Trip Distribution

Direction	To/From
North	38%
South	58%
East	1%
West	3%

For the future retail site traffic, we applied the existing peak hour site traffic distribution. More information will be provided in the following section.

4.3 TRIP ASSIGNMENT

This study reviews the impact of the future development with one site access and two site accesses. The two-access scenario retains the existing site access configuration except the south driveway permits only right-in/right-out movement. The one-access scenario retains only the northern access driveway and was included in the analysis at the request of Region staff. The overall net site traffic volume for the two-access and one-access scenarios are illustrated in Figures 4.1 and 4.2, respectively. For details of the site traffic and distribution for the different uses, please refer to Appendix E.

Figure 4.1: Net Site Traffic Volumes

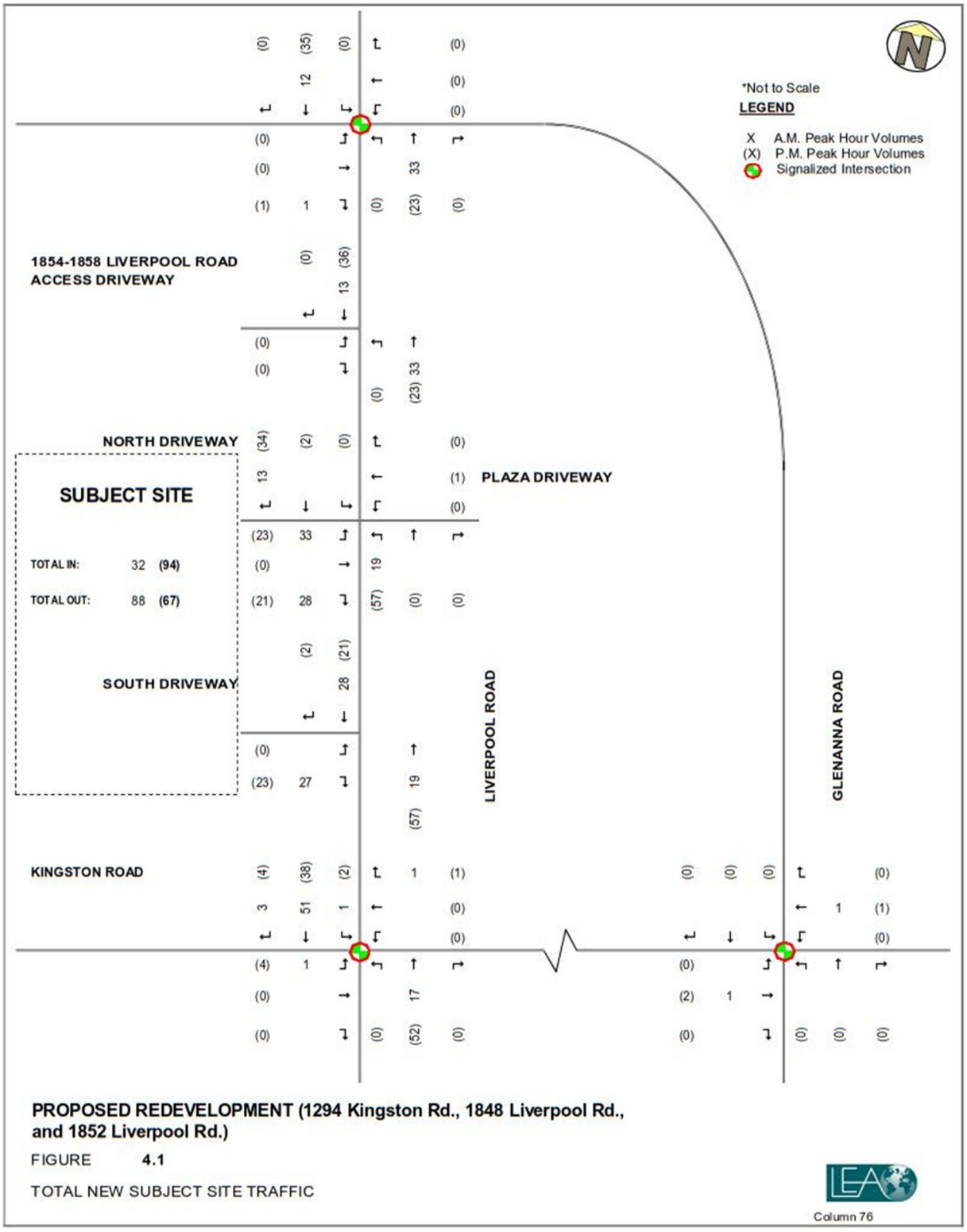
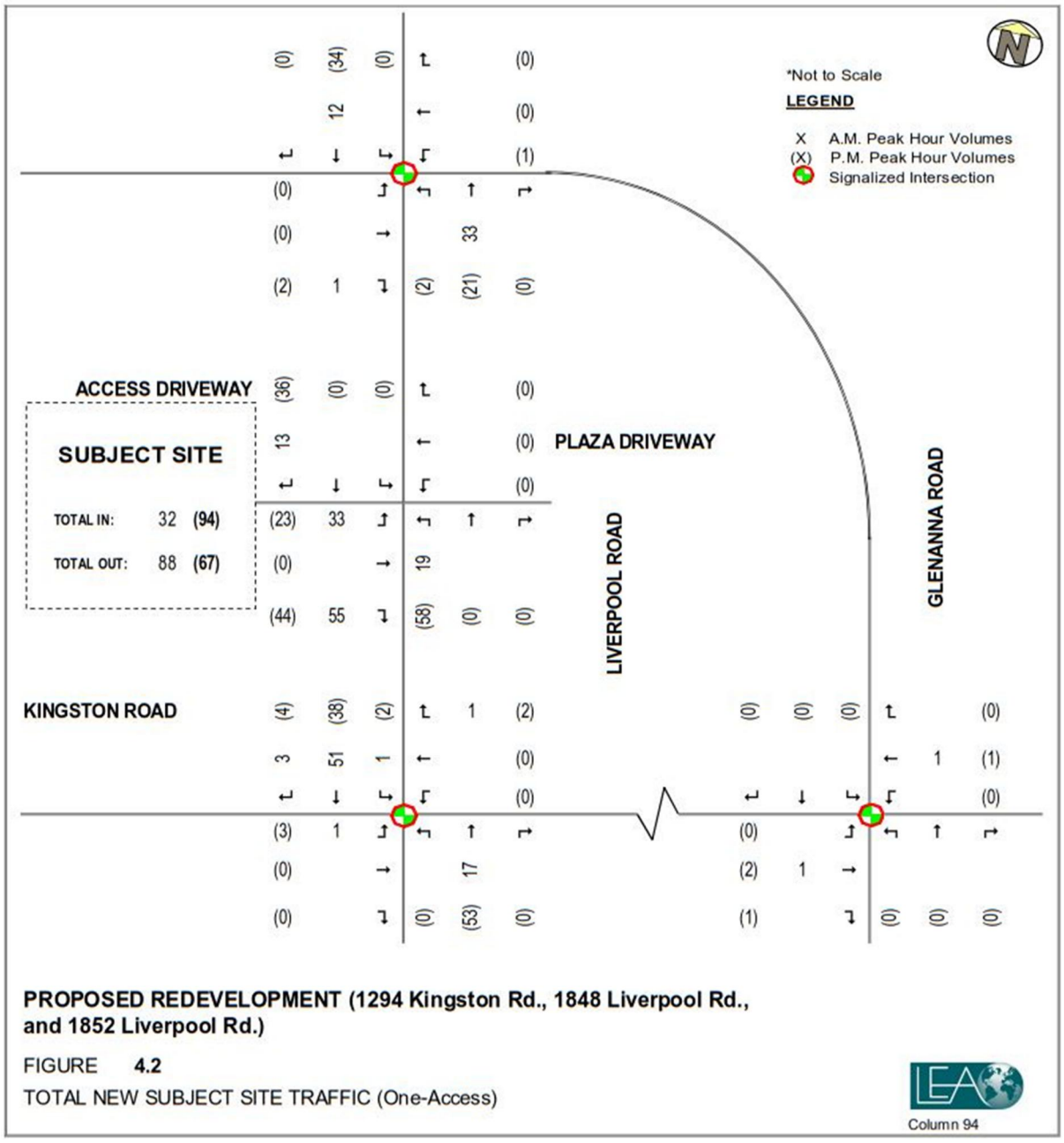


Figure 4.2: Net Site Traffic Volumes (One-Access)



5 FUTURE TOTAL TRANSPORTATION CONDITIONS

5.1 FUTURE TOTAL INTERSECTION CAPACITY ANALYSIS

Future total traffic volumes are the sum of total future background traffic plus future site traffic minus existing site traffic. Future total traffic volumes for 2024 and 2029 are shown in Figures 5.1 and 5.2, respectively.

Figure 5.1: 2024 Future Total Traffic

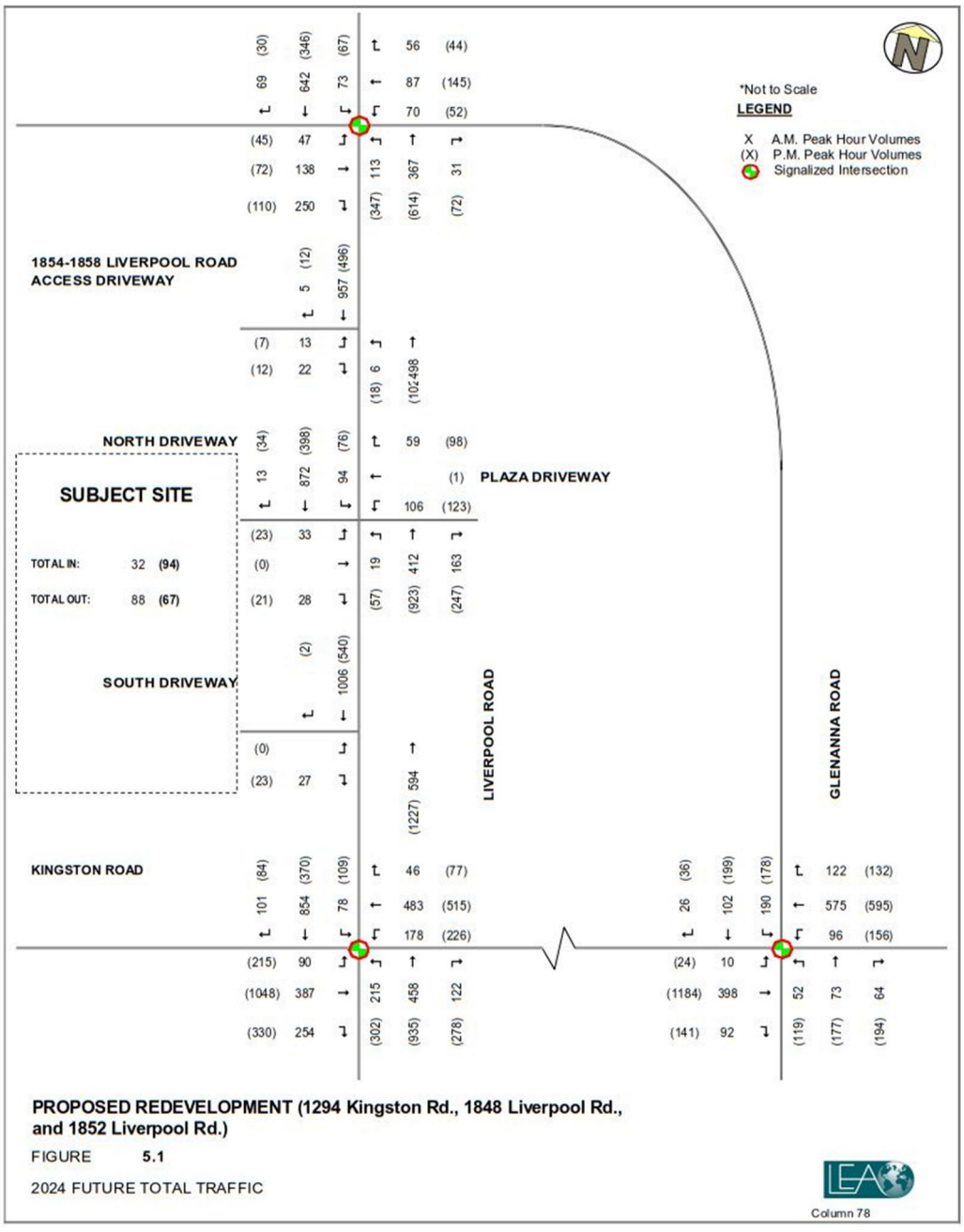


Figure 5.2: 2029 Future Total Traffic

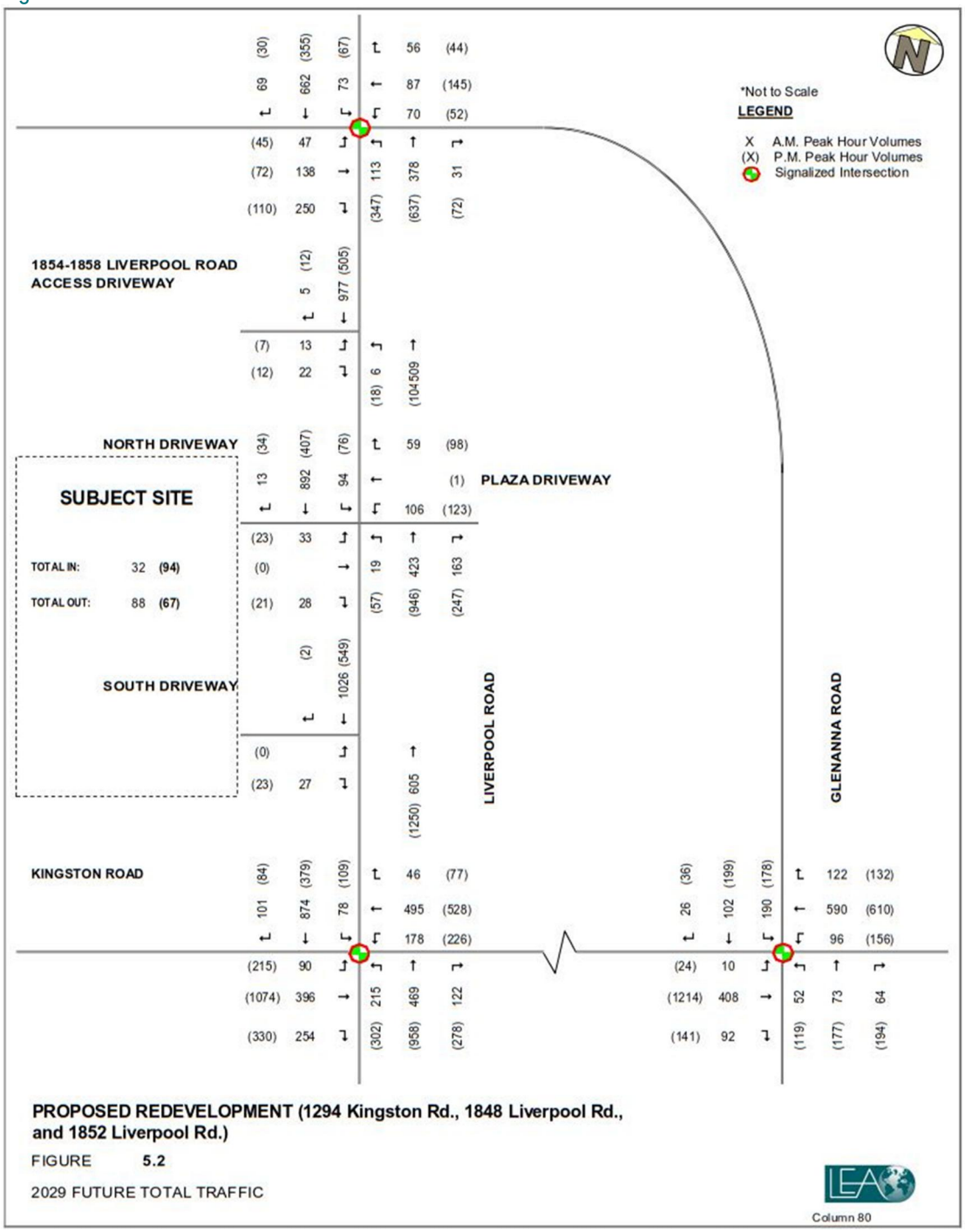


Table 5.1 summarizes the signalized intersection capacity analysis in 2024 with more detailed outputs found in Appendix F.

Table 5.1: 2024 Future Total Conditions – Signalized Intersection Capacity Analysis

Intersection	Weekday AM Peak Hour									Weekday PM Peak Hour								
	Overall			Movement of Interest						Overall			Movement of Interest					
	V/C	Delay (s)	LOS	Move-ment	V/C	Delay (s)	LOS	Queue (m)		V/C	Delay (s)	LOS	Move-ment	V/C	Delay (s)	LOS	Queue (m)	
								50th	95th								50th	95th
Glenanna Road at Kingston Road	0.47	24	C	EBL	0.07	18	B	1	2	0.84	26	C	EBL	0.08	8	A	1	3
				EBT	0.73	30	C	21	24				EBT	0.95	23	C	158	217
				WBL	0.42	26	C	14	22				WBL	0.60	24	C	16	40
				WBT	0.55	28	C	53	61				WBT	0.31	10	A	31	49
				WBR	0.27	25	C	19	30				WBR	0.12	9	A	3	13
				NBL	0.10	16	B	5	13				NBL	0.56	35	D	20	332
				NBT	0.11	20	C	10	26				NBT	0.59	46	D	37	55
				NBR	0.05	20	B	0	6				NBR	0.17	37	D	1	19
				SBL	0.31	11	B	19	50				SBL	0.74	48	D	34	41
				SBT	0.14	15	B	18	34				SBT	0.69	53	D	44	67
				SBR	0.02	16	B	0	2				SBR	0.03	35	C	0	2
Liverpool Road at Kingston Road	0.77	36	D	EBL	0.35	26	C	12	21	0.98	45	D	EBL	0.57	19	B	25	41
				EBT	0.54	36	D	39	51				EBT	0.95	49	D	118	164
				EBR	0.81	55	D	52	79				EBR	0.74	39	D	64	103
				WBL	0.56	56	E	39	61				WBL	0.98	85	F	41	82
				WBT	0.59	62	E	60	77				WBT	0.49	40	D	62	77
				WBR	0.13	55	D	11	23				WBR	0.18	36	D	15	29
				NBL	0.76	27	C	26	71				NBL	0.84	40	D	47	83
				NBT	0.36	22	C	39	58				NBT	0.95	52	D	107	150
				NBR	0.10	19	B	0	13				NBR	0.39	28	C	13	41
				SBL	0.21	16	B	8	15				SBL	0.77	56	E	14	34
				SBTR	0.60	26	C	61	77				SBTR	0.44	36	D	27	43
Liverpool Road at Glenanna Road	0.35	18	B	EBL	0.38	41	D	10	20	0.59	12	B	EBL	0.39	40	D	9	20
				EBT	0.60	45	D	29	47				EBT	0.27	37	D	14	26
				EBR	0.38	40	D	9	34				EBR	0.08	36	D	0	14
				WBL	0.54	56	E	16	32				WBL	0.28	26	C	5	22
				WBTR	0.54	58	E	27	49				WBTR	0.67	36	D	22	61
				NBL	0.27	5	A	5	11				NBL	0.57	8	A	13	75
				NBTR	0.17	3	A	7	14				NBTR	0.30	3	A	12	14
				SBL	0.12	4	A	4	11				SBL	0.16	5	A	4	12
				SBTR	0.31	5	A	23	39				SBTR	0.16	5	A	12	21

The subject site traffic presents minimal impacts to the road network from future background conditions. Acceptable LOS continue to occur at all intersections during the AM peak hour. During the PM peak hours, the largest increase in delay time occurs for the southbound left at the Liverpool Road and Kingston Road intersection by only 2 seconds when compared to future background conditions. The eastbound through movements on Kingston Road operate at under capacity.

Table 5.2 summarizes the signalized intersection capacity analysis with 2 site access points in 2029 with more detailed outputs found in Appendix F.

Table 5.2: 2029 Future Total Conditions – Signalized Intersection Capacity Analysis

Intersection	Weekday AM Peak Hour									Weekday PM Peak Hour								
	Overall			Movement of Interest						Overall			Movement of Interest					
	V/C	Delay (s)	LOS	Move-ment	V/C	Delay (s)	LOS	Queue (m)		V/C	Delay (s)	LOS	Move-ment	V/C	Delay (s)	LOS	Queue (m)	
								50th	95th								50th	95th
Glenanna Road at Kingston Road	0.47	24	C	EBL	0.07	18	B	1	2	0.85	27	C	EBL	0.08	8	A	1	3
				EBT	0.73	30	C	21	24				EBT	0.98	26	C	162	218
				WBL	0.42	25	C	14	22				WBL	0.60	25	C	16	40
				WBT	0.56	28	C	55	62				WBT	0.31	10	A	32	51
				WBR	0.27	24	C	19	29				WBR	0.13	9	A	3	13
				NBL	0.11	17	B	5	13				NBL	0.56	35	D	20	32
				NBT	0.11	21	C	10	26				NBT	0.59	46	D	37	55
				NBR	0.05	20	B	0	6				NBR	0.17	37	D	1	19
				SBL	0.32	11	B	20	49				SBL	0.74	48	D	34	41
				SBT	0.14	15	B	18	34				SBT	0.69	53	D	44	67
				SBR	0.02	16	B	0	2				SBR	0.03	35	C	0	2
Liverpool Road at Kingston Road	0.78	36	D	EBL	0.35	26	C	12	21	1.00	47	D	EBL	0.57	19	B	25	41
				EBT	0.55	37	D	40	52				EBT	0.98	54	D	123	170
				EBR	0.81	55	D	52	79				EBR	0.74	39	D	64	103
				WBL	0.57	56	E	40	61				WBL	0.98	85	F	41	83
				WBT	0.60	62	E	61	79				WBT	0.50	41	D	63	79
				WBR	0.13	55	D	11	23				WBR	0.18	36	D	15	29
				NBL	0.76	28	C	26	73				NBL	0.86	43	D	47	86
				NBT	0.37	22	C	40	60				NBT	0.98	57	E	110	155
				NBR	0.10	19	B	0	13				NBR	0.40	29	C	14	42
				SBL	0.22	17	B	7	17				SBL	0.77	56	E	14	35
				SBTR	0.62	27	C	62	82				SBTR	0.43	35	D	27	44
Liverpool Road at Glenanna Road	0.36	18	B	EBL	0.38	41	D	10	20	0.60	12	B	EBL	0.39	40	D	9	20
				EBT	0.60	44	D	29	46				EBT	0.27	37	D	14	26
				EBR	0.42	41	D	11	36				EBR	0.08	36	D	0	14
				WBL	0.54	54	D	16	30				WBL	0.28	27	C	6	22
				WBTR	0.53	56	E	27	45				WBTR	0.67	37	D	32	61
				NBL	0.28	5	A	5	10				NBL	0.58	8	A	12	74
				NBTR	0.18	3	A	7	13				NBTR	0.31	3	A	11	15
				SBL	0.13	4	A	4	11				SBL	0.16	5	A	4	12
				SBTR	0.32	5	A	24	42				SBTR	0.16	5	A	12	22

Results generally indicate minimal impact at all signalized intersections in the study area. Only the northbound through movement at the Liverpool Road and Kingston Road intersection exhibits a notable increase in delay time of about 5 seconds during the PM peak hour. The westbound left movement at this intersection operates with a v/c ratio of 0.92 without an increase in delay time. The eastbound movement at this intersection and the Glenanna Road intersection still operates with a v/c ratio just under 1.00 but exhibits a delay time of 54 seconds or less. Consequently, it is recommended that the optimized signal timing plan be further reviewed and revised accordingly to ensure acceptable LOS.

5.2 FUTURE TOTAL INTERSECTION CAPACITY ANALYSIS – ONE-ACCESS SCENARIO

An alternative analysis was performed with all site access conducted at the existing north site access point. Figures 5.3 and 5.4 show the future total traffic volume for 2024 and 2029, respectively.

Figure 5.3: 2024 Future Total Traffic (One-Access)

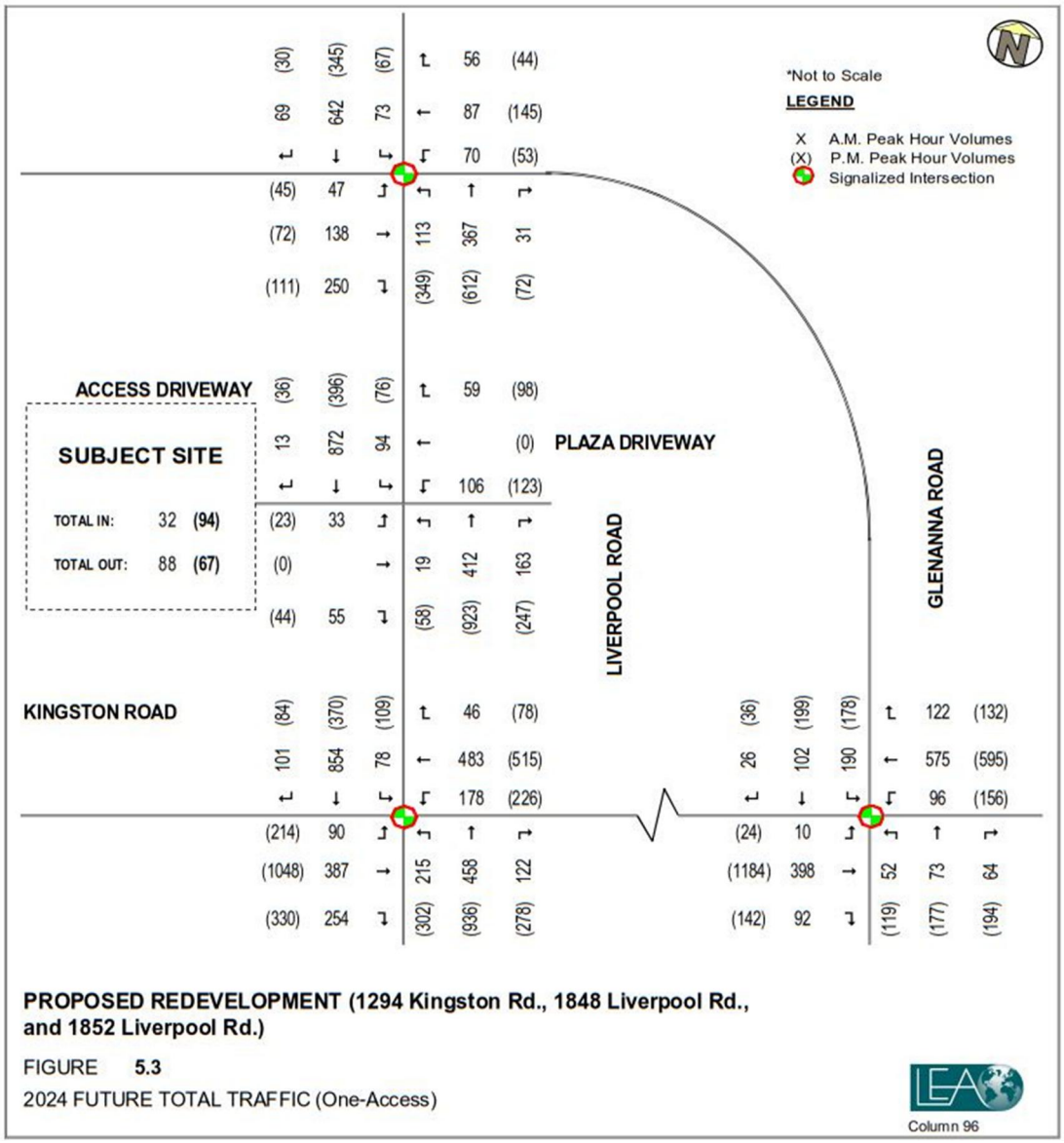


Figure 5.4: 2029 Future Total Traffic (One-Access)

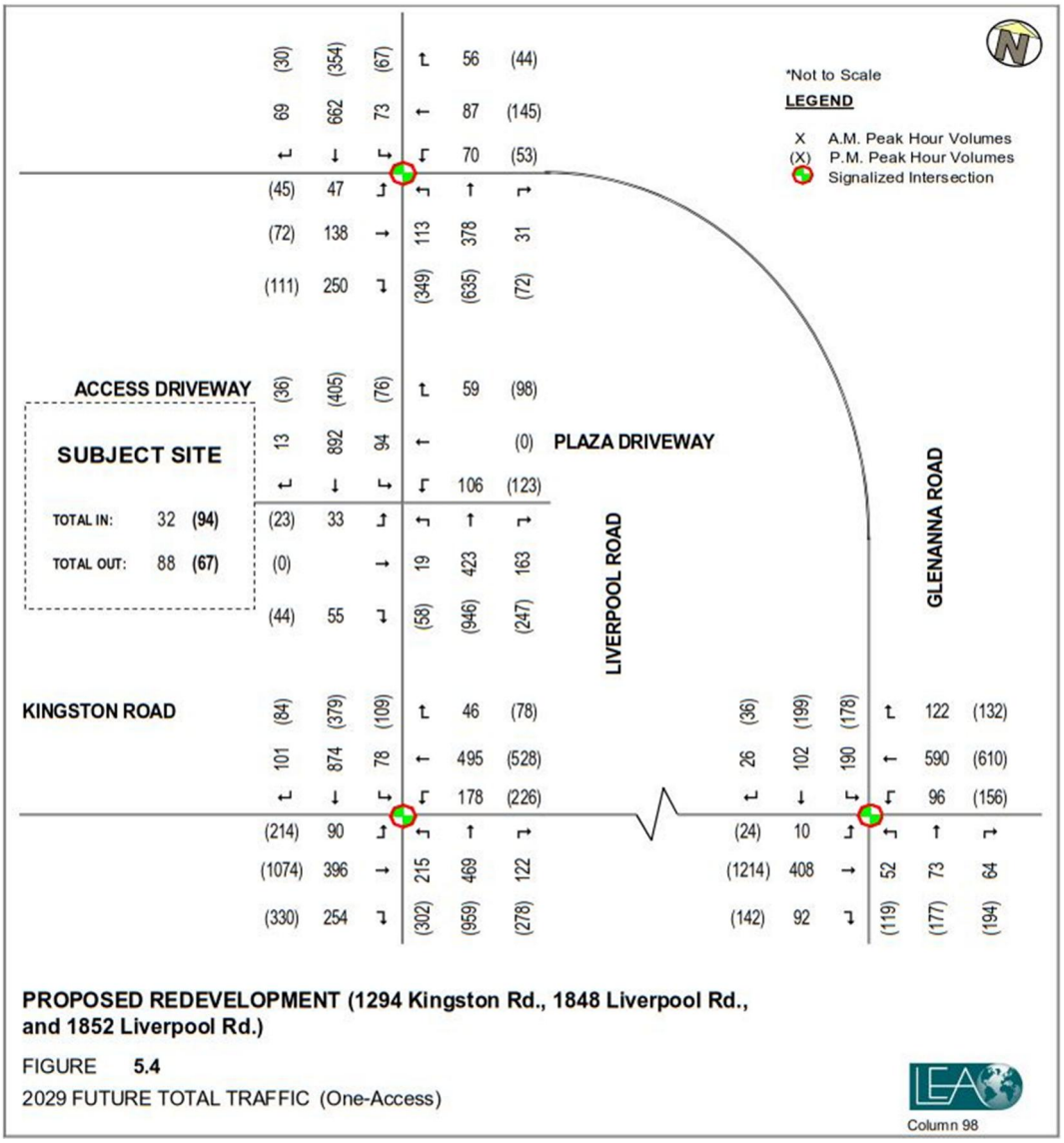


Table 5.3 summarizes the signalized intersection capacity analysis with one-access in 2024 with more detailed outputs found in Appendix F.

Table 5.3: 2024 Future Total Conditions (One-Access) – Signalized Intersection Capacity Analysis

Intersection	Weekday AM Peak Hour									Weekday PM Peak Hour								
	Overall			Movement of Interest				Queue (m)		Overall			Movement of Interest				Queue (m)	
	V/C	Delay (s)	LOS	Move-ment	V/C	Delay (s)	LOS	50th	95th	V/C	Delay (s)	LOS	Move-ment	V/C	Delay (s)	LOS	50th	95th
Glenanna Road at Kingston Road	0.47	24	C	EBL	0.07	18	B	1	2	0.84	26	C	EBL	0.08	8	A	1	3
				EBT	0.73	30	C	21	24				EBT	0.96	23	C	158	217
				WBL	0.42	26	C	14	22				WBL	0.60	24	C	16	40
				WBT	0.55	28	C	53	61				WBT	0.31	10	A	31	49
				WBR	0.27	25	C	19	30				WBR	0.12	9	A	3	13
				NBL	0.10	16	B	5	13				NBL	0.56	35	D	20	32
				NBT	0.11	20	C	10	26				NBT	0.59	46	D	37	55
				NBR	0.05	20	B	0	6				NBR	0.17	37	D	1	19
				SBL	0.31	11	B	19	50				SBL	0.74	48	D	34	41
				SBT	0.14	15	B	18	34				SBT	0.69	53	D	44	67
				SBR	0.02	16	B	0	2				SBR	0.03	35	C	0	2
Liverpool Road at Glenanna Road	0.77	36	D	EBL	0.35	26	C	12	21	0.98	45	D	EBL	0.56	19	B	25	41
				EBT	0.54	36	D	39	51				EBT	0.95	49	D	118	164
				EBR	0.81	55	D	52	79				EBR	0.74	39	D	64	103
				WBL	0.56	56	E	39	61				WBL	0.98	85	F	41	83
				WBT	0.59	62	E	60	77				WBT	0.49	40	D	62	77
				WBR	0.13	55	D	11	23				WBR	0.18	36	D	15	29
				NBL	0.76	27	C	26	71				NBL	0.86	42	D	47	85
				NBT	0.36	22	C	39	58				NBT	0.96	52	D	107	150
				NBR	0.10	19	B	0	13				NBR	0.39	28	C	13	41
				SBL	0.21	16	B	8	15				SBL	0.77	56	E	14	34
				SBTR	0.60	26	C	61	77				SBTR	0.42	35	D	26	43
Liverpool Road at Glenanna Road	0.35	18	B	EBL	0.38	41	D	10	20	0.59	12	B	EBL	0.39	40	D	9	20
				EBT	0.60	45	D	29	47				EBT	0.27	37	D	14	26
				EBR	0.38	40	D	9	34				EBR	0.08	36	D	0	15
				WBL	0.54	56	E	16	32				WBL	0.28	26	C	5	23
				WBTR	0.54	58	E	27	49				WBTR	0.67	36	D	24	60
				NBL	0.27	5	A	5	11				NBL	0.58	8	A	13	76
				NBTR	0.17	3	A	7	14				NBTR	0.30	3	A	12	14
				SBL	0.12	4	A	4	11				SBL	0.16	5	A	4	12
				SBTR	0.31	5	A	23	39				SBTR	0.16	5	A	12	21

The future site traffic will result in minimal impacts to the road network from future background conditions. Good LOS still occur at all intersections during the AM peak hour. For the PM peak hour, the increase in delay time is minimal. The eastbound through movement on Kingston Road operates at under capacity.

Table 5.4 summarizes the signalized intersection capacity analysis with 1 site access point in 2029 with more detailed outputs found in Appendix F.

Table 5.4: 2029 Future Total Conditions (One-Access) – Signalized Intersection Capacity Analysis

Intersection	Weekday AM Peak Hour									Weekday PM Peak Hour								
	Overall			Movement of Interest				Queue (m)		Overall			Movement of Interest				Queue (m)	
	V/C	Delay (s)	LOS	Move-ment	V/C	Delay (s)	LOS	50th	95th	V/C	Delay (s)	LOS	Move-ment	V/C	Delay (s)	LOS	50th	95th
Glenanna Road at Kingston Road	0.47	24	C	EBL	0.07	18	B	1	2	0.85	27	C	EBL	0.08	8	A	1	3
				EBT	0.73	30	C	21	24				EBT	0.98	26	C	162	218
				WBL	0.42	25	C	14	22				WBL	0.60	25	C	16	40
				WBT	0.56	28	C	55	62				WBT	0.31	10	A	32	51
				WBR	0.27	24	C	19	29				WBR	0.13	9	A	3	13
				NBL	0.11	17	B	5	13				NBL	0.56	35	D	20	32
				NBT	0.11	21	C	10	26				NBT	0.59	46	D	37	55
				NBR	0.05	20	B	0	6				NBR	0.17	37	D	1	19
				SBL	0.32	11	B	20	49				SBL	0.74	48	D	34	41
				SBT	0.14	15	B	18	34				SBT	0.69	53	D	44	67
				SBR	0.02	16	B	0	2				SBR	0.03	35	C	0	2
Liverpool Road at Glenanna Road	0.78	36	D	EBL	0.35	26	C	12	21	1.00	47	D	EBL	0.57	19	B	25	41
				EBT	0.55	37	D	40	52				EBT	0.98	54	D	123	170
				EBR	0.81	55	D	52	79				EBR	0.74	39	D	64	103
				WBL	0.57	56	E	40	61				WBL	0.98	85	F	41	83
				WBT	0.60	62	E	61	79				WBT	0.50	41	D	63	79
				WBR	0.13	55	D	11	23				WBR	0.18	36	D	16	30
				NBL	0.76	28	C	26	73				NBL	0.86	43	D	47	86
				NBT	0.37	22	C	40	60				NBT	0.98	57	E	110	156
				NBR	0.10	19	B	0	13				NBR	0.40	29	C	14	42
				SBL	0.22	17	B	7	17				SBL	0.77	56	E	14	34
				SBTR	0.62	27	C	62	82				SBTR	0.43	35	D	27	44
Liverpool Road at Glenanna Road	0.36	18	B	EBL	0.38	41	D	10	20	0.60	12	B	EBL	0.39	40	D	9	20
				EBT	0.60	44	D	29	46				EBT	0.27	37	D	14	26
				EBR	0.42	41	D	11	36				EBR	0.08	36	D	0	15
				WBL	0.54	54	D	16	30				WBL	0.28	27	C	6	23
				WBTR	0.53	56	E	27	45				WBTR	0.67	37	D	35	60
				NBL	0.28	5	A	5	10				NBL	0.58	8	A	11	75
				NBTR	0.18	3	A	7	13				NBTR	0.31	3	A	11	15
				SBL	0.13	4	A	4	11				SBL	0.16	5	A	4	12
				SBTR	0.32	5	A	24	42				SBTR	0.16	5	A	12	22

Similar to the development scenario with two site accesses, a minimal increase is expected at all signalized intersections in the study area. During the PM peak hour, the largest increase to movement delay time occurs for the northbound through at approximately 5 seconds at the Liverpool Road at Kingston Road intersection. The eastbound through along Kingston Road operates with a v/c ratio just under 1.00.

5.3 FUTURE TOTAL INTERSECTION CAPACITY ANALYSIS – UNSIGNALIZED INTERSECTIONS

This section summarizes the results of the intersection capacity analysis for unsignalized intersections for 2024 and 2029 with two and one-access scenarios.

Table 5.5 summarizes the unsignalized intersection capacity analysis for 2024. Good LOS are maintained under future total traffic conditions.

Table 5.5: 2024 Future Total Conditions – Unsignalized Intersection Capacity Analysis

Intersection	Move-ment	Weekday AM Peak Hour						Weekday PM Peak Hour					
		Flow Rate (vph)	Capacity (vph)	Control Delay (s)	Vol/Cap Ratio (v/c)	Queue Length 95th (m)	LOS	Flow Rate (vph)	Capacity (vph)	Control Delay (s)	Vol/Cap Ratio (v/c)	Queue Length 95th (m)	LOS
Liverpool Road at South Site Access	EBR	29	704	10	0.04	1	B	25	879	9	0.03	1	A
Liverpool Road at North Site Access/Plaza Access	EBLTR	67	273	23	0.25	8	C	48	468	14	0.10	3	B
	WBL	115	310	23	0.37	13	C	134	267	31	0.50	21	D
	WBTR	64	931	9	0.07	2	A	108	771	10	0.14	4	B
	NBL	21	741	10	0.03	1	B	62	1102	9	0.06	1	A
	SBL	102	1062	9	0.10	3	A	83	708	11	0.12	3	B

During the AM peak hour, a minimal increase of about 6 seconds in delay time is expected to the outbound movement from the subject site. The impact to the westbound left movement at the Liverpool Road and North Site Access/Plaza access is an increase by 1 second for the AM and PM peak hours when compared to background traffic conditions. Good LOS occur at the south site access.

Table 5.6 summarizes the capacity analysis for 2029. The net increase in delay time to the outbound left and westbound left movements is minimal, like the 2024 results. The outbound movement from the subject site is expected to experience an additional delay time of 6 seconds compared to 2024 traffic conditions during the AM peak hour.

Table 5.6: 2029 Future Total Conditions – Unsignalized Intersection Capacity Analysis

Intersection	Move-ment	Weekday AM Peak Hour						Weekday PM Peak Hour					
		Flow Rate (vph)	Capacity (vph)	Control Delay (s)	Vol/Cap Ratio (v/c)	Queue Length 95th (m)	LOS	Flow Rate (vph)	Capacity (vph)	Control Delay (s)	Vol/Cap Ratio (v/c)	Queue Length 95th (m)	LOS
Liverpool Road at South Site Access	EBR	29	698	10	0.04	0	B	25	876	9	0.03	0	A
Liverpool Road at North Site Access/Plaza Access	EBLTR	67	268	23	0.25	0	C	48	462	14	0.10	0	B
	WBL	115	308	23	0.37	0	C	134	260	33	0.52	1	D
	WBTR	64	933	9	0.07	0	A	108	764	11	0.14	0	B
	NBL	21	729	10	0.03	0	B	62	1094	9	0.06	0	A
	SBL	102	1054	9	0.10	0	A	83	694	11	0.12	0	B

The unsignalized intersection capacity analysis with one-access is summarized below. All future site traffic makes use of the existing north site access point with full movements and no changes to lane use assignments. Table 5.7 and 5.8 summarize the future total traffic LOS for years 2024 and 2029.

Table 5.7: 2024 Future Total Conditions (One-Access) – Unsignalized Intersection Capacity Analysis

Intersection	Move-ment	Weekday AM Peak Hour						Weekday PM Peak Hour					
		Flow Rate (vph)	Capacity (vph)	Control Delay (s)	Vol/Cap Ratio (v/c)	Queue Length 95th (m)	LOS	Flow Rate (vph)	Capacity (vph)	Control Delay (s)	Vol/Cap Ratio (v/c)	Queue Length 95th (m)	LOS
Liverpool Road at North Site Access/Plaza Access	EBLTR	97	319	21	0.30	10	C	73	542	13	0.13	4	B
	WBL	115	280	27	0.41	15	D	134	258	33	0.52	22	D
	WBTR	64	931	9	0.07	2	A	107	786	10	0.14	4	B
	NBL	21	741	10	0.03	1	B	63	1103	9	0.06	2	A
	SBL	102	1062	9	0.10	3	A	83	709	11	0.12	3	B

Table 5.8: 2029 Future Total Conditions (One-Access) – Unsignalized Intersection Capacity Analysis

Intersection	Move-ment	Weekday AM Peak Hour						Weekday PM Peak Hour					
		Flow Rate (vph)	Capacity (vph)	Control Delay (s)	Vol/Cap Ratio (v/c)	Queue Length 95th (m)	LOS	Flow Rate (vph)	Capacity (vph)	Control Delay (s)	Vol/Cap Ratio (v/c)	Queue Length 95th (m)	LOS
Liverpool Road at North Site Access/Plaza Access	EBLTR	97	314	22	0.31	10	C	73	535	13	0.14	4	B
	WBL	115	279	27	0.41	15	D	134	251	35	0.53	23	D
	WBTR	64	933	9	0.07	2	A	107	779	10	0.14	4	B
	NBL	21	729	10	0.03	1	B	63	1094	9	0.06	2	A
	SBL	102	1054	9	0.10	3	A	83	694	11	0.12	3	B

The one-access scenario at the subject site operates well with no intersection capacity issues. In comparison to the capacity analyses with a two-access scenario, the only notable increase in delay time occurs for the westbound left movement during the PM peak hour. The projected increase in delay time is about 5 seconds in 2024. For 2029, the difference in delay time is 21 seconds with the one access point scenario. However, the overall movement delay time is just over half a minute, which is not significant.

In comparing the two different access scenarios, it can be concluded that there is no major difference in terms of impacts to intersection capacity between either access arrangement. For both scenarios, the intersections operate well. Delay times associated with the one-access point scenario are slightly higher with a difference of less than 3 seconds in comparison to the two-access configuration.

Of note, a functional review of the proposed development was conducted with the two-access scenario and a functional review would need to be performed if the one-access scenario were to be considered.

6 SIGNAL WARRANT ANALYSIS

6.1 EXISTING TRAFFIC CONDITIONS

To evaluate whether a signal is warranted at the Liverpool Road and North Site Driveway-Private Access intersection, 12 hours of traffic movement counts were collected on Tuesday, March 19th, 2019, as shown in Exhibit 4 of Appendix G. The highest 8 hours of traffic volumes were identified. A signal warrant analysis was conducted under existing traffic conditions, utilizing the warrant analysis outlined in the Ontario Traffic Manual (OTM) Book 12- Traffic Signals. The detailed warrant analysis is attached in Appendix G and summarized in Table 6-1.

Table 6-1: Existing Traffic Signal Warrant

Justification		Compliance	Signal Justified?	
			Yes	No
1. Minimum Vehicle	A: Total Volume	100%	X	
	B: Crossing Volume	100%		
2. Delay to Cross Traffic	A: Main Road	79%		X
	B: Crossing Road	100%		
3. Combination	A: Justification 1	100%		X
	B: Justification 2	79%		
4. 4-Hour Volume		100%	X	
5. Collison Experience		0%		X
6. Pedestrians	A. Volume	-		X
	B. Delay	-		

Analysis results indicate that a signal is warranted at this intersection as per Justifications 1 (minimum volume) and 4 (4-Hour Volume) in the OTM Book 12. Therefore, there is some support for a traffic signal at this location.

6.2 FUTURE TOTAL TRAFFIC CONDITIONS

A signal warrant analysis was conducted with the site development scenarios with two and one-access scenarios. A temporal profile of peak hour residential site traffic was derived from a proxy site survey of a development in the nearby neighbourhood. The development at 1000-1200-1400 The Esplanade North was selected as a suitable proxy, which consists of two condominium towers and several townhouses. Trip generation data was collected on Tuesday, March 19th, 2019 (See Exhibit 5 in Appendix G). This proxy site data was used to generate a temporal profile of residential site traffic during a weekday.

The resulting profile was applied to the future background development and subject site traffic. We used the peak hour site traffic of both sites and the proxy residential site peak hour of 3:00 PM to 4:00 PM. For the remaining hours of the day, we applied the temporal profile values obtained from the proxy site survey.

These volumes were combined with existing traffic volumes, minus the existing subject site traffic, corridor growth volumes and new subject site traffic, to formulate the future traffic volumes for the signal warrant analyses.

The individual and combined traffic volumes are summarized in Exhibit 6 and 7 of Appendix G for the 2024 two (2) and one (1) site access scenarios. The results are summarized in Table 6-2.

Table 6-2: Future Total Traffic Signal Warrant 2024

Justification		Signal Justified?			
		Two-Access		One-Access	
		Yes	No	Yes	No
1. Minimum Vehicle	A: Total Volume	X		X	
	B: Crossing Volume				
2. Delay to Cross Traffic	A: Main Road	X		X	
	B: Crossing Road				
3. Combination	A: Justification 1	X		X	
	B: Justification 2				
4. 4-Hour Volume		X		X	
5. Collison Experience			X		X
6. Pedestrians	A. Volume		X		X
	B. Delay				

Results indicate the signal is warranted with at least justifications 2-4. Warrant 3 provides strong support for the need of a traffic signal installation.

We have reviewed the Durham Region Arterial Corridor Guidelines (February 2007) for the desired spacing between signals. Liverpool Road is classed as a Type “B” Regional Road and the ideal spacing is approximately 525 metres. The approximate distance between the subject site access to Kingston Road and Glenanna Road is 140 and 217 metres; respectively. As such, the current distance between traffic signals is less than the preferred distance. Should a traffic signal be considered further, additional analyses should be undertaken to monitor the impact to vehicle flows through this corridor.

We performed a capacity analysis for the new signal with a two and one access point scenario. Tables 6.3 and 6.4 summarize the capacity results with more detailed outputs contained in Appendix G.

Table 6-3: 2024 Future Total Conditions (Two-Access) – Signalized Intersection Capacity Analysis

Intersection	Weekday AM Peak Hour									Weekday PM Peak Hour								
	Overall			Movement of Interest						Overall			Movement of Interest					
	V/C	Delay (s)	LOS	Move-ment	V/C	Delay (s)	LOS	Queue (m)		V/C	Delay (s)	LOS	Move-ment	V/C	Delay (s)	LOS	Queue (m)	
								50th	95th								50th	95th
Liverpool Road at North Site Access/Plaza Access	0.42	9	A	EBLTR	0.36	40	D	13	24	0.43	14	B	EBLTR	0.36	40	D	13	24
				WBL	0.63	47	D	22	38				WBL	0.63	47	D	22	38
				WBTR	0.28	39	D	12	23				WBTR	0.28	39	D	12	23
				NBL	0.06	2	A	1	1				NBL	0.06	9	A	3	9
				NBTR	0.26	2	A	8	6				NBTR	0.27	12	B	54	72
				SBL	0.19	5	A	6	13				SBL	0.19	7	A	8	20
				SBTR	0.38	5	A	29	45				SBTR	0.39	8	A	47	74

Table 6-4: 2024 Future Total Conditions (One-Access) – Signalized Intersection Capacity Analysis

Intersection	Weekday AM Peak Hour									Weekday PM Peak Hour								
	Overall			Movement of Interest						Overall			Movement of Interest					
	V/C	Delay (s)	LOS	Move-ment	V/C	Delay (s)	LOS	Queue (m)		V/C	Delay (s)	LOS	Move-ment	V/C	Delay (s)	LOS	Queue (m)	
								50th	95th								50th	95th
Liverpool Road at North Site Access/Plaza Access	0.42	10	B	EBLTR	0.54	43	D	19	33	0.54	19	B	EBLTR	0.32	38	D	13	25
				WBL	0.63	47	D	22	39				WBL	0.59	43	D	26	42
				WBTR	0.29	39	D	12	23				WBTR	0.43	39	D	20	34
				NBL	0.06	4	A	1	4				NBL	0.10	10	A	8	14
				NBTR	0.26	5	A	20	33				NBTR	0.52	19	B	129	149
				SBL	0.19	4	A	6	13				SBL	0.35	11	B	8	24
				SBTR	0.38	5	A	29	45				SBTR	0.19	6	A	22	22

In both instances, no capacity issues were identified.

7 PARKING REVIEW

The subject site is situated in the City Centre Zone 1 of Pickering. The minimum vehicle parking space requirement is based on the City of Pickering Zoning By-Law 7553/17. Section 3.1 (Parking Space Requirements) specifying the base requirement by land use. The development proposes 373 apartment units and 18 block townhouse units as per By-law definition. The required and proposed parking spaces are shown in Table 7-1.

Table 7-1: Required and Proposed Parking Spaces

Use	Standard (per unit)	Rate per 100 m^2	# of Units / Size (m^2)	Number of Parking Spaces	
				Required	Proposed
Apartment Dwelling	0.8	-	373	298	
Visitor - Apartment Dwelling	0.15	-	373	56	
Block Townhouse Dwelling	1.75	-	18	32	
Visitor - Block Townhouse Dwelling	0.15	-	18	3	
Retail Store (per 100 m^2)	-	3.5	850	30	
Total				**419**	**512**

Section 3.4 of the by-law further defines the number of parking spaces based on multiple uses on one lot. Table 2 in the By-law shows the percentage of peak period for different time periods on a weekday and weekend. Table 7.2 and 7.3 shows the percentage and projected demand by use values for a weekday and weekend; respectively.

Table 7-2: Projected Maximum Parking Space Demand (Weekday)

Land Use	Percentage of Peak Period (Weekday)				Required	Peak Projected Demand			
	Morning	Noon	Afternoon	Evening		Morning	Noon	Afternoon	Evening
Retail Store	65%	90%	90%	90%	30	20	27	27	27
Residential	100%	100%	100%	100%	330	330	330	330	330
Residential Visitor	20%	20%	60%	100%	59	12	12	35	60
Minimum Parking Supply Required					***419***	***362***	***369***	***392***	***417***

Table 7-3: Projected Maximum Parking Space Demand (Weekend)

Land Use	Percentage of Peak Period (Weekday)				Required	Peak Projected Demand			
	Morning	Noon	Afternoon	Evening		Morning	Noon	Afternoon	Evening
Retail Store	80%	100%	100%	70%	30	24	30	30	21
Residential	100%	100%	100%	100%	330	330	30	330	330
Residential Visitor	20%	20%	60%	100%	59	12	12	35	59
Minimum Parking Supply Required					***419***	***366***	***372***	***395***	***410***

The maximum supply from both time periods is considered the minimum number of parking spaces required, which was calculated at 417 spaces. The proposal includes 3 underground parking levels totaling 488 spaces, 10 surface parking spaces, and 14 townhouse spaces for a total supply of 512 spaces. This supply exceeds the minimum requirement by 93 spaces.

Accessible Parking Requirements

The minimum number of accessible parking spaces required was based on the general City By-law 6604/05, Part 24. Each owner/operator of a parking lot shall provide a minimum number of accessible parking spaces of Type "A" and Type "B". The minimum requirements are identified in Table (5a) of the by-law. With an overall requirement of 417 parking spaces, the accessible parking space requirement is 5 Type "A" and 6 Type "B" spaces. The development plan includes 6 Type "A" spaces and 5 Type "B" spaces. Therefore, the proposed parking supply meets the requirement.

Bicycle Parking Requirements

The bicycle parking supply requirement is specified in the City of Pickering Zoning By-Law 7553/17, Section 3.9. The base requirement is for 0.50 spaces for apartment units and 1.0 for each townhouse.

Table 7-4: Comparison of Bicycle Parking Requirement and Proposed Supply

Land Use	Number of Units / Size (m^2)	By-law Standard	Requirement
Apartment	373	0.50 per unit	187
Block Townhouse	18	1.00 per unit	18
Retail	850	Greater of 2 or 1.0 per 1,000 m^2	2
		Total	***207***
		Proposed Supply	***254***
		Net Difference	***+47***

The by-law requirement is 207 bicycle parking spaces. The proposed supply is 254 spaces which exceeds the requirement by 47 spaces.

8 LOADING AND SWEPT PATH REVIEW

The loading space requirements is based on City of Pickering Zoning By-Law 7553/17. Section 3.11 (Loading Standards). The minimum dimension of a loading space is 3.5 metres in width, 12.0 metres in length with a minimum vertical clearance of 4.2 metres. The by-law does not state the type of loading space required. Each of the proposed residential buildings has a dedicated loading space with dimensions that exceed the minimum requirement.

A functional review was conducted to identify site traffic access, internal loading vehicle circulation, and loading vehicle maneuvering in/out of the dedicated loading spaces. Our review examines the development plan with two-access scenario. The entry and exit paths to/from Liverpool Road, loading spaces and underground parking garage are provided in Appendix H as drawings 001-009. The location of convex mirrors and warning system for private vehicle and loading vehicle mix is also shown.

9 SIGHTLINE ANALYSIS

A sightline analysis was conducted to determine if the site access design is acceptable for the minimum visible distance required for an exiting vehicle to turn onto Liverpool Road. The review assesses the condition with two accesses. The review criteria are based on Transportation Association of Canada (TAC) Table 2.52. The posted speed limit on Liverpool Road is 50 km/hr and the design speed is 60 km/hr. Drawings 001 and 002 in Appendix I illustrate the sight line distance review for the north and south access points, respectively.

At the north access point, the required stopping distance on Liverpool Road for vehicles to view outbound left vehicles from this access point is 85 metres and this minimum requirement is met. The desired sight distance for an outbound vehicle to view vehicles on Liverpool Road is 110 and 130 metres from the north and south directions, respectively. The review finds the minimum distance requirement is met.

At the south access point, the required stopping distance for a vehicle on Liverpool Road is 85 metres. This minimum requirement is met for a southbound vehicle but not for northbound vehicle as this access point is located close to Kingston Road. Due to insufficient stopping distance for northbound traffic at this location, the southern access point should be reconfigured only for right-in/right-out movements. It is recommended that the centre median be extended 45 metres to discourage outbound left movement.

The desired sight distance for an outbound vehicle to view upstream traffic on Liverpool Road is 110 metres and the available distance exceeds this requirement. Due to insufficient sight line distance for northbound traffic on Liverpool Road, outbound left movement at the south access point will be discouraged by an extended centre median on Liverpool Road.

10 TRAVEL DEMAND MANAGEMENT

Travel Demand Management (TDM) is the application of strategies and policies to reduce travel demand, or to redistribute this demand in space or in time. The goal is to improve connectivity to the transportation network and offer improved options for transit, walking, and cycling. The following section reviews the existing bicycle and pedestrian network surrounding the subject site. In addition, active transportation trip generators and planned active transportation network improvements are identified and discussed.

10.1 POTENTIAL STRATEGIES TO SUPPORT TRANSIT & SMART COMMUTE CHOICE

As explained in Section 2.4 of this report, the general area is well served by public transit service mode share. Section 2.3.5 of the 2017 Durham Region Master Transportation Plan 2017 specifies a targeted growth in transit mode share from 10.7% in 2011 to 12.2% by 2031. The Smart Commute program offered by Metrolinx aims to reduce the number of single-occupancy vehicles commuting trips in the Greater Toronto and Hamilton Area. Smart Commute works with partnering organizations and provides services specific to each location. These organizations can be residential condominium corporations and their residents. Services offered by Smart Commute to member companies include:

- Smart Commute Tool
  - Helps to find alternative transportation options when an origin and destination are chosen.
- Carpooling Assistance
  - The Smart Commute carpool tool helps to match commuters travelling to and from similar locations. Members can indicate their origin and destination as well as time of departure to find a carpool to participate in.
- Emergency Ride Home
  - A program which subsidizes taxi or transit rides home for commuters who use active transportation or a carpool to get to work, but for unforeseen situations are required to travel by taxi or transit.

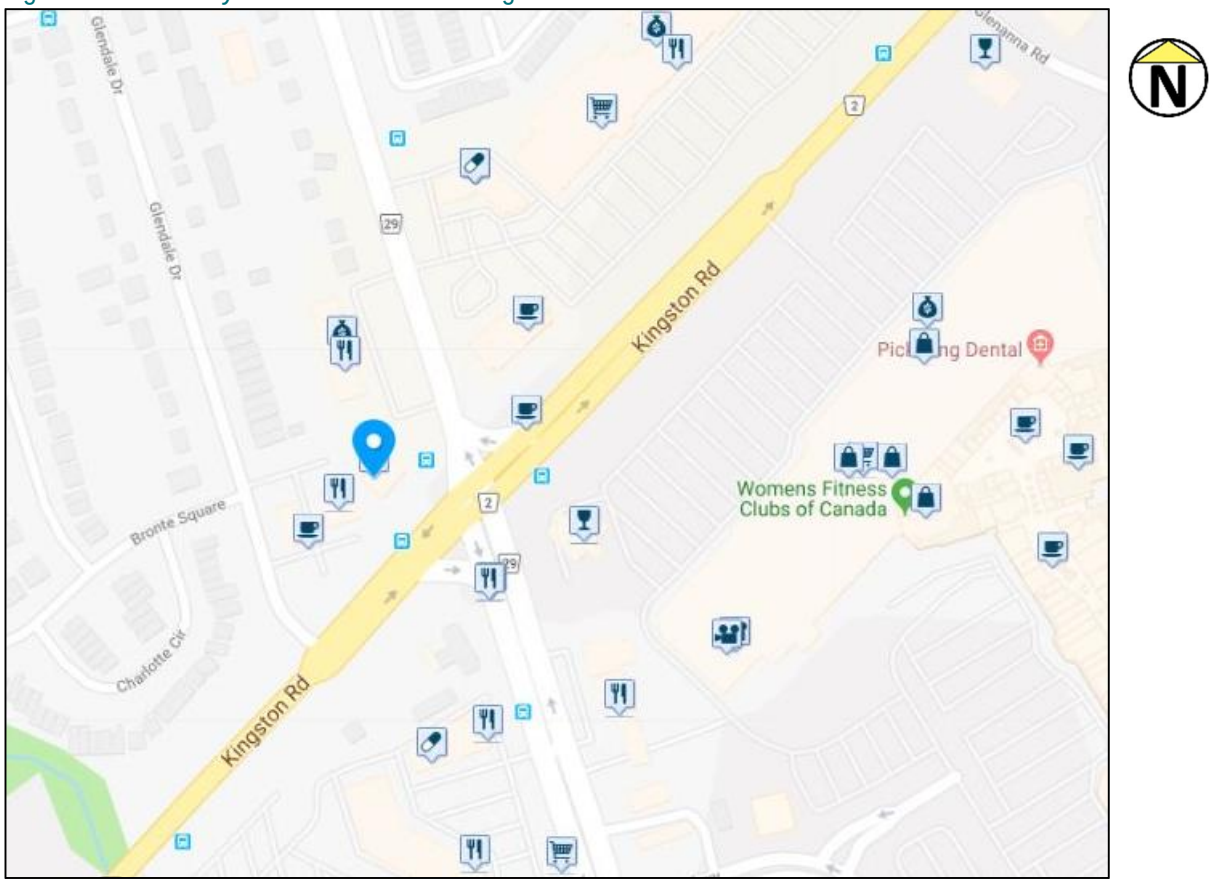
In addition to receiving information packages from Smart Commute, any information would be made easily accessible and available to tenants. A bulletin board in the residential lobby and elevators are good places to present information regarding carpools, cycling routes, transit pass discounts, or any other TDM measures being implemented. Alternatively, the information can be relayed via email.

Property owners may choose to provide tenants with discounted or free transit passes to reduce the number commuting trips by car. Tenants who already own a car may find daily or monthly passes too expensive in addition to the cost of owning and insuring a vehicle. Monthly transit passes can be purchased at a cost of $117.00 for an adult pass, $93.50 for a youth pass (ages 13 to 19) pass, $46.00 for a senior pass (aged 65 or older), and $65.00 for a child pass (Ages 12 or under) travelling solo. Should the child be age 5 or under, or is accompanied by an adult, senior or youth, the child can ride for free. Paying with PRESTO allows riders to pay a reduced fare and not have to worry about carrying an exact cash fare. In addition, the PRESTO program allows members to register their card online, allowing them to receive replacement cards if they are lost or stolen. A monthly PRESTO e-pass can also be purchased for the same cost as a regular monthly pass for commuters who use transit daily. The proposed strategies can be further detailed at the site plan stage.

10.2 WALKABILITY AND PEDESTRIAN CONNECTIVITY

The subject site is part of the City Centre Neighbourhood which provides a range of shopping and personal service amenities. Walkscore.com rates the subject site high with a value for walking at 8 out of 10. This score reflects the wide variety of nearby amenities within a 15-minute walking distance. Such amenities and the proposed addition of mixed uses on the site include: shopping, bars, restaurants, parks, schools and entertainment. Given the large variety, the proposed development is well supported to facilitate reduced vehicular travel. The proposed public realm design introduces new high-quality pedestrian connections through the subject site and to the surrounding transit amenities and street network. These pedestrian connections are proposed to be enhanced with landscaping, adjacent active at-grade frontages, and publicly accessible gathering spaces. Figure 10.1 illustrates the subject site and nearby amenities.

Figure 10.1: Nearby Amenities to 1294 Kingston Road



The proposed site plan includes design elements that encourage pedestrian movement along and through the site, in particular to access retail frontages and the transit stop. Multiple walking paths are featured throughout the site, thus allowing quick access to Liverpool Road. Figure 10.2 shows the pedestrian connections in red. In addition, the open space around Liverpool House aims to present a healthy atmosphere for social interaction and relaxation.

Figure 10.2: Pedestrian Connectivity Linkages

Source: MBTW Group (May 22, 2019)

10.3 BICYCLE FACILITIES AND PARKING

Bike parking is a requirement for new developments. As shown in Table 7-4, a minimum of 207 spaces are required of which 2 are for retail use. The development includes 254 bicycle parking spaces for all users with bicycle parking available at-grade, level 1 and on level P1 (See Figure 10.3). At-grade bicycle parking includes 16 on-site bicycle parking spaces and 24 spaces within the Right-of-Way (ROW).

Figure 10.3: On-site and off-site bicycle parking locations

Source: MBTW Group (May 22, 2019)

The surrounding area includes Durham Region Transit Bus Terminal located just south of the Pickering Town Centre, Pickering GO Station (less than 1 kilometre south of the subject site and within a cycling distance), and a good assortment of retail and commercial amenities to the immediate east and southeast of the subject site. Dedicated bicycle lanes are on Kingston Road in the immediate vicinity of the subject site.

10.4 POTENTIAL CAR SHARING STRATEGIES

Car sharing services help to reduce individual car ownership by providing temporary and affordable, on-demand access to a fleet of shared vehicles. Reduced car ownership is associated with higher use of alternative modes of transportation and in turn, contributes to fewer vehicles kilometres travelled, more efficient land use, and the development of human scaled urban environments. Dedicated car-share parking spaces are available at various locations and provide access to a vehicle for people to rent for short-term use; by the hour, the day, or overnight. Zipcars, Enterprise CarShare, and Maven are three (3) commercial car-share operations in the Toronto area. Unfortunately, such services are not available in Pickering now.

Turo is a service that operates differently than these other car-share services and may be applicable to the multi-residential context in Pickering. This concept involves a prospective user being able to find a vehicle owner nearby that is offering a vehicle for rent. The concept is similar to a conventional car rental agency except the rental vehicle is an individual's personal vehicle.

Another alternative travel option is ridesharing. This concept allows for people to arrange a ride with a driver who is heading to a destination in the same general direction. The goal is to increase occupancy in vehicles and facilitate people travelling together. Poparide is a ridesharing program available in the City of Pickering which matches passengers and drivers heading in the same general direction. The passenger specifies a departure time with a general origin and destination. A driver shares their vehicle for use to anyone for a fee.

11 CONCLUSIONS

LEA Consulting Ltd. (LEA) was retained by Altona Group to prepare a Traffic Impact Study for the proposed mixed-use development at 1294 Kingston Road, 1848 Liverpool Road, and 1852 Liverpool Road (subject site), located in Pickering, Ontario. The subject site is located on the northwest corner of Liverpool Road and Kingston Road and the proposed development will replace the existing retail plaza with two (2) residential buildings with approximately 391 residential units and an estimated 850 m^2 of retail space.

Existing intersection capacity analyses were conducted. Some capacity and delay issues were identified for the eastbound through on Kingston Road. The Westbound left at Liverpool Road at Kingston Road was found to operate at above capacity. No issues were identified at the Liverpool Road and Glenanna Road intersection.

Background traffic analysis was evaluated for the nearby potential 120-unit residential development located at 1854-1858 Liverpool Road immediately north of the subject site. The two-way site trips generated are projected at 41 and 44 for the AM and PM peak hours, respectively.

There are intentions to widen Liverpool Road from 4 to 6 lanes between Kingston Road and the Highway 401 interchange. To date, the Environmental Assessment has not begun. This report assumes the road widening will be operational upon full development build-out in 2024. A growth rate of 0.5% per annum was applied for analysis years 2024 and 2029.

Future background capacity analysis was conducted with an optimized timing plan applied for the PM peak hour at the Liverpool Road and Kingston Road intersection. The eastbound through movements on Kingston Road operate at LOS graded E or better but with a v/c just under 1.00. The westbound left at Liverpool Road at Kingston Road operates at close to capacity.

Future traffic for the subject site was calculated based on a development size of 391 residential units and an estimated 850 m^2 of retail/commercial floor space. The expected site traffic generated by the subject site totals 120 and 161 two-way site trips for the AM and PM peak hours, respectively.

The net impact of the new site traffic on the surrounding road network was determined to be negligible. The analyses reviewed the site access arrangement with two and one-access scenarios and it was determined that there is no significant difference in traffic operations with either access scenario.

A traffic signal warrant analysis was conducted at Liverpool Road and the north site access point. The review applied the Ontario Traffic Manual (OTM) Book 12 – Traffic Signals. The analysis found that a traffic signal is warranted under justification 3 (combined warrant of minimum vehicle and delay to cross traffic). An intersection capacity analysis was conducted and all turning movements operate well. Further investigation as to the impacts of a new traffic signal is recommended.

The vehicle parking requirements total 417 spaces whereas 512 vehicular parking spaces are proposed with this development plan. A total of 11 accessible parking spaces (5 Type “A” and 6 Type “B”) are required and the development meets this requirement.

The by-law requires a minimum of 207 bicycle parking spaces. The development plan includes 254 bicycle spaces which exceeds the requirement.

A functional review of the site parking, loading, and accesses was conducted for the proposed development assuming two site accesses. Two (2) type “G” loading spaces are provided; one for the midrise building and one for the 25-storey building. All vehicles have been provided with adequate space for turning movements.

A sightline analysis was reviewed to determine if the minimum stopping distance for vehicles on Liverpool Road and viewing distance for outbound vehicles meet the minimum required set out by the Transportation Association of Canada. The minimum requirements are met except for the outbound left movement at the south access point. It is recommended that the centre median be extended 45 metres to discourage this turning movement and ensure vehicle safety.

Travel Demand Management (TDM) is the application of strategies and policies to reduce travel demand, by improving connectivity to the transportation network with options other than personal automobiles including transit, walking, and cycling. The subject site is located adjacent to higher order transit routes which include a regional transit terminal which provides transportation access to other parts of the Region and Toronto. The Pickering Go Train Station is located nearby which provides access to the entire Greater Toronto and Hamilton Area.

Other TDM measures can potentially be pursued. The Smart Commute programme could be promoted to the future tenants presenting alternative travel options, such as travelling at a different time of day, choosing a different mode (e.g., carpooling, transit, walking or cycling), or reducing trips through teleworking. The area has a high walkability score with a wide variety of amenities nearby within a short walking distance. On-site bicycle locker storage and at-grade bicycle parking is available under this development plan. Car sharing is an alternative TDM measure, that is, unfortunately, unavailable in Pickering now. Other forms of transport include automobile ridesharing and Poparide.

A high level of pedestrian connectivity to the surrounding area is proposed with multiple walking paths and publicly accessible open spaces for social interaction and a healthy atmosphere.

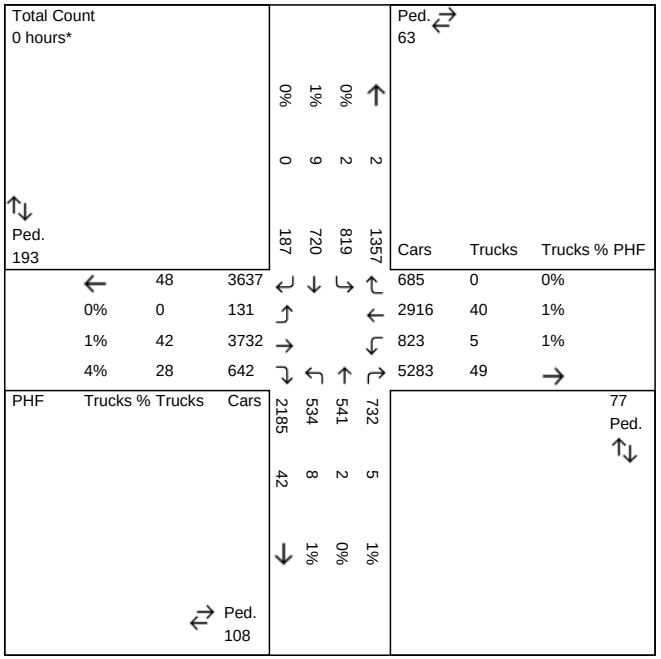
APPENDIX A

Existing Traffic Counts and Signal Timing Plans

TMC Tabular Report

Kingston Rd @ Glenanna Rd

TMC No: 0700700000 **Intersection ID:** 10022 **Count ID:** 25262016135 **Count Date:** 05/14/2016, Sat



TMC 15 Min Report

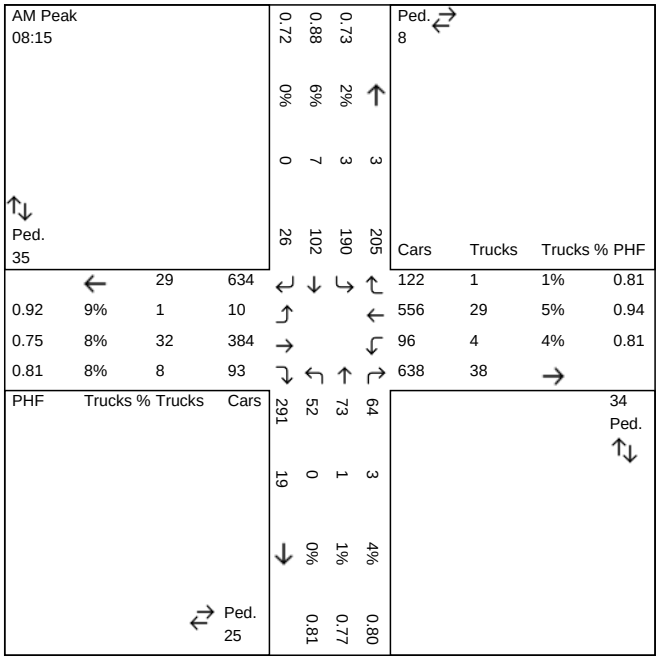
Kingston Rd @ Glenanna Rd

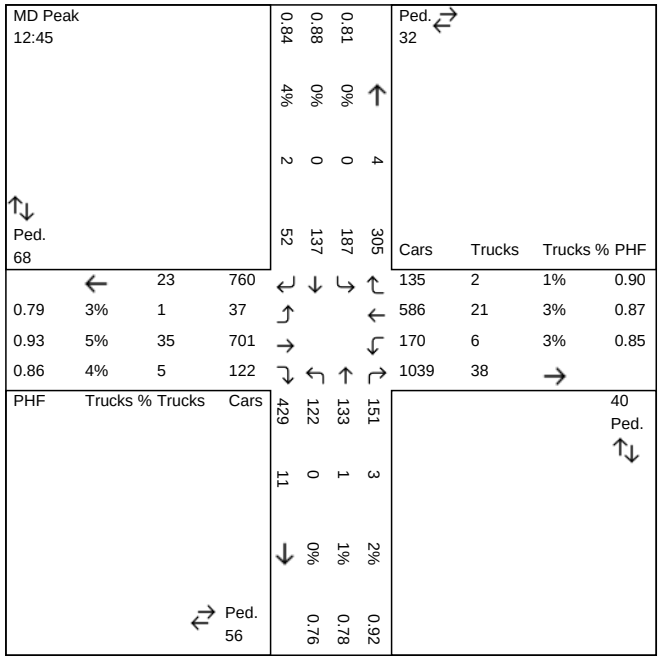
TMC No: 0700700000 **Intersection ID:** 10022 **Count ID:** 25262016135 **Count Date:** 05/14/2016, Sat

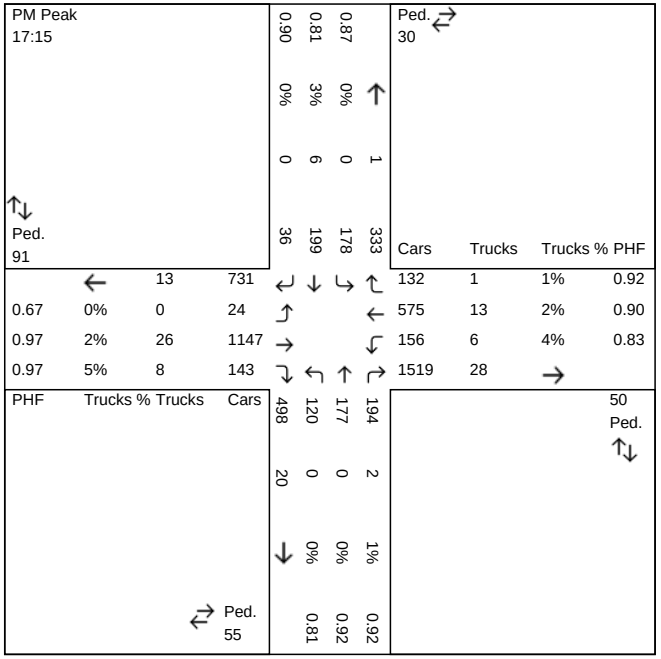
Time	NORTH APPROACH										EAST APPROACH										SOUTH APPROACH										WEST APPROACH										Total
	Cars			Trucks			Heavies			Ped	Cars			Trucks			Heavies			Ped	Cars			Trucks			Heavies			Ped	Cars			Trucks			Heavies			Ped	
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right		
06:00	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*
06:15	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*
06:30	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*
06:45	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*
07:00	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*
07:15	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*
07:30	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*
07:45	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*
08:00	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*
08:15	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*
08:30	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*
08:45	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*
10:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:15	51	39	9	0	0	0	0	0	0	4	48	135	31	0	2	0	0	0	0	2	27	27	23	1	0	0	0	0	0	1	4	183	22	0	5	2	0	0	0	8	624
10:30	46	48	10	0	0	0	0	0	0	4	32	134	47	0	1	0	0	0	0	8	27	29	23	0	0	0	0	0	0	7	7	181	27	0	2	1	0	0	0	10	644
10:45	53	39	13	0	0	0	0	0	0	3	49	153	22	1	4	0	0	0	0	2	26	20	16	1	1	1	0	0	0	8	9	207	34	0	3	2	0	0	0	13	680
11:00	47	43	13	0	1	0	0	0	0	6	45	163	31	0	2	0	0	0	0	2	38	34	42	0	0	1	0	0	0	4	7	218	36	0	2	1	0	0	0	9	745
11:15	56	38	11	1	0	0	0	0	0	5	28	180	37	0	4	0	0	0	0	3	29	35	53	1	0	0	0	0	0	6	14	244	33	0	2	2	0	0	0	15	797
11:30	52	40	12	0	1	0	0	0	0	0	51	185	37	0	3	0	0	0	0	3	21	32	49	0	0	0	0	0	0	1	3	207	40	0	4	1	0	0	0	11	753
11:45	52	39	10	0	0	0	0	0	0	2	51	213	37	1	0	0	0	0	0	4	34	35	33	1	0	1	0	0	0	10	8	232	46	0	3	3	0	0	0	5	820
12:00	52	56	6	0	2	0	0	0	0	2	48	188	54	0	3	0	0	0	0	2	30	33	64	0	0	0	0	0	0	3	8	243	59	0	1	1	0	0	0	13	868
12:15	44	47	16	0	0	0	0	0	0	4	60	183	63	0	5	0	0	0	0	6	33	31	51	1	0	0	0	0	0	2	8	219	50	0	1	2	0	0	0	13	839
12:30	57	45	10	0	1	0	0	0	0	3	61	201	48	0	1	0	0	0	0	4	34	32	45	0	0	0	0	0	0	11	3	239	39	0	5	2	0	0	0	14	855
12:45	41	41	11	0	0	0	0	0	0	3	52	198	37	1	3	0	0	0	0	1	49	39	47	1	1	1	0	0	0	6	10	263	33	0	4	2	0	0	0	14	858
13:00	49	49	14	0	1	0	0	0	0	5	60	203	46	0	2	0	0	0	0	8	36	26	50	0	0	0	0	0	0	11	12	262	28	0	2	1	0	0	0	16	881
13:15	50	37	14	0	0	0	0	0	0	4	61	224	57	1	3	0	0	0	0	5	29	43	60	1	0	0	0	0	0	8	12	246	39	0	1	3	0	0	0	17	915
13:30	58	56	17	1	1	0	0	0	0	4	57	181	45	0	0	0	0	0	0	9	34	48	60	0	0	0	0	0	0	12	5	262	53	0	3	1	0	0	0	9	916
13:45	61	48	11	0	0	0	0	0	0	6	60	194	44	1	5	0	0	0	0	7	36	32	64	1	0	1	0	0	0	10	10	261	48	0	2	2	0	0	0	17	921
14:00	50	55	10	0	2	0	0	0	0	8	60	181	49	0	2	0	0	0	0	11	51	45	52	0	0	0	0	0	0	8	11	265	55	0	2	2	0	0	0	9	928
14:15	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*
14:30	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*
14:45	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*
15:00	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*
15:15	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*
15:30	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*
15:45	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*
16:00	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*
16:15	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*
16:30	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*
16:45	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*
17:00	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*
17:15	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*
17:30	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*
17:45	100*	100*	100*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	300*

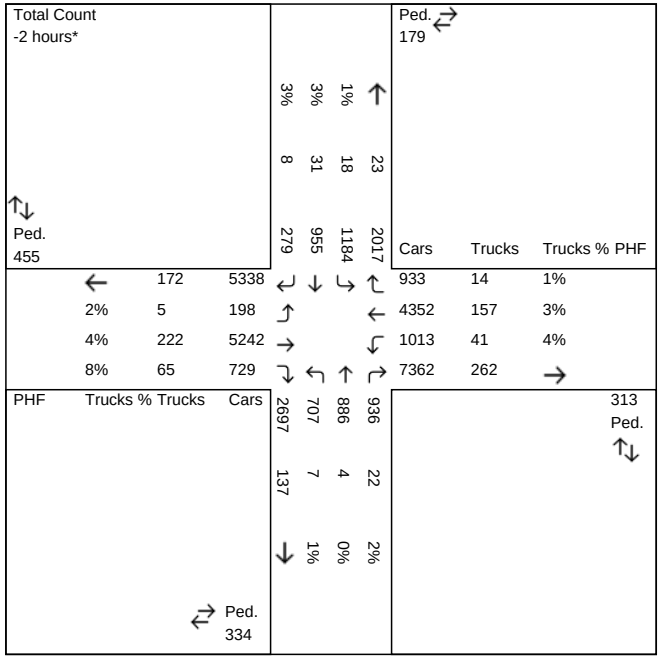
Kingston Rd @ Glenanna Rd

TMC No: 0700700000 **Intersection ID:** 10022 **Count ID:** 35702016741 **Count Date:** 06/14/2017, Wed









TMC 15 Min Report

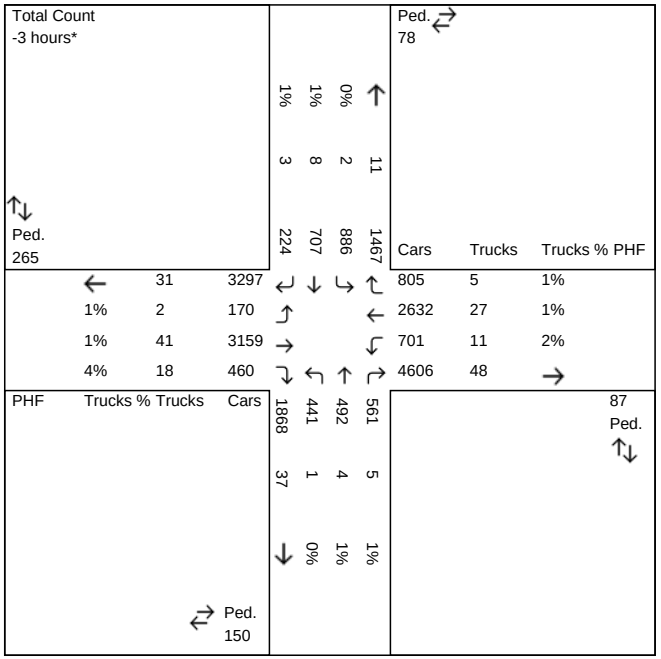
Kingston Rd @ Glenanna Rd

TMC No: 0700700000 **Intersection ID:** 10022 **Count ID:** 35702016741 **Count Date:** 06/14/2017, Wed

Time	NORTH APPROACH										EAST APPROACH										SOUTH APPROACH										WEST APPROACH										Total
	Cars			Trucks			Heavies			Ped	Cars			Trucks			Heavies			Ped	Cars			Trucks			Heavies			Ped	Cars			Trucks			Heavies			Ped	
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right		
Period 1																																								
06:15	7	9	4	0	1	0	0	0	0	0	5	74	4	1	4	1	0	0	0	2	5	4	4	0	0	0	0	0	1	0	25	6	0	3	1	0	0	0	4	165
06:30	5	3	2	0	1	0	0	0	0	3	4	94	13	0	4	0	0	0	0	0	2	5	3	0	0	0	0	0	1	1	41	8	0	2	4	0	0	0	3	199
06:45	20	6	9	0	2	0	0	0	0	4	10	110	10	1	4	0	0	0	0	3	7	10	2	0	0	0	0	0	1	0	43	5	0	5	1	0	0	0	4	257
07:00	11	14	2	1	0	0	0	0	0	1	25	101	10	1	5	0	0	0	0	4	13	4	6	0	0	1	0	0	3	0	38	7	0	7	5	0	0	0	7	266
07:15	24	9	3	1	2	1	0	0	0	2	19	135	9	2	8	1	0	0	0	2	6	12	4	0	0	0	0	0	2	1	56	3	0	3	1	0	0	0	8	314
07:30	19	21	4	1	2	0	0	0	0	2	19	146	13	2	5	0	0	0	0	6	8	14	6	1	0	0	0	0	3	0	57	9	0	6	6	0	0	0	11	361
07:45	20	19	7	1	1	0	0	0	0	5	20	135	12	1	5	1	0	0	0	2	6	13	3	1	0	1	0	0	4	3	75	3	1	9	3	0	0	0	6	357
08:00	35	25	7	2	2	0	0	0	0	3	27	140	16	1	9	0	0	0	0	5	9	12	9	1	0	1	0	0	0	4	7	83	11	0	7	3	0	0	0	4	423
08:15	**35**	**20**	**8**	**1**	**3**	**0**	**0**	**0**	**0**	**0**	**25**	**143**	**16**	**0**	**5**	**1**	**0**	**0**	**0**	**14**	**16**	**18**	**13**	**0**	**1**	**0**	**0**	**0**	**0**	**11**	**3**	**70**	**15**	**0**	**10**	**0**	**0**	**0**	**0**	**9**	**437**
08:30	**43**	**26**	**9**	**1**	**1**	**0**	**0**	**0**	**0**	**3**	**23**	**127**	**31**	**1**	**9**	**0**	**0**	**0**	**0**	**12**	**14**	**24**	**13**	**0**	**0**	**0**	**0**	**0**	**0**	**3**	**3**	**95**	**25**	**0**	**5**	**4**	**0**	**0**	**0**	**6**	**478**
08:45	**47**	**30**	**2**	**0**	**1**	**0**	**0**	**0**	**0**	**3**	**18**	**146**	**38**	**2**	**9**	**0**	**0**	**0**	**0**	**6**	**12**	**18**	**19**	**0**	**0**	**2**	**0**	**0**	**0**	**9**	**2**	**91**	**30**	**1**	**7**	**1**	**0**	**0**	**0**	**15**	**509**
09:00	**65**	**26**	**7**	**1**	**2**	**0**	**0**	**0**	**0**	**2**	**30**	**140**	**37**	**1**	**6**	**0**	**0**	**0**	**0**	**2**	**10**	**13**	**19**	**0**	**0**	**1**	**0**	**0**	**0**	**2**	**2**	**128**	**23**	**0**	**10**	**3**	**0**	**0**	**0**	**5**	**535**
09:15	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*
Period 2																																								
11:45	41	31	10	0	0	1	0	0	0	8	32	140	39	0	3	1	0	0	0	10	25	27	38	0	0	2	0	0	0	10	7	159	29	0	6	2	0	0	0	18	639
12:00	36	47	13	0	1	0	0	0	0	3	51	140	29	2	6	0	0	0	0	11	26	31	34	0	1	1	0	0	0	10	8	188	36	0	6	2	0	0	0	10	692
12:15	38	28	10	0	0	0	0	0	0	5	36	143	36	1	8	1	0	0	0	10	34	28	34	1	0	0	0	0	0	8	11	140	18	0	9	2	0	0	0	8	609
12:30	35	24	13	1	1	0	0	0	0	10	29	173	35	2	2	1	0	0	0	7	26	30	36	1	0	0	0	0	0	13	10	170	23	1	9	2	0	0	0	15	669
12:45	**58**	**39**	**7**	**0**	**0**	**1**	**0**	**0**	**0**	**9**	**39**	**143**	**36**	**1**	**4**	**0**	**0**	**0**	**0**	**12**	**20**	**29**	**36**	**0**	**1**	**2**	**0**	**0**	**0**	**18**	**9**	**179**	**30**	**0**	**8**	**2**	**0**	**0**	**0**	**14**	**697**
13:00	**53**	**39**	**14**	**0**	**0**	**1**	**0**	**0**	**0**	**8**	**46**	**126**	**35**	**2**	**3**	**1**	**0**	**0**	**0**	**7**	**29**	**34**	**34**	**0**	**0**	**0**	**0**	**0**	**0**	**13**	**12**	**178**	**36**	**0**	**10**	**1**	**0**	**0**	**0**	**15**	**697**
13:15	**39**	**32**	**16**	**0**	**0**	**0**	**0**	**0**	**0**	**9**	**36**	**166**	**38**	**0**	**9**	**0**	**0**	**0**	**0**	**9**	**40**	**43**	**41**	**0**	**0**	**1**	**0**	**0**	**0**	**12**	**9**	**155**	**31**	**0**	**8**	**2**	**0**	**0**	**0**	**21**	**717**
13:30	**37**	**27**	**15**	**0**	**0**	**0**	**0**	**0**	**0**	**6**	**49**	**151**	**26**	**3**	**5**	**1**	**0**	**0**	**0**	**12**	**33**	**27**	**40**	**0**	**0**	**0**	**0**	**0**	**0**	**13**	**7**	**189**	**25**	**1**	**9**	**0**	**0**	**0**	**0**	**18**	**694**
Period 3																																								
13:45	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*
14:00	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*
15:15	41	25	7	3	0	0	0	0	0	11	35	138	52	0	8	1	0	0	0	19	24	41	46	1	0	0	0	0	0	14	14	229	23	0	8	2	0	0	0	15	757
15:30	34	39	13	0	1	3	0	0	0	12	45	128	40	3	6	1	0	0	0	26	31	34	41	0	1	2	0	0	0	24	11	201	24	0	8	0	0	0	0	29	757
15:45	47	43	8	1	0	0	0	0	0	8	39	153	38	1	5	0	0	0	0	13	25	30	32	1	0	1	0	0	0	15	10	252	36	1	8	1	0	0	0	18	786
16:00	49	38	21	2	0	1	0	0	0	9	53	132	40	0	3	0	0	0	0	16	26	36	47	0	0	1	0	0	0	11	9	219	31	0	6	1	0	0	0	24	775
16:15	43	31	12	2	2	0	0	0	0	8	38	138	33	1	3	1	0	0	0	15	44	44	44	0	0	2	0	0	0	13	9	210	29	0	10	1	0	0	0	26	759
16:30	40	33	6	0	0	0	0	0	0	5	27	134	38	3	3	0	0	0	0	11	27	35	46	0	0	0	0	0	0	21	9	274	24	0	5	3	0	0	0	22	766
16:45	42	40	8	0	2	0	0	0	0	5	39	147	36	2	3	0	0	0	0	9	47	51	43	0	0	2	0	0	0	19	12	284	25	0	4	2	0	0	0	19	841
17:00	42	32	6	0	0	0	0	0	0	5	38	134	41	1	0	1	0	0	0	18	22	42	49	0	0	0	0	0	0	21	5	266	21	0	8	2	0	0	0	10	764
17:15	**44**	**41**	**8**	**0**	**2**	**0**	**0**	**0**	**0**	**9**	**47**	**159**	**30**	**2**	**4**	**0**	**0**	**0**	**0**	**19**	**36**	**48**	**45**	**0**	**0**	**1**	**0**	**0**	**0**	**14**	**3**	**283**	**37**	**0**	**9**	**2**	**0**	**0**	**0**	**24**	**867**
17:30	**36**	**42**	**10**	**0**	**2**	**0**	**0**	**0**	**0**	**8**	**35**	**144**	**36**	**2**	**2**	**0**	**0**	**0**	**0**	**12**	**37**	**47**	**45**	**0**	**0**	**0**	**0**	**0**	**0**	**15**	**7**	**294**	**36**	**0**	**7**	**2**	**0**	**0**	**0**	**21**	**840**
17:45	**47**	**55**	**9**	**0**	**0**	**0**	**0**	**0**	**0**	**6**	**27**	**135**	**33**	**1**	**4**	**0**	**0**	**0**	**0**	**9**	**25**	**42**	**51**	**0**	**0**	**1**	**0**	**0**	**0**	**16**	**5**	**277**	**33**	**0**	**3**	**3**	**0**	**0**	**0**	**26**	**808**
18:00	**51**	**61**	**9**	**0**	**2**	**0**	**0**	**0**	**0**	**7**	**47**	**137**	**33**	**1**	**3**	**1**	**0**	**0**	**0**	**10**	**22**	**40**	**53**	**0**	**0**	**0**	**0**	**0**	**0**	**10**	**9**	**293**	**37**	**0**	**7**	**1**	**0**	**0**	**0**	**20**	**854**
18:15	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*
18:30	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*

Kingston Rd @ Glenanna Rd

TMC No: 0700700000 **Intersection ID:** 10022 **Count ID:** 35702017225 **Count Date:** 04/07/2018, Sat



TMC 15 Min Report

Kingston Rd @ Glenanna Rd

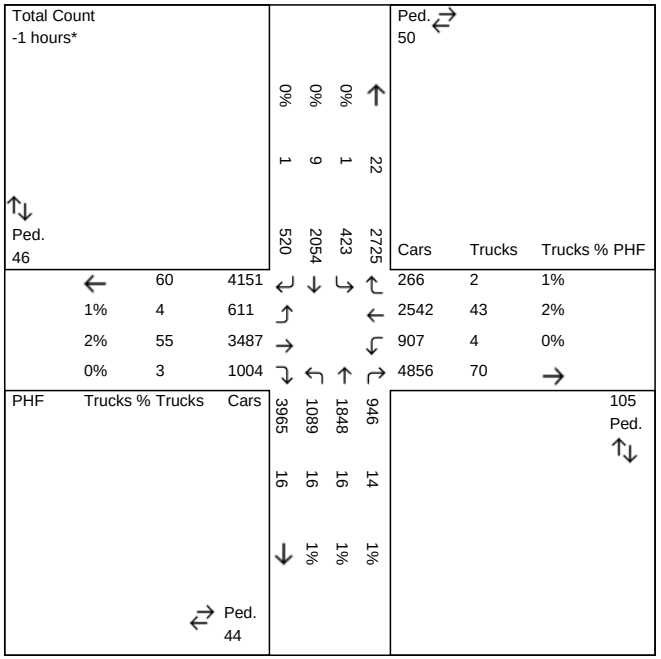
TMC No: 0700700000 **Intersection ID:** 10022 **Count ID:** 35702017225 **Count Date:** 04/07/2018, Sat

Time	NORTH APPROACH										EAST APPROACH										SOUTH APPROACH										WEST APPROACH										Total
	Cars			Trucks			Heavies			Ped	Cars			Trucks			Heavies			Ped	Cars			Trucks			Heavies			Ped	Cars			Trucks			Heavies			Ped	
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right		
09:15	25*	34*	8*	0*	0*	0*	0*	0*	0*	2*	15*	94*	22*	0*	2*	0*	0*	0*	0*	4*	16*	13*	21*	0*	0*	0*	0*	0*	0*	6*	7*	119*	22*	1*	4*	1*	0*	0*	0*	8*	424*
09:30	35*	26*	16*	0*	0*	0*	0*	0*	0*	3*	35*	117*	27*	2*	1*	0*	0*	0*	0*	5*	15*	17*	20*	0*	0*	0*	0*	0*	0*	4*	4*	147*	25*	0*	4*	1*	0*	0*	0*	5*	509*
09:45	34*	38*	6*	0*	0*	0*	0*	0*	0*	4*	29*	120*	28*	0*	2*	0*	0*	0*	0*	4*	15*	19*	19*	0*	0*	1*	0*	0*	0*	8*	5*	133*	25*	0*	4*	2*	0*	0*	0*	12*	508*
10:00	39	33	9	0	1	0	0	0	0	2	24	129	45	1	2	1	0	0	0	3	18	25	23	0	0	0	0	0	0	8	7	165	31	1	3	0	0	0	0	10	580
10:15	48	40	15	0	0	0	0	0	0	5	31	148	47	1	2	0	0	0	0	11	21	17	23	0	0	0	0	0	0	10	14	160	31	0	4	2	0	0	0	14	644
10:30	49	52	11	0	0	0	0	0	0	4	39	144	47	1	1	0	0	0	0	6	29	25	37	0	0	0	0	0	0	7	13	173	22	0	1	1	0	0	0	10	672
10:45	50	44	10	0	0	1	0	0	0	3	42	149	38	0	2	0	0	0	0	4	21	33	30	0	1	2	0	0	0	4	7	195	30	0	3	3	0	0	0	7	679
11:00	54	52	19	0	1	0	0	0	0	8	46	156	52	1	2	0	0	0	0	3	25	31	31	0	1	0	0	0	0	5	8	184	31	0	2	0	0	0	0	18	730
11:15	56	26	10	0	0	1	0	0	0	8	47	179	41	1	2	0	0	0	0	8	32	31	25	0	0	0	0	0	0	20	12	208	24	0	5	2	0	0	0	23	761
11:30	62	44	13	0	1	0	0	0	0	5	49	182	59	0	2	0	0	0	0	5	35	28	34	0	0	0	0	0	0	8	9	210	28	0	3	1	0	0	0	17	795
11:45	71	50	12	1	0	0	0	0	0	10	37	172	58	1	2	0	0	0	0	8	33	30	33	0	1	1	0	0	0	19	17	227	38	1	3	2	0	0	0	26	853
12:00	68	42	16	0	1	0	0	0	0	7	62	202	65	1	0	1	0	0	0	7	47	30	38	0	0	0	0	0	0	6	9	201	28	0	2	0	0	0	0	19	852
12:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:45	66	51	20	0	0	0	0	0	0	3	64	193	56	0	3	0	0	0	0	3	30	36	42	0	1	1	0	0	0	9	8	214	31	0	4	2	0	0	0	20	857
13:00	67	64	15	0	1	0	0	0	0	13	53	214	66	1	2	0	0	0	0	4	25	40	50	0	0	0	0	0	0	12	13	250	27	0	2	1	0	0	0	28	948
13:15	63	51	16	0	1	0	0	0	0	5	44	206	52	0	1	1	0	0	0	9	29	39	51	0	0	0	0	0	0	7	11	223	35	0	3	2	0	0	0	17	866
13:30	72	56	22	0	1	0	0	0	0	2	50	170	54	2	1	1	0	0	0	4	26	38	62	1	0	0	0	0	0	9	12	254	32	0	2	0	0	0	0	18	889
13:45	61	49	16	1	0	0	0	0	0	1	43	181	63	0	3	0	0	0	0	6	38	39	45	0	0	1	0	0	0	14	16	246	32	0	3	1	0	0	0	13	872
14:00	60	53	20	0	1	1	0	0	0	2	70	207	62	1	2	1	0	0	0	6	32	50	37	0	0	0	0	0	0	12	14	249	40	0	1	1	0	0	0	25	947
14:15	70*	54*	22*	0*	0*	0*	0*	0*	0*	10*	64*	190*	56*	0*	1*	1*	0*	0*	0*	9*	25*	44*	44*	0*	0*	0*	0*	0*	0*	19*	18*	254*	36*	0*	3*	1*	0*	0*	0*	14*	935*
14:30	73*	43*	29*	0*	1*	0*	0*	0*	0*	8*	55*	189*	40*	2*	3*	0*	0*	0*	0*	6*	34*	50*	50*	0*	0*	0*	0*	0*	0*	13*	18*	242*	30*	0*	1*	2*	0*	0*	0*	20*	909*
14:45	65*	45*	19*	0*	0*	0*	0*	0*	0*	5*	43*	205*	62*	0*	1*	0*	0*	0*	0*	3*	37*	42*	64*	0*	1*	1*	0*	0*	0*	12*	10*	261*	27*	0*	4*	1*	0*	0*	0*	30*	938*
15:00	62*	44*	15*	0*	1*	0*	0*	0*	0*	10*	48*	206*	55*	1*	3*	0*	0*	0*	0*	8*	30*	22*	45*	0*	0*	0*	0*	0*	0*	15*	11*	260*	24*	0*	1*	0*	0*	0*	0*	19*	880*
15:15	67*	40*	11*	0*	0*	0*	0*	0*	0*	6*	45*	194*	48*	0*	1*	0*	0*	0*	0*	2*	28*	39*	48*	0*	0*	1*	0*	0*	0*	14*	9*	227*	33*	0*	3*	2*	0*	0*	0*	22*	840*
15:30	47*	45*	15*	0*	1*	0*	0*	0*	0*	8*	52*	204*	44*	2*	2*	0*	0*	0*	0*	5*	30*	38*	37*	0*	0*	0*	0*	0*	0*	15*	18*	248*	33*	0*	1*	0*	0*	0*	0*	22*	867*
15:45	60*	43*	18*	1*	0*	0*	0*	0*	0*	11*	54*	182*	68*	0*	1*	0*	0*	0*	0*	10*	36*	50*	43*	0*	0*	1*	0*	0*	0*	18*	14*	233*	24*	0*	2*	1*	0*	0*	0*	28*	898*
16:00	61*	38*	15*	0*	1*	0*	0*	0*	0*	10*	43*	178*	58*	1*	2*	0*	0*	0*	0*	8*	51*	48*	34*	0*	0*	0*	0*	0*	0*	14*	13*	245*	30*	0*	3*	1*	0*	0*	0*	18*	872*
16:15	45*	26*	20*	0*	0*	0*	0*	0*	0*	7*	43*	136*	47*	0*	1*	0*	0*	0*	0*	10*	21*	36*	38*	0*	0*	0*	0*	0*	0*	9*	6*	181*	25*	0*	3*	1*	0*	0*	0*	28*	683*
16:30	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*

TMC Tabular Report

Kingston Rd @ Liverpool Rd (R.R.29)

TMC No: 0290100000 **Intersection ID:** 10162 **Count ID:** 27442016135 **Count Date:** 05/14/2016, Sat



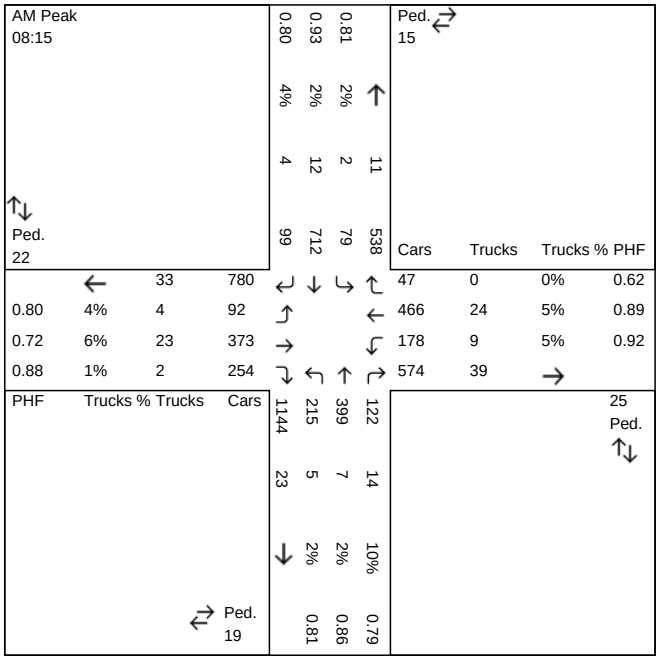
Kingston Rd @ Liverpool Rd (R.R.29)

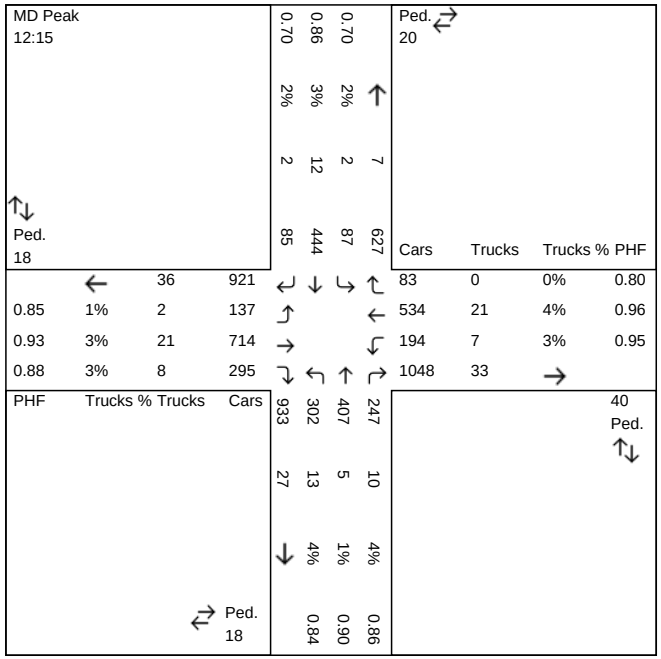
TMC No: 0290100000 **Intersection ID:** 10162 **Count ID:** 27442016135 **Count Date:** 05/14/2016, Sat

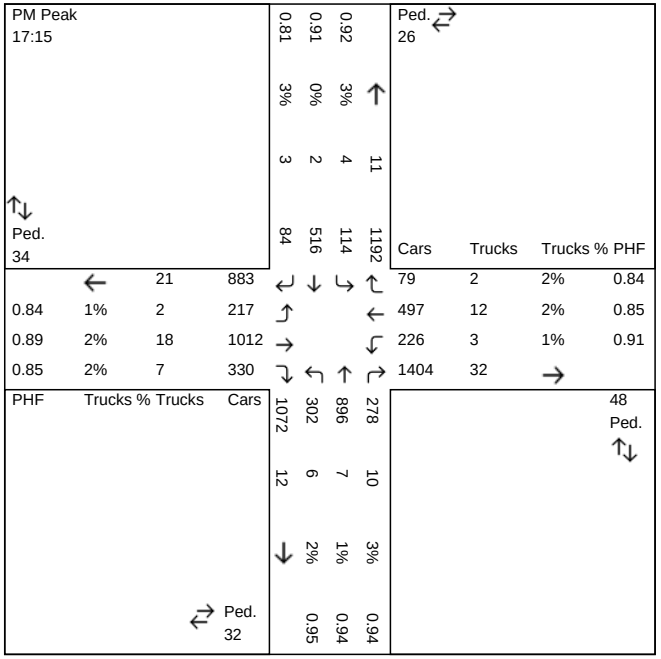
Time	NORTH APPROACH										EAST APPROACH										SOUTH APPROACH										WEST APPROACH										Total
	Cars			Trucks			Heavies			Ped	Cars			Trucks			Heavies			Ped	Cars			Trucks			Heavies			Ped	Cars			Trucks			Heavies			Ped	
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right		
06:00	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*
06:15	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*
06:30	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*
06:45	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*
07:00	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*
07:15	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*
07:30	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*
07:45	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*
08:00	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*
08:15	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*
08:30	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*
08:45	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*
10:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:15	18	107	27	0	1	0	0	0	0	1	42	120	18	0	3	1	0	0	0	1	67	83	47	2	1	2	0	0	0	2	44	167	51	0	3	0	0	0	0	3	811
10:30	19	134	31	0	0	0	0	0	0	2	42	109	12	0	1	0	0	0	0	9	59	96	40	1	1	0	0	0	0	2	25	172	64	0	3	0	0	0	0	2	824
10:45	28	126	29	0	0	0	0	0	0	0	42	139	10	0	5	0	0	0	0	2	64	81	47	1	2	1	0	0	0	0	39	206	55	2	4	0	0	0	0	1	884
11:00	22	118	30	0	1	0	0	0	0	2	47	162	14	0	2	0	0	0	0	5	72	96	52	1	0	0	0	0	0	2	32	205	46	0	4	1	0	0	0	4	918
11:15	28	122	27	0	0	1	0	0	0	1	44	158	21	0	4	0	0	0	0	6	64	107	47	1	1	1	0	0	0	1	42	221	57	0	5	0	0	0	0	3	962
11:30	29	136	32	0	1	0	0	0	0	2	52	153	15	1	2	0	0	0	0	4	62	88	49	0	1	0	0	0	0	5	28	208	75	0	4	0	0	0	0	1	948
11:45	29	135	35	0	1	0	0	0	0	3	58	175	17	0	1	1	0	0	0	5	62	115	64	1	1	2	0	0	0	2	40	217	73	0	4	0	0	0	0	3	1044
12:00	31	122	27	0	1	0	0	0	0	1	51	150	21	0	3	0	0	0	0	6	73	116	61	1	0	0	0	0	0	6	32	221	87	0	2	0	0	0	0	2	1014
12:15	27	141	36	0	0	0	0	0	0	5	61	147	23	1	4	0	0	0	0	8	59	127	69	1	2	1	0	0	0	1	34	215	73	1	2	0	0	0	0	4	1042
12:30	27	137	43	1	1	0	0	0	0	5	62	173	12	0	1	0	0	0	0	8	75	104	57	1	1	2	0	0	0	3	34	223	60	0	4	1	0	0	0	3	1038
12:45	31	120	40	0	0	0	0	0	0	2	69	180	19	0	4	0	0	0	0	5	76	120	64	1	2	1	0	0	0	2	49	235	53	0	4	0	0	0	0	4	1081
13:00	20	144	32	0	1	0	0	0	0	5	68	182	13	1	0	0	0	0	0	9	70	134	65	0	1	0	0	0	0	6	37	243	48	0	4	0	0	0	0	3	1086
13:15	28	116	34	0	0	0	0	0	0	3	64	190	18	0	5	0	0	0	0	9	79	149	62	0	1	1	0	0	0	4	50	249	67	1	2	0	0	0	0	3	1135
13:30	18	148	27	0	1	0	0	0	0	9	73	162	20	0	0	0	0	0	0	9	65	138	65	1	0	0	0	0	0	4	43	226	60	0	4	0	0	0	0	4	1077
13:45	33	108	38	0	0	0	0	0	0	6	59	168	18	1	6	0	0	0	0	13	78	157	80	1	2	1	0	0	0	1	40	232	70	0	3	1	0	0	0	3	1119
14:00	35	140	32	0	1	0	0	0	0	3	73	174	15	0	2	0	0	0	0	6	64	137	77	3	0	2	0	0	0	3	42	247	65	0	3	0	0	0	0	3	1127
14:15	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*
14:30	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*
14:45	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*
15:00	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*
15:15	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*
15:30	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*
15:45	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*
16:00	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*
16:15	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*
16:30	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*
16:45	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*
17:00	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*
17:15	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*
17:30	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*

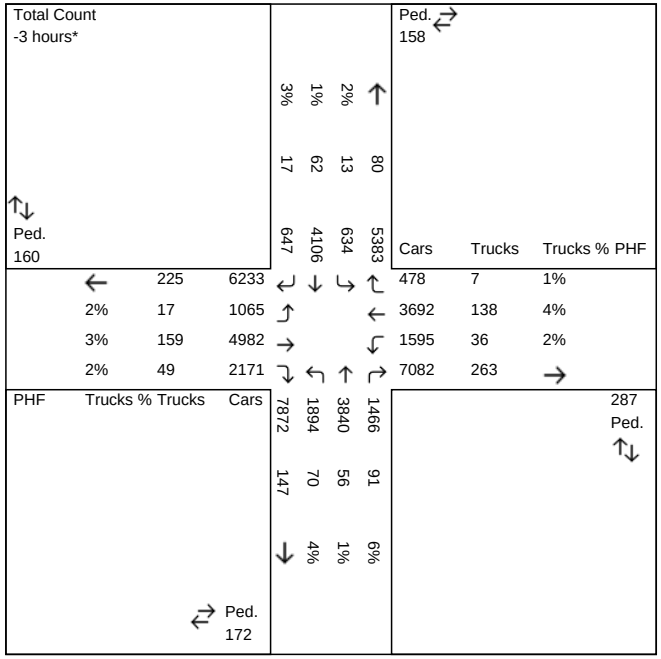
Kingston Rd @ Liverpool Rd (R.R.29)

TMC No: 0290100000 **Intersection ID:** 10162 **Count ID:** 35702016728 **Count Date:** 06/15/2017, Thu









TMC 15 Min Report

Kingston Rd @ Liverpool Rd (R.R.29)

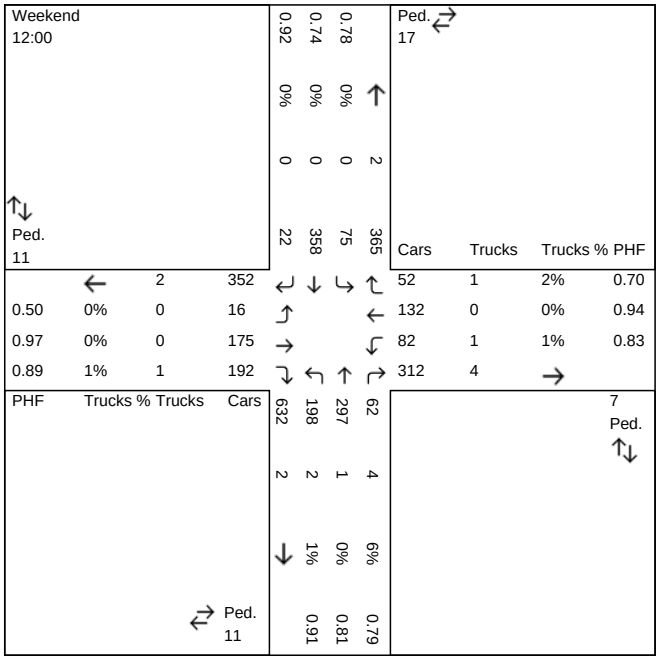
TMC No: 0290100000 **Intersection ID:** 10162 **Count ID:** 35702016728 **Count Date:** 06/15/2017, Thu

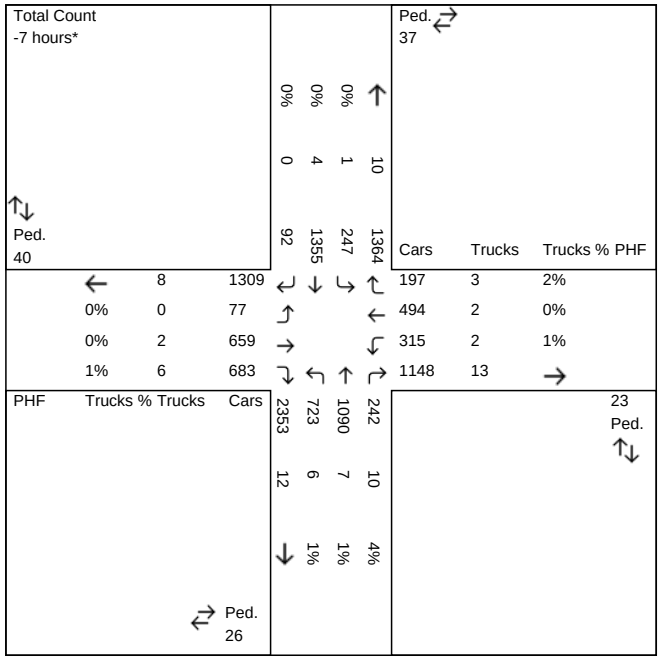
Time	NORTH APPROACH										EAST APPROACH										SOUTH APPROACH										WEST APPROACH										
	Cars			Trucks			Heavies			Ped	Cars			Trucks			Heavies			Ped	Cars			Trucks			Heavies			Ped	Cars			Trucks			Heavies			Ped	Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right		
Period 1																																								
06:15	4	6	4	0	0	0	0	0	0	2	55	51	3	0	3	0	0	0	0	3	24	7	14	2	0	1	0	0	0	4	6	25	95	0	3	1	0	0	0	1	314
06:30	0	5	6	0	0	0	0	0	0	4	60	75	5	0	3	0	0	0	0	3	35	6	21	6	0	5	0	0	0	1	3	39	88	1	2	1	0	0	0	3	372
06:45	13	145	10	1	1	0	0	0	0	3	52	61	4	1	4	0	0	0	0	6	21	25	16	1	2	2	0	0	0	2	16	29	62	0	3	2	0	0	0	2	484
07:00	9	169	14	0	1	0	0	0	0	4	31	68	7	0	5	0	0	0	0	6	24	63	18	2	1	3	0	0	0	1	9	41	50	0	3	0	0	0	0	2	531
07:15	9	196	12	0	0	0	0	0	0	5	35	97	11	2	7	0	0	0	0	5	19	60	8	3	4	2	0	0	0	7	14	37	45	1	4	0	0	0	0	4	587
07:30	10	228	16	0	2	2	0	0	0	3	31	106	6	0	3	0	0	0	0	3	37	77	19	4	2	4	0	0	0	2	20	42	75	0	7	0	0	0	0	1	700
07:45	9	206	19	0	2	0	0	0	0	5	52	103	12	4	5	0	0	0	0	6	31	86	17	2	3	2	0	0	0	2	24	62	52	0	5	1	0	0	0	2	712
08:00	19	238	17	0	2	1	0	0	0	3	45	105	12	2	5	0	0	0	0	6	46	76	22	3	2	4	0	0	0	5	25	61	68	1	5	5	0	0	0	5	783
08:15	**14**	**192**	**16**	**0**	**2**	**0**	**0**	**0**	**0**	**1**	**41**	**97**	**11**	**2**	**9**	**0**	**0**	**0**	**0**	**2**	**44**	**103**	**24**	**2**	**2**	**2**	**0**	**0**	**0**	**2**	**21**	**63**	**54**	**1**	**7**	**0**	**0**	**0**	**0**	**3**	**715**
08:30	**24**	**185**	**32**	**1**	**0**	**0**	**0**	**0**	**0**	**6**	**40**	**130**	**9**	**3**	**7**	**0**	**0**	**0**	**0**	**9**	**52**	**118**	**32**	**2**	**0**	**4**	**0**	**0**	**0**	**2**	**20**	**88**	**67**	**1**	**4**	**1**	**0**	**0**	**0**	**7**	**844**
08:45	**24**	**172**	**24**	**1**	**1**	**1**	**0**	**0**	**0**	**5**	**47**	**116**	**8**	**4**	**5**	**0**	**0**	**0**	**0**	**10**	**51**	**84**	**27**	**1**	**4**	**4**	**0**	**0**	**0**	**7**	**22**	**88**	**61**	**1**	**8**	**0**	**0**	**0**	**0**	**7**	**783**
09:00	**17**	**163**	**27**	**0**	**9**	**3**	**0**	**0**	**0**	**3**	**50**	**123**	**19**	**0**	**3**	**0**	**0**	**0**	**0**	**4**	**68**	**94**	**39**	**0**	**1**	**4**	**0**	**0**	**0**	**8**	**29**	**134**	**72**	**1**	**4**	**1**	**0**	**0**	**0**	**5**	**881**
09:15	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*
Period 2																																								
11:45	21	91	24	0	2	0	0	0	0	5	48	118	22	0	4	0	0	0	0	3	75	107	38	3	2	3	0	0	0	3	32	179	80	2	3	3	0	0	0	4	872
12:00	29	98	24	0	2	0	0	0	0	3	44	137	15	1	4	1	0	0	0	5	66	98	57	3	2	2	0	0	0	2	41	205	54	1	1	2	0	0	0	1	898
12:15	**16**	**102**	**31**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**53**	**127**	**15**	**0**	**6**	**0**	**0**	**0**	**0**	**8**	**90**	**89**	**73**	**4**	**1**	**2**	**0**	**0**	**0**	**2**	**32**	**190**	**76**	**1**	**8**	**1**	**0**	**0**	**0**	**4**	**932**
12:30	**23**	**108**	**14**	**0**	**2**	**1**	**0**	**0**	**0**	**6**	**39**	**140**	**23**	**3**	**3**	**0**	**0**	**0**	**0**	**14**	**63**	**114**	**53**	**3**	**1**	**0**	**0**	**0**	**0**	**3**	**41**	**180**	**66**	**0**	**3**	**2**	**0**	**0**	**0**	**3**	**908**
12:45	**18**	**106**	**23**	**0**	**5**	**0**	**0**	**0**	**0**	**6**	**52**	**129**	**26**	**1**	**6**	**0**	**0**	**0**	**0**	**6**	**75**	**102**	**55**	**4**	**3**	**7**	**0**	**0**	**0**	**6**	**37**	**155**	**86**	**1**	**4**	**0**	**0**	**0**	**0**	**5**	**918**
13:00	**30**	**128**	**17**	**2**	**5**	**1**	**0**	**0**	**0**	**7**	**50**	**138**	**19**	**3**	**6**	**0**	**0**	**0**	**0**	**12**	**74**	**102**	**66**	**2**	**0**	**1**	**0**	**0**	**0**	**7**	**27**	**189**	**67**	**0**	**6**	**5**	**0**	**0**	**0**	**6**	**970**
13:15	20	98	20	0	2	0	0	0	0	3	59	133	15	1	4	1	0	0	0	10	72	98	46	1	1	2	0	0	0	10	47	149	78	1	6	0	0	0	0	6	883
13:30	23	117	24	0	3	1	0	0	0	6	67	129	23	0	5	1	0	0	0	11	76	88	44	1	1	2	0	0	0	6	38	178	51	0	5	3	0	0	0	5	908
Period 3																																								
13:45	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*
14:00	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*
15:15	20	95	32	0	1	0	0	0	0	5	56	142	14	1	6	0	0	0	0	28	71	125	60	0	5	2	0	0	0	10	50	182	69	1	9	2	0	0	0	1	987
15:30	23	92	24	0	2	0	0	0	0	9	52	139	16	2	5	0	0	0	0	11	59	127	54	2	2	1	0	0	0	9	40	205	52	0	7	1	0	0	0	8	942
15:45	26	125	25	1	2	0	0	0	0	6	43	115	15	0	4	1	0	0	0	11	71	154	60	0	3	4	0	0	0	6	46	248	52	0	8	2	0	0	0	9	1037
16:00	27	110	30	2	2	1	0	0	0	2	63	129	14	1	2	0	0	0	0	3	68	169	54	3	2	3	0	0	0	2	43	201	61	1	4	5	0	0	0	9	1011
16:15	16	101	16	0	1	1	0	0	0	7	53	105	18	0	8	1	0	0	0	14	71	200	80	2	2	5	0	0	0	3	40	243	68	0	7	1	0	0	0	3	1066
16:30	16	104	20	0	1	1	0	0	0	6	59	129	15	1	1	0	0	0	0	20	64	168	72	3	0	3	0	0	0	8	42	251	69	0	3	1	0	0	0	4	1061
16:45	31	100	28	1	3	0	0	0	0	12	49	135	21	1	3	0	0	0	0	10	75	208	71	3	2	3	0	0	0	13	30	240	49	0	7	1	0	0	0	13	1109
17:00	29	110	14	0	7	1	0	0	0	4	43	118	21	0	0	0	0	0	0	10	70	196	48	2	1	4	0	0	0	7	53	266	74	0	5	1	0	0	0	3	1087
17:15	**32**	**115**	**27**	**0**	**1**	**0**	**0**	**0**	**0**	**8**	**53**	**123**	**15**	**2**	**3**	**1**	**0**	**0**	**0**	**10**	**74**	**210**	**70**	**1**	**2**	**2**	**0**	**0**	**0**	**11**	**41**	**287**	**88**	**1**	**3**	**3**	**0**	**0**	**0**	**10**	**1193**
17:30	**26**	**118**	**19**	**1**	**0**	**3**	**0**	**0**	**0**	**9**	**60**	**147**	**23**	**1**	**3**	**0**	**0**	**0**	**0**	**14**	**75**	**239**	**64**	**2**	**2**	**3**	**0**	**0**	**0**	**7**	**63**	**262**	**73**	**0**	**4**	**2**	**0**	**0**	**0**	**11**	**1231**
17:45	**26**	**143**	**15**	**1**	**0**	**0**	**0**	**0**	**0**	**6**	**50**	**108**	**23**	**0**	**1**	**1**	**0**	**0**	**0**	**14**	**74**	**221**	**74**	**1**	**2**	**3**	**0**	**0**	**0**	**12**	**48**	**234**	**72**	**1**	**7**	**0**	**0**	**0**	**0**	**8**	**1145**
18:00	**30**	**140**	**23**	**2**	**1**	**0**	**0**	**0**	**0**	**3**	**63**	**119**	**18**	**0**	**5**	**0**	**0**	**0**	**0**	**10**	**79**	**226**	**70**	**2**	**1**	**2**	**0**	**0**	**0**	**2**	**65**	**229**	**97**	**0**	**4**	**2**	**0**	**0**	**0**	**5**	**1198**
18:15	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*
18:30	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*

TMC Tabular Report

Liverpool Rd (R.R.29) @ Glenanna Dr

TMC No: 0290500000 **Intersection ID:** 10011 **Count ID:** 35702016391 **Count Date:** 04/09/2016, Sat





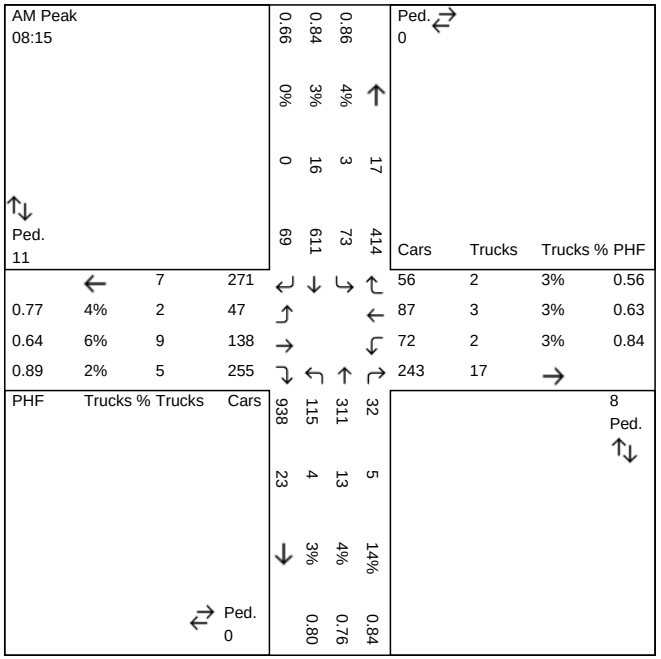
Liverpool Rd (R.R.29) @ Glenanna Dr

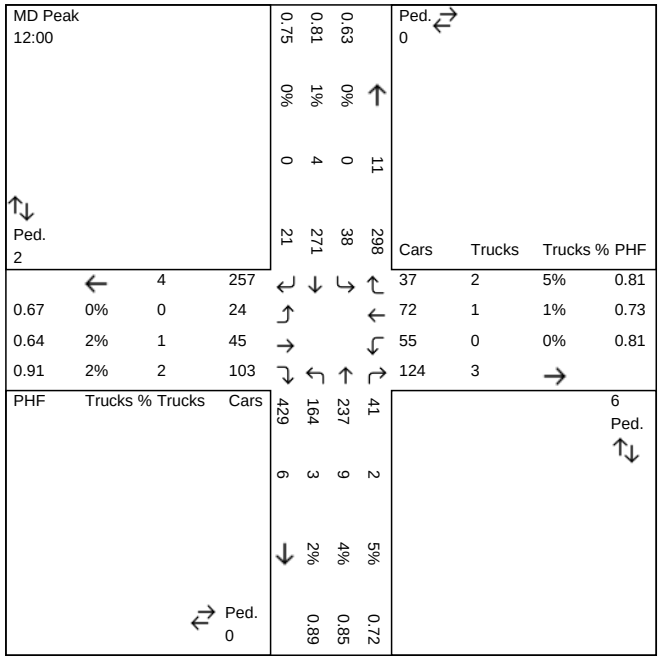
TMC No: 0290500000 **Intersection ID:** 10011 **Count ID:** 35702016391 **Count Date:** 04/09/2016, Sat

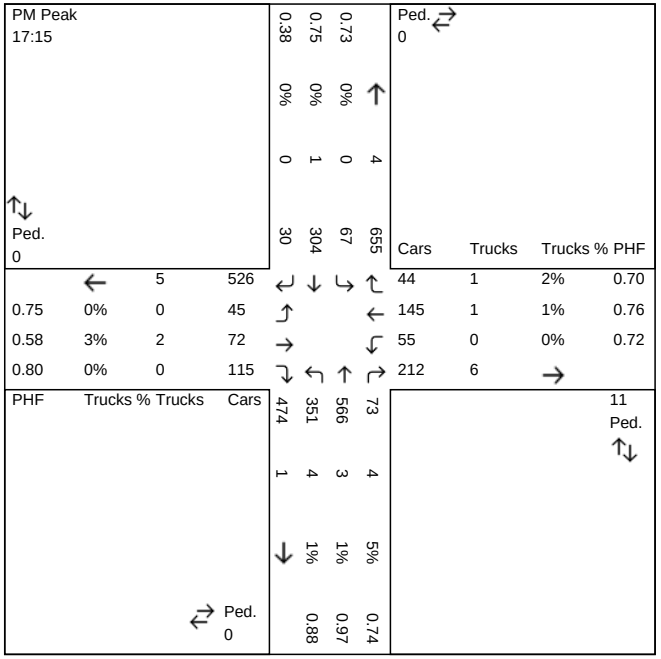
Time	NORTH APPROACH										EAST APPROACH										SOUTH APPROACH										WEST APPROACH										Total
	Cars			Trucks			Heavies			Ped	Cars			Trucks			Heavies			Ped	Cars			Trucks			Heavies			Ped	Cars			Trucks			Heavies			Ped	
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right		
10:15	12	115	6	1	0	0	0	0	0	2	22	26	16	0	0	0	0	0	0	1	36	55	8	0	0	0	0	0	0	0	2	32	32	0	0	0	0	0	0	4	370
10:30	23	79	9	0	1	0	0	0	0	2	17	19	6	1	0	0	0	0	0	0	43	61	15	0	0	1	0	0	0	0	2	34	43	0	0	1	0	0	0	1	358
10:45	6	77	7	0	0	0	0	0	0	0	21	28	11	0	0	1	0	0	0	3	35	57	13	1	0	1	0	0	0	1	6	35	41	0	0	0	0	0	0	3	347
11:00	15	91	5	0	0	0	0	0	0	0	17	32	7	0	1	0	0	0	0	2	41	56	9	0	1	0	0	0	0	2	6	46	49	0	0	1	0	0	0	1	382
11:15	12	73	3	0	2	0	0	0	0	3	27	25	15	0	0	0	0	0	0	0	34	62	18	0	1	1	0	0	0	2	8	35	44	0	1	0	0	0	0	5	371
11:30	15	91	7	0	0	0	0	0	0	1	20	27	6	0	1	0	0	0	0	1	46	71	19	1	2	0	0	0	0	1	2	33	36	0	0	1	0	0	0	2	383
11:45	16	80	4	0	0	0	0	0	0	1	31	26	15	0	0	0	0	0	0	1	42	66	14	1	0	1	0	0	0	0	9	47	50	0	0	0	0	0	0	3	407
12:00	**13**	**87**	**6**	**0**	**0**	**0**	**0**	**0**	**0**	**4**	**20**	**35**	**12**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**49**	**92**	**8**	**1**	**0**	**1**	**0**	**0**	**0**	**5**	**1**	**44**	**46**	**0**	**0**	**1**	**0**	**0**	**0**	**2**	**428**
12:15	**15**	**121**	**5**	**0**	**0**	**0**	**0**	**0**	**0**	**6**	**18**	**31**	**12**	**0**	**0**	**0**	**0**	**0**	**0**	**4**	**55**	**76**	**20**	**0**	**0**	**1**	**0**	**0**	**0**	**3**	**1**	**42**	**42**	**0**	**0**	**0**	**0**	**0**	**0**	**7**	**459**
12:30	**24**	**71**	**5**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**24**	**35**	**10**	**1**	**0**	**0**	**0**	**0**	**0**	**1**	**50**	**61**	**17**	**0**	**1**	**0**	**0**	**0**	**0**	**3**	**8**	**45**	**54**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**412**
12:45	**23**	**79**	**6**	**0**	**0**	**0**	**0**	**0**	**0**	**6**	**20**	**31**	**18**	**0**	**0**	**1**	**0**	**0**	**0**	**1**	**44**	**68**	**17**	**1**	**0**	**2**	**0**	**0**	**0**	**0**	**6**	**44**	**50**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**418**
13:00	12	90	7	0	0	0	0	0	0	1	18	35	14	0	0	0	0	0	0	0	54	75	25	0	1	0	0	0	0	2	4	41	45	0	0	1	0	0	0	0	425
13:15	15	83	3	0	0	0	0	0	0	2	18	42	12	0	0	0	0	0	0	1	41	69	14	0	1	1	0	0	0	1	9	38	40	0	1	0	0	0	0	2	393
13:30	16	65	3	0	0	0	0	0	0	4	13	39	18	0	0	0	0	0	0	1	45	71	16	1	0	0	0	0	0	2	3	54	37	0	0	0	0	0	0	3	391
13:45	16	78	7	0	1	0	0	0	0	2	13	31	11	0	0	1	0	0	0	2	64	82	12	0	0	1	0	0	0	1	8	48	30	0	0	0	0	0	0	2	410
14:00	14	75	9	0	0	0	0	0	0	2	16	32	14	0	0	0	0	0	0	4	44	68	17	0	0	0	0	0	0	3	2	41	44	0	0	1	0	0	0	3	389
14:15	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	1*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	3*	0*	0*	0*	0*	0*	0*	0*	4*

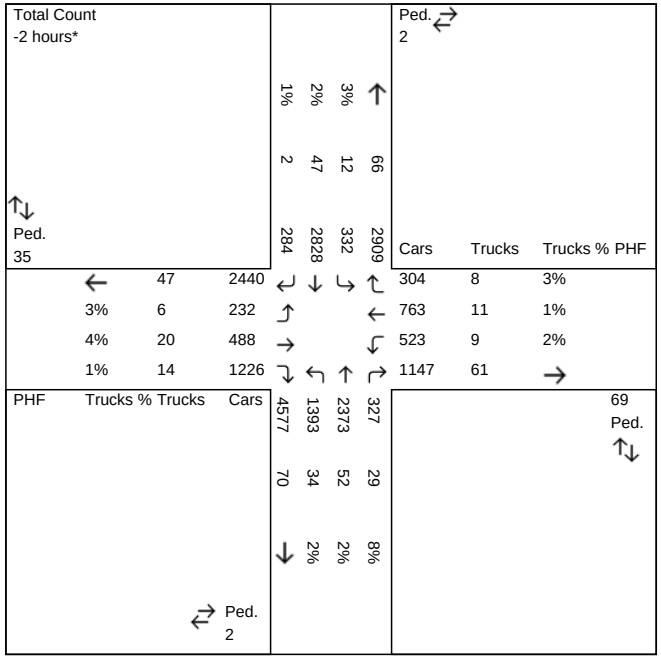
Liverpool Rd (R.R.29) @ Glenanna Dr

TMC No: 0290500000 **Intersection ID:** 10011 **Count ID:** 35702016736 **Count Date:** 06/14/2017, Wed









TMC 15 Min Report

Liverpool Rd (R.R.29) @ Glenanna Dr

TMC No: 0290500000 **Intersection ID:** 10011 **Count ID:** 35702016736 **Count Date:** 06/14/2017, Wed

Time	NORTH APPROACH										EAST APPROACH										SOUTH APPROACH										WEST APPROACH										Total
	Cars			Trucks			Heavies			Ped	Cars			Trucks			Heavies			Ped	Cars			Trucks			Heavies			Ped	Cars			Trucks			Heavies			Ped	
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right		
Period 1																																								
06:15	1	72	11	0	1	0	0	0	0	0	19	3	5	0	0	0	0	0	0	0	5	17	1	1	0	0	0	0	0	0	1	3	40	0	1	1	0	0	0	0	182
06:30	2	72	7	0	0	0	0	0	0	0	21	9	6	0	0	0	0	0	0	0	15	19	2	0	0	0	0	0	0	0	2	2	41	0	0	0	0	0	0	0	198
06:45	1	109	6	0	0	0	0	0	0	0	30	7	7	0	0	0	0	0	0	1	5	34	5	1	0	2	0	0	0	0	3	8	59	0	1	0	0	0	0	1	280
07:00	4	96	9	0	0	0	0	0	0	0	20	3	4	0	0	0	0	0	0	0	20	55	4	1	0	1	0	0	0	0	1	6	58	0	0	0	0	0	1	1	284
07:15	1	117	10	2	0	0	0	0	0	0	27	16	10	0	0	1	0	0	0	0	14	38	7	1	3	1	0	0	0	0	3	8	52	0	0	0	0	0	0	1	312
07:30	5	168	12	1	1	0	0	0	0	2	31	8	7	0	0	1	0	0	0	0	29	61	9	2	3	1	0	0	0	2	4	13	89	0	0	1	0	0	0	1	451
07:45	3	141	1	1	1	0	0	0	0	0	25	17	10	0	1	0	0	0	0	1	27	61	5	2	3	1	0	0	0	0	7	13	55	0	1	0	0	0	0	1	377
08:00	10	133	14	1	1	0	0	0	0	0	30	13	9	2	0	1	0	0	0	2	23	70	5	0	3	1	0	0	0	0	7	23	67	0	0	0	0	0	0	1	416
08:15	**20**	**154**	**11**	**2**	**6**	**0**	**0**	**0**	**0**	**0**	**22**	**15**	**7**	**0**	**3**	**1**	**0**	**0**	**0**	**0**	**36**	**98**	**5**	**1**	**8**	**1**	**0**	**0**	**0**	**0**	**16**	**25**	**73**	**0**	**2**	**0**	**0**	**0**	**0**	**1**	**507**
08:30	**21**	**184**	**26**	**1**	**2**	**0**	**0**	**0**	**0**	**0**	**16**	**17**	**26**	**0**	**0**	**0**	**0**	**0**	**0**	**5**	**29**	**78**	**9**	**0**	**1**	**2**	**0**	**0**	**0**	**0**	**14**	**18**	**52**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**503**
08:45	**16**	**158**	**17**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**15**	**36**	**12**	**1**	**0**	**0**	**0**	**0**	**0**	**3**	**26**	**64**	**9**	**2**	**1**	**2**	**0**	**0**	**0**	**0**	**5**	**53**	**62**	**0**	**4**	**2**	**0**	**0**	**0**	**6**	**496**
09:00	**16**	**115**	**15**	**0**	**6**	**0**	**0**	**0**	**0**	**0**	**19**	**19**	**11**	**1**	**0**	**1**	**0**	**0**	**0**	**0**	**24**	**71**	**9**	**1**	**3**	**0**	**0**	**0**	**0**	**0**	**12**	**42**	**68**	**2**	**3**	**3**	**0**	**0**	**0**	**2**	**443**
09:15	0*	3*	1*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	1*	0*	0*	0*	0*	0*	0*	0*	5*
Period 2																																								
11:45	9	58	12	0	1	0	0	0	0	0	11	14	11	1	1	0	0	0	0	2	34	56	9	1	1	2	0	0	0	0	11	19	26	0	0	0	0	0	0	0	279
12:00	**15**	**85**	**7**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**14**	**20**	**8**	**0**	**0**	**1**	**0**	**0**	**0**	**1**	**46**	**69**	**11**	**1**	**2**	**0**	**0**	**0**	**0**	**0**	**4**	**9**	**21**	**0**	**0**	**1**	**0**	**0**	**0**	**2**	**317**
12:15	**5**	**52**	**4**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**11**	**8**	**12**	**0**	**1**	**0**	**0**	**0**	**0**	**3**	**36**	**53**	**8**	**0**	**4**	**1**	**0**	**0**	**0**	**0**	**6**	**17**	**27**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**251**
12:30	**5**	**62**	**3**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**13**	**25**	**7**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**39**	**44**	**8**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**5**	**6**	**29**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**251**
12:45	**13**	**72**	**7**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**17**	**19**	**10**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**43**	**71**	**14**	**2**	**1**	**1**	**0**	**0**	**0**	**0**	**9**	**13**	**26**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**321**
13:00	9	58	6	1	1	0	0	0	0	0	18	15	10	0	0	0	0	0	0	1	30	44	11	2	0	1	0	0	0	0	6	10	23	0	0	0	0	0	0	0	246
13:15	8	60	6	1	2	0	0	0	0	0	10	26	4	0	0	0	0	0	0	1	45	53	13	2	3	0	0	0	0	0	6	14	27	0	0	0	0	0	0	0	281
13:30	5	61	10	0	0	0	0	0	0	0	11	15	11	0	0	0	0	0	0	2	34	49	13	0	0	1	0	0	0	0	7	12	27	0	0	1	0	0	0	0	259
Period 3																																								
13:45	0*	2*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	4*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	2*	0*	0*	0*	0*	0*	0*	0*	8*
15:15	12	62	7	1	1	0	0	0	0	0	16	36	14	0	2	0	0	0	0	0	14	44	71	10	4	1	1	0	0	0	3	5	15	0	1	0	0	0	0	8	328
15:30	12	56	13	1	1	0	0	0	0	0	15	25	17	0	0	0	0	0	0	0	3	58	85	13	1	3	0	0	0	0	6	16	23	2	3	1	0	0	0	0	354
15:45	18	60	9	0	5	1	0	0	0	0	9	26	4	0	1	0	0	0	0	0	7	37	78	10	2	2	1	0	0	0	15	10	28	2	0	0	0	0	0	1	326
16:00	10	73	14	0	3	0	0	0	0	0	5	33	7	1	0	0	0	0	0	0	0	55	78	10	0	2	1	0	0	0	6	7	26	0	0	0	0	0	0	2	333
16:15	5	39	3	0	2	1	0	0	0	0	5	33	9	1	1	0	0	0	0	0	5	60	77	10	2	0	1	0	0	0	7	7	14	0	0	0	0	0	0	2	284
16:30	12	60	4	0	5	0	0	0	0	0	11	41	3	0	0	0	0	0	0	3	78	105	16	0	1	1	0	0	0	0	8	17	21	0	1	0	0	0	0	3	390
16:45	10	66	5	0	1	0	0	0	0	0	14	61	10	2	0	0	0	0	0	0	72	117	16	1	0	2	0	0	0	0	7	13	24	0	0	1	0	0	0	0	422
17:00	17	81	5	0	0	0	0	0	0	0	13	58	9	0	0	0	0	0	0	2	78	91	12	0	2	0	0	0	0	0	6	27	38	0	0	1	0	0	0	0	440
17:15	**16**	**58**	**4**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**11**	**25**	**6**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**87**	**142**	**17**	**2**	**1**	**1**	**0**	**0**	**0**	**0**	**15**	**9**	**20**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**417**
17:30	**16**	**78**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**19**	**42**	**12**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**81**	**137**	**14**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**7**	**11**	**25**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**445**
17:45	**23**	**66**	**20**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**15**	**47**	**10**	**0**	**1**	**1**	**0**	**0**	**0**	**7**	**100**	**141**	**17**	**1**	**1**	**1**	**0**	**0**	**0**	**0**	**10**	**21**	**36**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**518**
18:00	**12**	**102**	**4**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**10**	**31**	**16**	**0**	**0**	**0**	**0**	**0**	**0**	**3**	**83**	**146**	**25**	**1**	**1**	**1**	**0**	**0**	**0**	**0**	**13**	**31**	**34**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**514**
18:15	0*	0*	1*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	1*	0*	1*	0*	0*	0*	0*	0*	0*	0*	3*

LEA Consulting Ltd

9th Floor, 625 COchrane Drive
Markham, Ontario, L3R 9R9

Project No: 19225.200
Location: Liverppol+North Site Access
Weather: Good
Surveyor(s): BW + MY

File Name : 19225_Liverpool_1294Kingston NorthAll
Site Code : 19225130
Start Date : 2019-03-19
Page No : 1

Groups Printed- Cars - Trucks - Buses

	Liverpool Road Southbound					Private Access Westbound					Liverpool Road Northbound					1848-1852 Liverpool Rd. North Dwy. Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
07:00	15	182	5	0	202	18	0	9	2	29	2	53	16	0	71	0	0	1	0	1	303
07:15	15	221	2	1	239	23	0	12	2	37	6	68	22	0	96	0	0	3	0	3	375
07:30	10	194	3	1	208	17	0	10	0	27	3	75	27	0	105	0	0	2	0	2	342
07:45	21	202	4	0	227	28	0	15	2	45	2	101	24	0	127	1	0	0	1	2	401
Total	61	799	14	2	876	86	0	46	6	138	13	297	89	0	399	1	0	6	1	8	1421
08:00	32	234	2	0	268	35	2	12	2	51	6	67	28	0	101	1	0	3	1	5	425
08:15	24	198	4	0	226	19	1	17	6	43	5	70	35	0	110	0	0	3	0	3	382
08:30	18	168	2	0	188	28	0	16	1	45	6	68	46	0	120	0	2	3	0	5	358
08:45	23	189	6	1	219	23	0	16	5	44	2	80	50	1	133	2	1	1	3	7	403
Total	97	789	14	1	901	105	3	61	14	183	19	285	159	1	464	3	3	10	4	20	1568
09:00	26	141	3	0	170	32	0	15	5	52	3	58	58	0	119	1	0	0	0	1	342
09:15	21	131	0	0	152	23	1	18	3	45	1	57	54	1	113	0	0	1	0	1	311
09:30	19	134	3	0	156	28	0	22	3	53	3	57	40	0	100	1	0	0	3	4	313
09:45	18	98	1	0	117	33	0	17	1	51	0	41	42	0	83	0	1	2	4	7	258
Total	84	504	7	0	595	116	1	72	12	201	7	213	194	1	415	2	1	3	7	13	1224
10:00	13	86	2	0	101	34	0	6	3	43	3	55	35	0	93	0	1	2	0	3	240
10:15	15	88	2	1	106	33	1	13	5	52	3	42	29	0	74	1	1	0	0	2	234
10:30	19	87	1	0	107	23	0	18	8	49	4	54	43	0	101	0	2	1	1	4	261
10:45	22	92	1	0	115	39	1	13	4	57	6	66	62	0	134	1	0	0	1	2	308
Total	69	353	6	1	429	129	2	50	20	201	16	217	169	0	402	2	4	3	2	11	1043
11:00	29	76	1	0	106	34	0	16	5	55	0	75	54	0	129	0	0	2	0	2	292
11:15	9	94	0	0	103	35	1	18	3	57	4	80	45	0	129	0	0	2	1	3	292
11:30	13	86	1	1	101	32	0	24	4	60	3	76	62	0	141	1	1	0	0	2	304
11:45	11	104	0	1	116	41	0	16	4	61	3	89	81	0	173	0	0	1	1	2	352
Total	62	360	2	2	426	142	1	74	16	233	10	320	242	0	572	1	1	5	2	9	1240
12:00	18	85	1	0	104	52	4	18	8	82	3	99	56	0	158	1	1	0	1	3	347
12:15	15	92	0	1	108	50	0	29	1	80	3	88	68	0	159	0	1	2	1	4	351
12:30	15	87	2	0	104	45	1	19	4	69	3	88	59	1	151	2	1	3	4	10	334
12:45	23	107	2	0	132	50	1	25	6	82	2	62	55	0	119	0	1	1	2	4	337
Total	71	371	5	1	448	197	6	91	19	313	11	337	238	1	587	3	4	6	8	21	1369
13:00	11	73	6	0	90	48	1	20	2	71	1	82	56	0	139	1	0	1	2	4	304
13:15	12	72	6	1	91	40	0	22	5	67	2	72	58	0	132	0	0	2	1	3	293
13:30	11	78	1	0	90	43	1	19	3	66	6	103	49	0	158	2	0	2	0	4	318
13:45	15	97	1	0	113	33	0	13	5	51	3	84	69	0	156	2	1	0	3	6	326
Total	49	320	14	1	384	164	2	74	15	255	12	341	232	0	585	5	1	5	6	17	1241
14:00	13	95	1	0	109	40	0	21	6	67	1	96	49	0	146	2	0	0	3	5	327
14:15	24	104	6	0	134	33	1	22	7	63	2	97	49	1	149	1	0	1	0	2	348
14:30	15	97	0	0	112	39	1	23	42	105	5	95	51	0	151	1	1	4	1	7	375
14:45	14	88	3	1	106	37	1	33	13	84	2	108	73	0	183	2	0	2	3	7	380
Total	66	384	10	1	461	149	3	99	68	319	10	396	222	1	629	6	1	7	7	21	1430
15:00	14	93	1	1	109	35	1	32	10	78	2	133	46	0	181	0	1	1	5	7	375
15:15	15	67	1	0	83	31	0	20	3	54	5	141	67	0	213	2	0	3	3	8	358
15:30	17	104	3	0	124	42	0	18	9	69	4	152	70	0	226	0	0	3	3	6	425
15:45	13	121	3	0	137	34	1	23	7	65	5	138	52	0	195	4	2	1	2	9	406
Total	59	385	8	1	453	142	2	93	29	266	16	564	235	0	815	6	3	8	13	30	1564

LEA Consulting Ltd

9th Floor, 625 COchrane Drive
Markham, Ontario, L3R 9R9

Project No: 19225.200
Location: Liverppol+North Site Access
Weather: Good
Surveyor(s): BW + MY

File Name : 19225_Liverpool_1294Kingston NorthAll
Site Code : 19225130
Start Date : 2019-03-19
Page No : 2

Groups Printed- Cars - Trucks - Buses

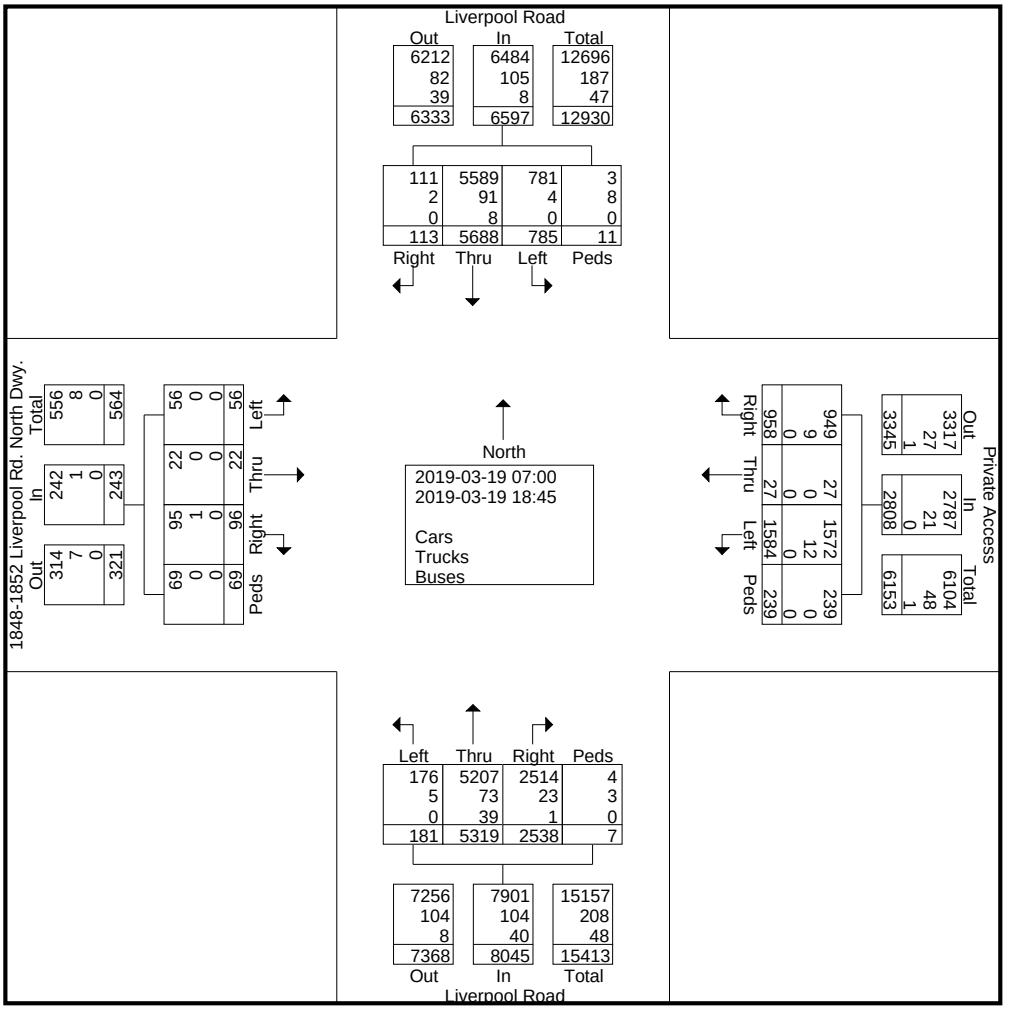
	Liverpool Road Southbound					Private Access Westbound					Liverpool Road Northbound					1848-1852 Liverpool Rd. North Dwy. Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
16:00	15	104	0	0	119	31	1	27	3	62	3	145	53	0	201	3	0	0	0	3	385
16:15	13	109	3	0	125	24	0	24	2	50	0	158	55	0	213	0	0	1	3	4	392
16:30	13	93	5	0	111	29	0	23	1	53	7	226	76	1	310	1	1	3	1	6	480
16:45	12	106	2	0	120	35	1	21	7	64	7	171	61	0	239	2	1	2	2	7	430
Total	53	412	10	0	475	119	2	95	13	229	17	700	245	1	963	6	2	6	6	20	1687
17:00	17	121	3	0	141	28	1	30	5	64	5	221	56	0	282	1	0	7	2	10	497
17:15	10	122	7	1	140	31	1	38	3	73	9	252	74	1	336	1	0	6	0	7	556
17:30	8	101	5	0	114	27	1	17	4	49	10	241	72	0	323	9	0	4	1	14	500
17:45	15	149	1	0	165	28	1	23	3	55	12	234	62	0	308	3	0	9	3	15	543
Total	50	493	16	1	560	114	4	108	15	241	36	948	264	1	1249	14	0	26	6	46	2096
18:00	24	148	3	0	175	31	0	25	0	56	6	203	74	1	284	2	0	6	2	10	525
18:15	17	161	1	0	179	31	1	24	6	62	3	173	62	0	238	3	1	3	0	7	486
18:30	10	99	1	0	110	24	0	22	2	48	2	162	66	0	230	2	0	1	1	4	392
18:45	13	110	2	0	125	35	0	24	4	63	3	163	47	0	213	0	1	1	4	6	407
Total	64	518	7	0	589	121	1	95	12	229	14	701	249	1	965	7	2	11	7	27	1810
Grand Total	785	5688	113	11	6597	1584	27	958	239	2808	181	5319	2538	7	8045	56	22	96	69	243	17693
Apprch %	11.9	86.2	1.7	0.2		56.4	1	34.1	8.5		2.2	66.1	31.5	0.1		23	9.1	39.5	28.4		
Total %	4.4	32.1	0.6	0.1	37.3	9	0.2	5.4	1.4	15.9	1	30.1	14.3	0	45.5	0.3	0.1	0.5	0.4	1.4	
Cars	781	5589	111	3	6484	1572	27	949	239	2787	176	5207	2514	4	7901	56	22	95	69	242	17414
% Cars	99.5	98.3	98.2	27.3	98.3	99.2	100	99.1	100	99.3	97.2	97.9	99.1	57.1	98.2	100	100	99	100	99.6	98.4
Trucks	4	91	2	8	105	12	0	9	0	21	5	73	23	3	104	0	0	1	0	1	231
% Trucks	0.5	1.6	1.8	72.7	1.6	0.8	0	0.9	0	0.7	2.8	1.4	0.9	42.9	1.3	0	0	1	0	0.4	1.3
Buses	0	8	0	0	8	0	0	0	0	0	0	39	1	0	40	0	0	0	0	0	48
% Buses	0	0.1	0	0	0.1	0	0	0	0	0	0	0.7	0	0	0.5	0	0	0	0	0	0.3

LEA Consulting Ltd

9th Floor, 625 COchrane Drive
Markham, Ontario, L3R 9R9

Project No: 19225.200
Location: Liverppol+North Site Access
Weather: Good
Surveyor(s): BW + MY

File Name : 19225_Liverpool_1294Kingston NorthAll
Site Code : 19225130
Start Date : 2019-03-19
Page No : 3



LEA Consulting Ltd

9th Floor, 625 COchrane Drive
Markham, Ontario, L3R 9R9

Project No: 19225.200
Location: Liverppol+North Site Access
Weather: Good
Surveyor(s): BW + MY

File Name : 19225_Liverpool_1294Kingston NorthAll
Site Code : 19225130
Start Date : 2019-03-19
Page No : 1

Groups Printed- Cars

	Liverpool Road Southbound					Private Access Westbound					Liverpool Road Northbound					1848-1852 Liverpool Rd. North Dwy. Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
07:00	15	182	5	0	202	18	0	9	2	29	2	49	16	0	67	0	0	1	0	1	299
07:15	15	221	2	0	238	22	0	12	2	36	6	65	22	0	93	0	0	3	0	3	370
07:30	10	194	3	0	207	17	0	10	0	27	3	67	27	0	97	0	0	2	0	2	333
07:45	21	197	4	0	222	28	0	15	2	45	2	96	23	0	121	1	0	0	1	2	390
Total	61	794	14	0	869	85	0	46	6	137	13	277	88	0	378	1	0	6	1	8	1392
08:00	32	230	1	0	263	35	2	11	2	50	6	65	28	0	99	1	0	3	1	5	417
08:15	24	197	4	0	225	19	1	17	6	43	4	70	35	0	109	0	0	2	0	2	379
08:30	18	166	2	0	186	28	0	16	1	45	6	60	45	0	111	0	2	3	0	5	347
08:45	23	180	6	1	210	23	0	16	5	44	2	79	49	0	130	2	1	1	3	7	391
Total	97	773	13	1	884	105	3	60	14	182	18	274	157	0	449	3	3	9	4	19	1534
09:00	26	141	3	0	170	32	0	15	5	52	3	58	57	0	118	1	0	0	0	1	341
09:15	20	128	0	0	148	23	1	18	3	45	1	55	53	1	110	0	0	1	0	1	304
09:30	19	132	3	0	154	28	0	21	3	52	3	55	39	0	97	1	0	0	3	4	307
09:45	18	97	1	0	116	33	0	17	1	51	0	40	42	0	82	0	1	2	4	7	256
Total	83	498	7	0	588	116	1	71	12	200	7	208	191	1	407	2	1	3	7	13	1208
10:00	13	85	2	0	100	34	0	6	3	43	2	54	34	0	90	0	1	2	0	3	236
10:15	15	87	2	1	105	33	1	13	5	52	3	40	28	0	71	1	1	0	0	2	230
10:30	19	86	1	0	106	23	0	18	8	49	4	51	43	0	98	0	2	1	1	4	257
10:45	22	89	1	0	112	38	1	13	4	56	5	65	61	0	131	1	0	0	1	2	301
Total	69	347	6	1	423	128	2	50	20	200	14	210	166	0	390	2	4	3	2	11	1024
11:00	28	74	1	0	103	34	0	15	5	54	0	73	53	0	126	0	0	2	0	2	285
11:15	8	91	0	0	99	35	1	18	3	57	4	80	44	0	128	0	0	2	1	3	287
11:30	13	85	1	0	99	31	0	23	4	58	3	71	60	0	134	1	1	0	0	2	293
11:45	11	102	0	0	113	40	0	15	4	59	3	87	81	0	171	0	0	1	1	2	345
Total	60	352	2	0	414	140	1	71	16	228	10	311	238	0	559	1	1	5	2	9	1210
12:00	18	82	1	0	101	52	4	18	8	82	3	97	56	0	156	1	1	0	1	3	342
12:15	15	90	0	0	105	50	0	29	1	80	3	85	66	0	154	0	1	2	1	4	343
12:30	15	85	2	0	102	45	1	19	4	69	3	83	58	0	144	2	1	3	4	10	325
12:45	23	103	2	0	128	49	1	25	6	81	2	61	55	0	118	0	1	1	2	4	331
Total	71	360	5	0	436	196	6	91	19	312	11	326	235	0	572	3	4	6	8	21	1341
13:00	11	72	6	0	89	46	1	20	2	69	1	81	56	0	138	1	0	1	2	4	300
13:15	12	69	6	0	87	40	0	21	5	66	2	71	58	0	131	0	0	2	1	3	287
13:30	11	75	1	0	87	43	1	19	3	66	6	100	46	0	152	2	0	2	0	4	309
13:45	15	94	1	0	110	32	0	13	5	50	3	83	69	0	155	2	1	0	3	6	321
Total	49	310	14	0	373	161	2	73	15	251	12	335	229	0	576	5	1	5	6	17	1217
14:00	13	91	1	0	105	40	0	20	6	66	1	92	48	0	141	2	0	0	3	5	317
14:15	24	101	6	0	131	33	1	22	7	63	2	95	49	0	146	1	0	1	0	2	342
14:30	15	91	0	0	106	39	1	22	42	104	4	90	51	0	145	1	1	4	1	7	362
14:45	14	84	3	0	101	37	1	33	13	84	2	105	73	0	180	2	0	2	3	7	372
Total	66	367	10	0	443	149	3	97	68	317	9	382	221	0	612	6	1	7	7	21	1393
15:00	14	91	1	0	106	34	1	32	10	77	2	128	46	0	176	0	1	1	5	7	366
15:15	15	66	1	0	82	30	0	20	3	53	4	139	67	0	210	2	0	3	3	8	353
15:30	17	98	3	0	118	42	0	18	9	69	4	147	70	0	221	0	0	3	3	6	414
15:45	13	118	2	0	133	34	1	23	7	65	5	137	52	0	194	4	2	1	2	9	401
Total	59	373	7	0	439	140	2	93	29	264	15	551	235	0	801	6	3	8	13	30	1534

LEA Consulting Ltd
9th Floor, 625 COchrane Drive
Markham, Ontario, L3R 9R9

Project No: 19225.200
Location: Liverppol+North Site Access
Weather: Good
Surveyor(s): BW + MY

File Name : 19225_Liverpool_1294Kingston NorthAll
Site Code : 19225130
Start Date : 2019-03-19

Groups Printed- Cars

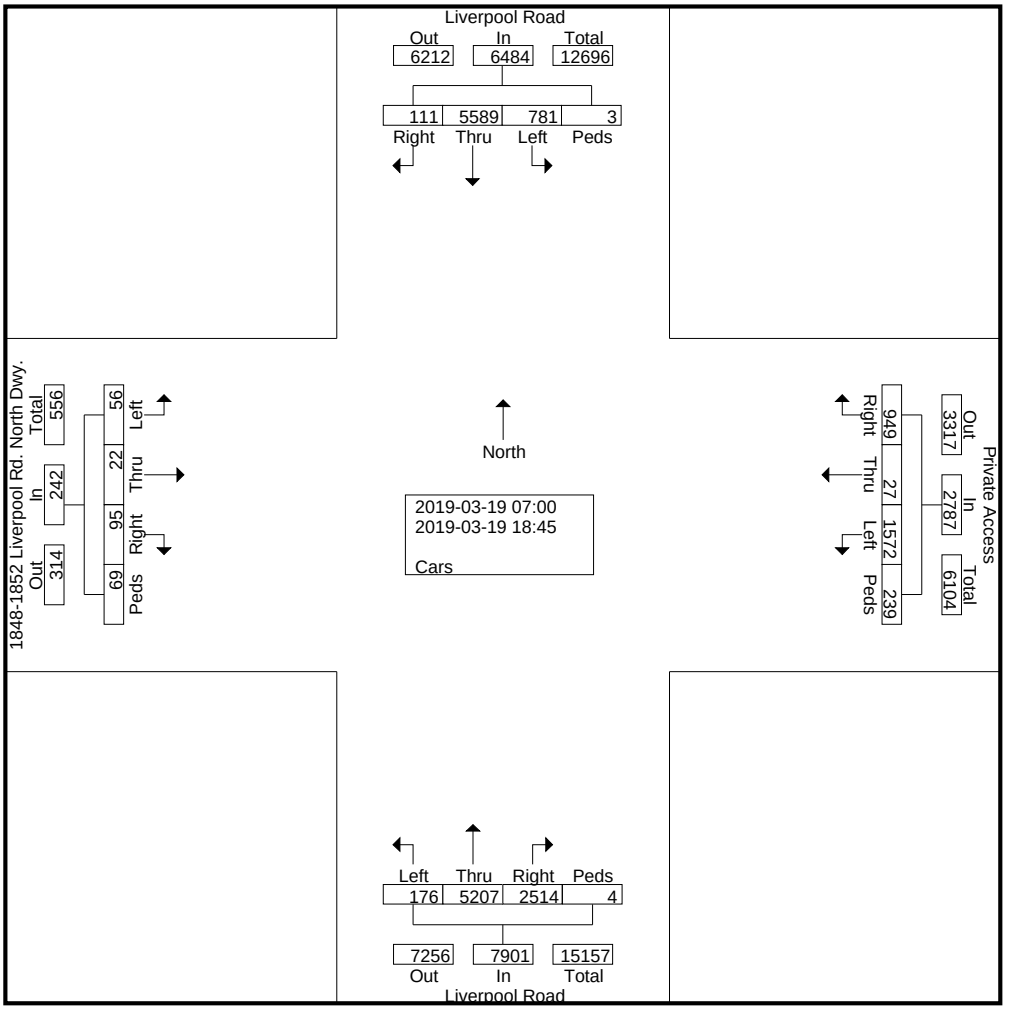
	Liverpool Road Southbound					Private Access Westbound					Liverpool Road Northbound					1848-1852 Liverpool Rd. North Dwy. Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
16:00	15	104	0	0	119	31	1	27	3	62	3	140	52	0	195	3	0	0	0	3	379
16:15	13	106	3	0	122	23	0	24	2	49	0	157	54	0	211	0	0	1	3	4	386
16:30	13	90	5	0	108	29	0	23	1	53	7	224	75	1	307	1	1	3	1	6	474
16:45	11	105	2	0	118	35	1	20	7	63	7	171	61	0	239	2	1	2	2	7	427
Total	52	405	10	0	467	118	2	94	13	227	17	692	242	1	952	6	2	6	6	20	1666
17:00	17	120	3	0	140	28	1	30	5	64	5	220	56	0	281	1	0	7	2	10	495
17:15	10	122	7	1	140	31	1	38	3	73	9	251	74	1	335	1	0	6	0	7	555
17:30	8	101	5	0	114	27	1	17	4	49	10	239	71	0	320	9	0	4	1	14	497
17:45	15	149	1	0	165	27	1	23	3	54	12	233	62	0	307	3	0	9	3	15	541
Total	50	492	16	1	559	113	4	108	15	240	36	943	263	1	1243	14	0	26	6	46	2088
18:00	24	148	3	0	175	31	0	25	0	56	6	202	74	1	283	2	0	6	2	10	524
18:15	17	161	1	0	179	31	1	24	6	62	3	172	62	0	237	3	1	3	0	7	485
18:30	10	99	1	0	110	24	0	22	2	48	2	161	66	0	229	2	0	1	1	4	391
18:45	13	110	2	0	125	35	0	24	4	63	3	163	47	0	213	0	1	1	4	6	407
Total	64	518	7	0	589	121	1	95	12	229	14	698	249	1	962	7	2	11	7	27	1807
Grand Total	781	5589	111	3	6484	1572	27	949	239	2787	176	5207	2514	4	7901	56	22	95	69	242	17414
Apprch %	12	86.2	1.7	0		56.4	1	34.1	8.6		2.2	65.9	31.8	0.1		23.1	9.1	39.3	28.5		
Total %	4.5	32.1	0.6	0	37.2	9	0.2	5.4	1.4	16	1	29.9	14.4	0	45.4	0.3	0.1	0.5	0.4	1.4	

LEA Consulting Ltd

9th Floor, 625 COchrane Drive
Markham, Ontario, L3R 9R9

Project No: 19225.200
Location: Liverppol+North Site Access
Weather: Good
Surveyor(s): BW + MY

File Name : 19225_Liverpool_1294Kingston NorthAll
Site Code : 19225130
Start Date : 2019-03-19
Page No : 3



LEA Consulting Ltd

9th Floor, 625 COchrane Drive
Markham, Ontario, L3R 9R9

Project No: 19225.200
Location: Liverppol+North Site Access
Weather: Good
Surveyor(s): BW + MY

File Name : 19225_Liverpool_1294Kingston NorthAll
Site Code : 19225130
Start Date : 2019-03-19
Page No : 1

Groups Printed- Trucks

	Liverpool Road Southbound					Private Access Westbound					Liverpool Road Northbound					1848-1852 Liverpool Rd. North Dwy. Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
07:00	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	2
07:15	0	0	0	1	1	1	0	0	0	1	0	3	0	0	3	0	0	0	0	0	5
07:30	0	0	0	1	1	0	0	0	0	0	0	6	0	0	6	0	0	0	0	0	7
07:45	0	4	0	0	4	0	0	0	0	0	0	5	1	0	6	0	0	0	0	0	10
Total	0	4	0	2	6	1	0	0	0	1	0	16	1	0	17	0	0	0	0	0	24
08:00	0	4	1	0	5	0	0	1	0	1	0	1	0	0	1	0	0	0	0	0	7
08:15	0	1	0	0	1	0	0	0	0	0	1	0	0	0	1	0	0	1	0	1	3
08:30	0	2	0	0	2	0	0	0	0	0	0	6	1	0	7	0	0	0	0	0	9
08:45	0	9	0	0	9	0	0	0	0	0	0	1	1	1	3	0	0	0	0	0	12
Total	0	16	1	0	17	0	0	1	0	1	1	8	2	1	12	0	0	1	0	1	31
*** BREAK ***																					
09:15	1	3	0	0	4	0	0	0	0	0	0	2	1	0	3	0	0	0	0	0	7
09:30	0	2	0	0	2	0	0	1	0	1	0	0	1	0	1	0	0	0	0	0	4
09:45	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1
Total	1	5	0	0	6	0	0	1	0	1	0	3	2	0	5	0	0	0	0	0	12
10:00	0	1	0	0	1	0	0	0	0	0	1	0	1	0	2	0	0	0	0	0	3
10:15	0	1	0	0	1	0	0	0	0	0	0	2	1	0	3	0	0	0	0	0	4
10:30	0	1	0	0	1	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	2
10:45	0	2	0	0	2	1	0	0	0	1	1	1	1	0	3	0	0	0	0	0	6
Total	0	5	0	0	5	1	0	0	0	1	2	4	3	0	9	0	0	0	0	0	15
11:00	1	2	0	0	3	0	0	1	0	1	0	1	1	0	2	0	0	0	0	0	6
11:15	1	3	0	0	4	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	5
11:30	0	1	0	1	2	1	0	1	0	2	0	3	2	0	5	0	0	0	0	0	9
11:45	0	1	0	1	2	1	0	1	0	2	0	2	0	0	2	0	0	0	0	0	6
Total	2	7	0	2	11	2	0	3	0	5	0	6	4	0	10	0	0	0	0	0	26
12:00	0	3	0	0	3	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	4
12:15	0	2	0	1	3	0	0	0	0	0	0	3	2	0	5	0	0	0	0	0	8
12:30	0	2	0	0	2	0	0	0	0	0	0	3	1	1	5	0	0	0	0	0	7
12:45	0	3	0	0	3	1	0	0	0	1	0	1	0	0	1	0	0	0	0	0	5
Total	0	10	0	1	11	1	0	0	0	1	0	8	3	1	12	0	0	0	0	0	24
13:00	0	1	0	0	1	2	0	0	0	2	0	0	0	0	0	0	0	0	0	0	3
13:15	0	3	0	1	4	0	0	1	0	1	0	1	0	0	1	0	0	0	0	0	6
13:30	0	3	0	0	3	0	0	0	0	0	0	1	3	0	4	0	0	0	0	0	7
13:45	0	3	0	0	3	1	0	0	0	1	0	1	0	0	1	0	0	0	0	0	5
Total	0	10	0	1	11	3	0	1	0	4	0	3	3	0	6	0	0	0	0	0	21
14:00	0	3	0	0	3	0	0	1	0	1	0	3	1	0	4	0	0	0	0	0	8
14:15	0	3	0	0	3	0	0	0	0	0	0	2	0	1	3	0	0	0	0	0	6
14:30	0	6	0	0	6	0	0	1	0	1	1	3	0	0	4	0	0	0	0	0	11
14:45	0	3	0	1	4	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	7
Total	0	15	0	1	16	0	0	2	0	2	1	11	1	1	14	0	0	0	0	0	32
15:00	0	2	0	1	3	1	0	0	0	1	0	4	0	0	4	0	0	0	0	0	8
15:15	0	1	0	0	1	1	0	0	0	1	1	2	0	0	3	0	0	0	0	0	5
15:30	0	5	0	0	5	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	8
15:45	0	3	1	0	4	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	5
Total	0	11	1	1	13	2	0	0	0	2	1	10	0	0	11	0	0	0	0	0	26

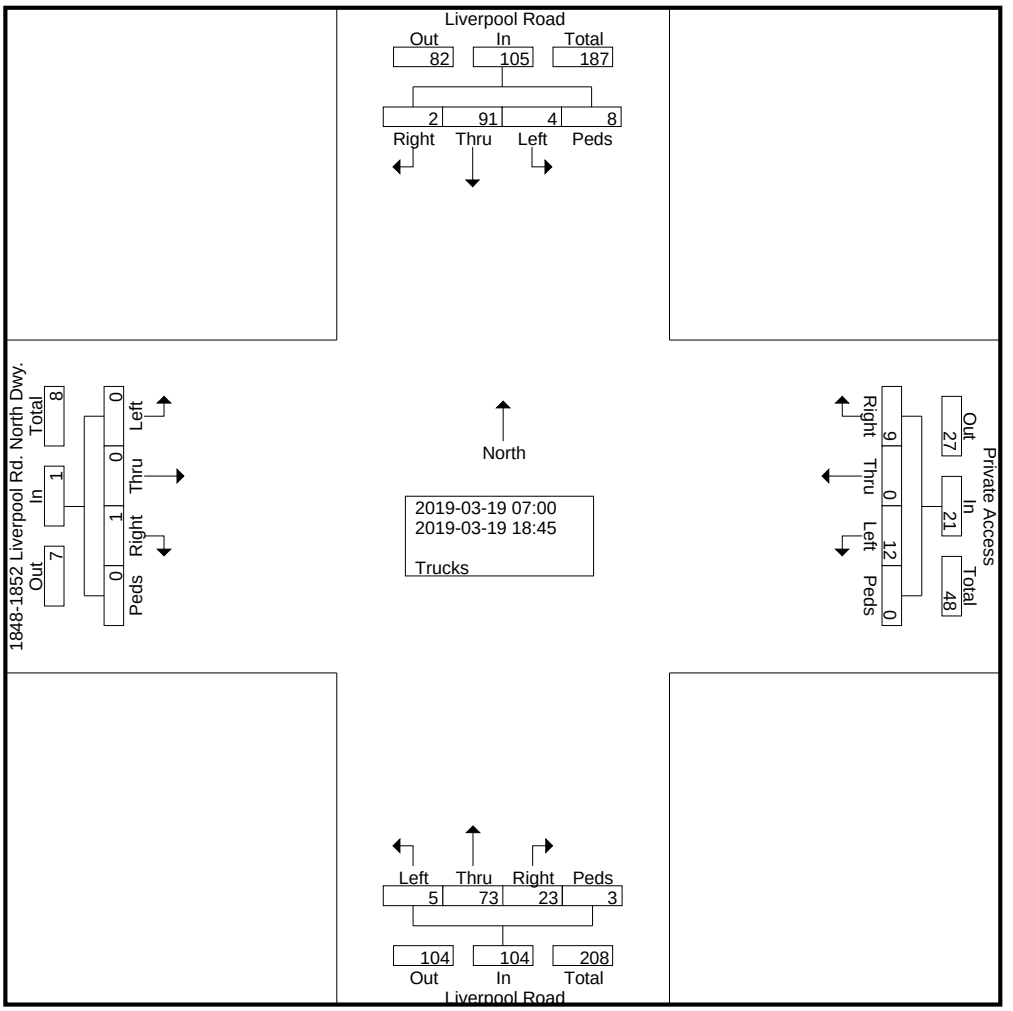
LEA Consulting Ltd
9th Floor, 625 COchrane Drive
Markham, Ontario, L3R 9R9

Project No: 19225.200
Location: Liverppol+North Site Access
Weather: Good
Surveyor(s): BW + MY

File Name : 19225_Liverpool_1294Kingston NorthAll
Site Code : 19225130
Start Date : 2019-03-19

Groups Printed- Trucks

	Liverpool Road Southbound					Private Access Westbound					Liverpool Road Northbound					1848-1852 Liverpool Rd. North Dwy. Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
16:00	0	0	0	0	0	0	0	0	0	0	0	3	1	0	4	0	0	0	0	0	4
16:15	0	3	0	0	3	1	0	0	0	1	0	1	1	0	2	0	0	0	0	0	6
16:30	0	3	0	0	3	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	4
16:45	1	1	0	0	2	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	3
Total	1	7	0	0	8	1	0	1	0	2	0	4	3	0	7	0	0	0	0	0	17
17:00	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
*** BREAK ***																					
17:30	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	1
17:45	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
Total	0	1	0	0	1	1	0	0	0	1	0	0	1	0	1	0	0	0	0	0	3
*** BREAK ***																					
Grand Total	4	91	2	8	105	12	0	9	0	21	5	73	23	3	104	0	0	1	0	1	231
Apprch %	3.8	86.7	1.9	7.6		57.1	0	42.9	0		4.8	70.2	22.1	2.9		0	0	100	0		
Total %	1.7	39.4	0.9	3.5	45.5	5.2	0	3.9	0	9.1	2.2	31.6	10	1.3	45	0	0	0.4	0	0.4	



LEA Consulting Ltd

9th Floor, 625 COchrane Drive
Markham, Ontario, L3R 9R9

Project No: 19225.200
Location: Liverppol+North Site Access
Weather: Good
Surveyor(s): BW + MY

File Name : 19225_Liverpool_1294Kingston NorthAll
Site Code : 19225130
Start Date : 2019-03-19
Page No : 1

Groups Printed- Buses

	Liverpool Road Southbound					Private Access Westbound					Liverpool Road Northbound					1848-1852 Liverpool Rd. North Dwy. Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
07:00	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	2
*** BREAK ***																					
07:30	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	2
07:45	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Total	0	1	0	0	1	0	0	0	0	0	0	4	0	0	4	0	0	0	0	0	5
08:00	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1
*** BREAK ***																					
08:30	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	2
*** BREAK ***																					
Total	0	0	0	0	0	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	3
09:00	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	1
*** BREAK ***																					
09:30	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	2
09:45	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Total	0	1	0	0	1	0	0	0	0	0	0	2	1	0	3	0	0	0	0	0	4
10:00	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1
*** BREAK ***																					
10:30	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	2
10:45	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Total	0	1	0	0	1	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	4
11:00	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1
*** BREAK ***																					
11:30	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	2
11:45	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Total	0	1	0	0	1	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	4
12:00	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1
*** BREAK ***																					
12:30	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	2
12:45	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Total	0	1	0	0	1	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	4
13:00	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1
*** BREAK ***																					
13:30	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	2
*** BREAK ***																					
Total	0	0	0	0	0	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	3
14:00	0	1	0	0	1	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	2
*** BREAK ***																					
14:30	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	2
14:45	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Total	0	2	0	0	2	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	5
15:00	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1
*** BREAK ***																					
15:30	0	1	0	0	1	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	3
*** BREAK ***																					
Total	0	1	0	0	1	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	4

LEA Consulting Ltd
9th Floor, 625 COchrane Drive
Markham, Ontario, L3R 9R9

Project No: 19225.200
Location: Liverppol+North Site Access
Weather: Good
Surveyor(s): BW + MY

File Name : 19225_Liverpool_1294Kingston NorthAll
Site Code : 19225130
Start Date : 2019-03-19
Page No : 2

Groups Printed- Buses

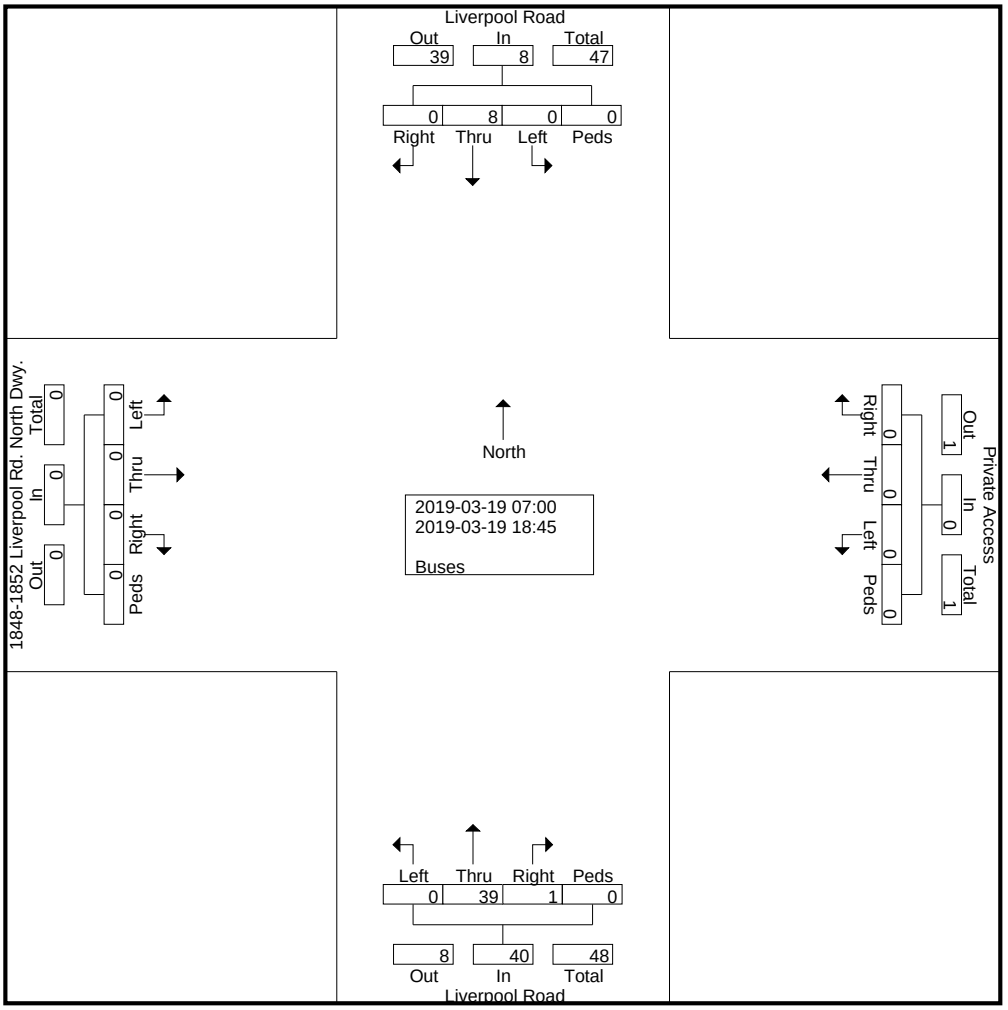
	Liverpool Road Southbound					Private Access Westbound					Liverpool Road Northbound					1848-1852 Liverpool Rd. North Dwy. Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
16:00	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	2
*** BREAK ***																					
16:30	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	2
*** BREAK ***																					
Total	0	0	0	0	0	0	0	0	0	0	0	4	0	0	4	0	0	0	0	0	4
17:00	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1
17:15	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1
17:30	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	2
17:45	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1
Total	0	0	0	0	0	0	0	0	0	0	0	5	0	0	5	0	0	0	0	0	5
18:00	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1
18:15	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1
18:30	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1
*** BREAK ***																					
Total	0	0	0	0	0	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	3
Grand Total	0	8	0	0	8	0	0	0	0	0	0	39	1	0	40	0	0	0	0	0	48
Apprch %	0	100	0	0		0	0	0	0		0	97.5	2.5	0		0	0	0	0		
Total %	0	16.7	0	0	16.7	0	0	0	0	0	0	81.2	2.1	0	83.3	0	0	0	0	0	

LEA Consulting Ltd

9th Floor, 625 COchrane Drive
Markham, Ontario, L3R 9R9

Project No: 19225.200
Location: Liverppol+North Site Access
Weather: Good
Surveyor(s): BW + MY

File Name : 19225_Liverpool_1294Kingston NorthAll
Site Code : 19225130
Start Date : 2019-03-19
Page No : 3



LEA Consulting Ltd

9th Floor, 625 COchrane Drive
Markham, Ontario, L3R 9R9

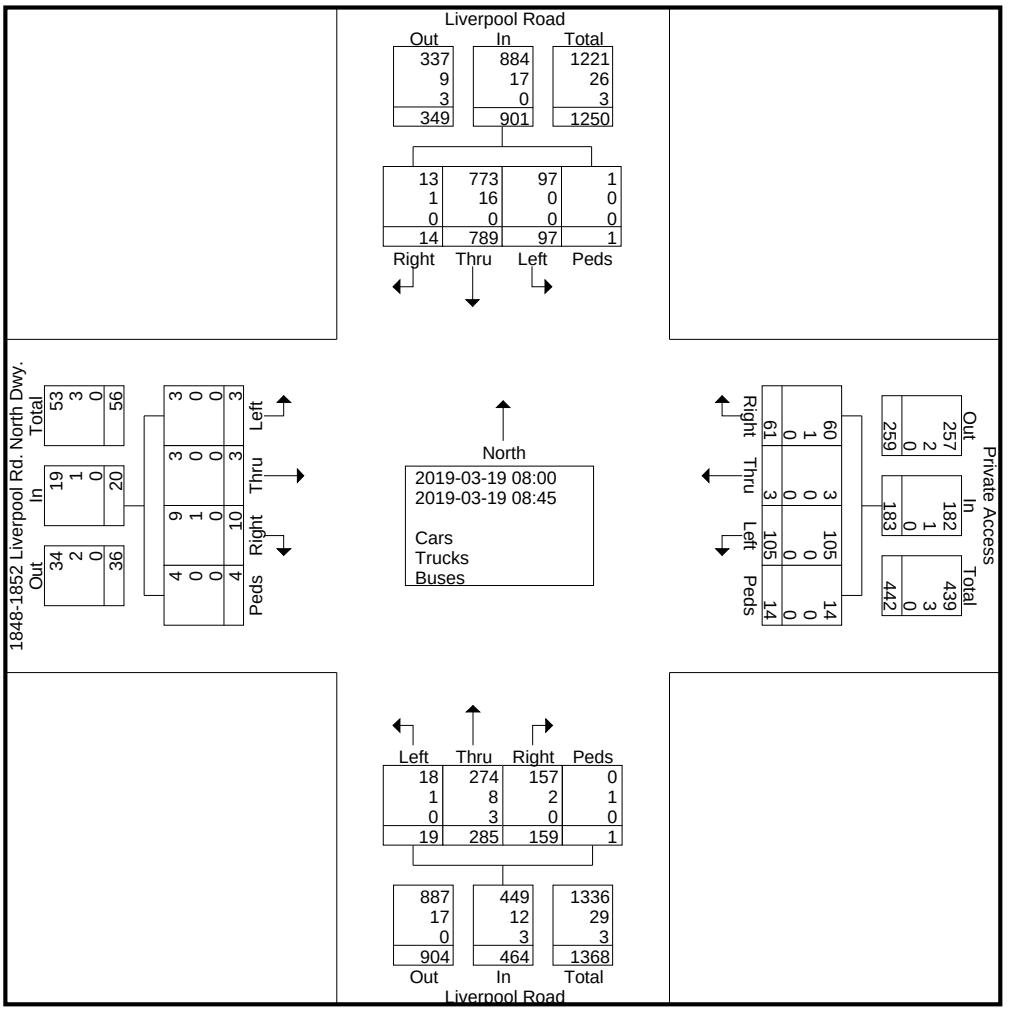
Project No: 19225.200
Location: Liverppol+North Site Access
Weather: Good
Surveyor(s): BW + MY

File Name : 19225_Liverpool_1294Kingston NorthAll
Site Code : 19225130
Start Date : 2019-03-19
Page No : 1

Groups Printed- Cars - Trucks - Buses

	Liverpool Road Southbound					Private Access Westbound					Liverpool Road Northbound					1848-1852 Liverpool Rd. North Dwy. Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
08:00	32	234	2	0	268	35	2	12	2	51	6	67	28	0	101	1	0	3	1	5	425
08:15	24	198	4	0	226	19	1	17	6	43	5	70	35	0	110	0	0	3	0	3	382
08:30	18	168	2	0	188	28	0	16	1	45	6	68	46	0	120	0	2	3	0	5	358
08:45	23	189	6	1	219	23	0	16	5	44	2	80	50	1	133	2	1	1	3	7	403
Total	97	789	14	1	901	105	3	61	14	183	19	285	159	1	464	3	3	10	4	20	1568
Grand Total	97	789	14	1	901	105	3	61	14	183	19	285	159	1	464	3	3	10	4	20	1568
Apprch %	10.8	87.6	1.6	0.1		57.4	1.6	33.3	7.7		4.1	61.4	34.3	0.2		15	15	50	20		
Total %	6.2	50.3	0.9	0.1	57.5	6.7	0.2	3.9	0.9	11.7	1.2	18.2	10.1	0.1	29.6	0.2	0.2	0.6	0.3	1.3	
Cars	97	773	13	1	884	105	3	60	14	182	18	274	157	0	449	3	3	9	4	19	1534
% Cars	100	98	92.9	100	98.1	100	100	98.4	100	99.5	94.7	96.1	98.7	0	96.8	100	100	90	100	95	97.8
Trucks	0	16	1	0	17	0	0	1	0	1	1	8	2	1	12	0	0	1	0	1	31
% Trucks	0	2	7.1	0	1.9	0	0	1.6	0	0.5	5.3	2.8	1.3	100	2.6	0	0	10	0	5	2
Buses	0	0	0	0	0	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	3
% Buses	0	0	0	0	0	0	0	0	0	0	0	1.1	0	0	0.6	0	0	0	0	0	0.2

Natural Peak Hour



LEA Consulting Ltd

9th Floor, 625 COchrane Drive
Markham, Ontario, L3R 9R9

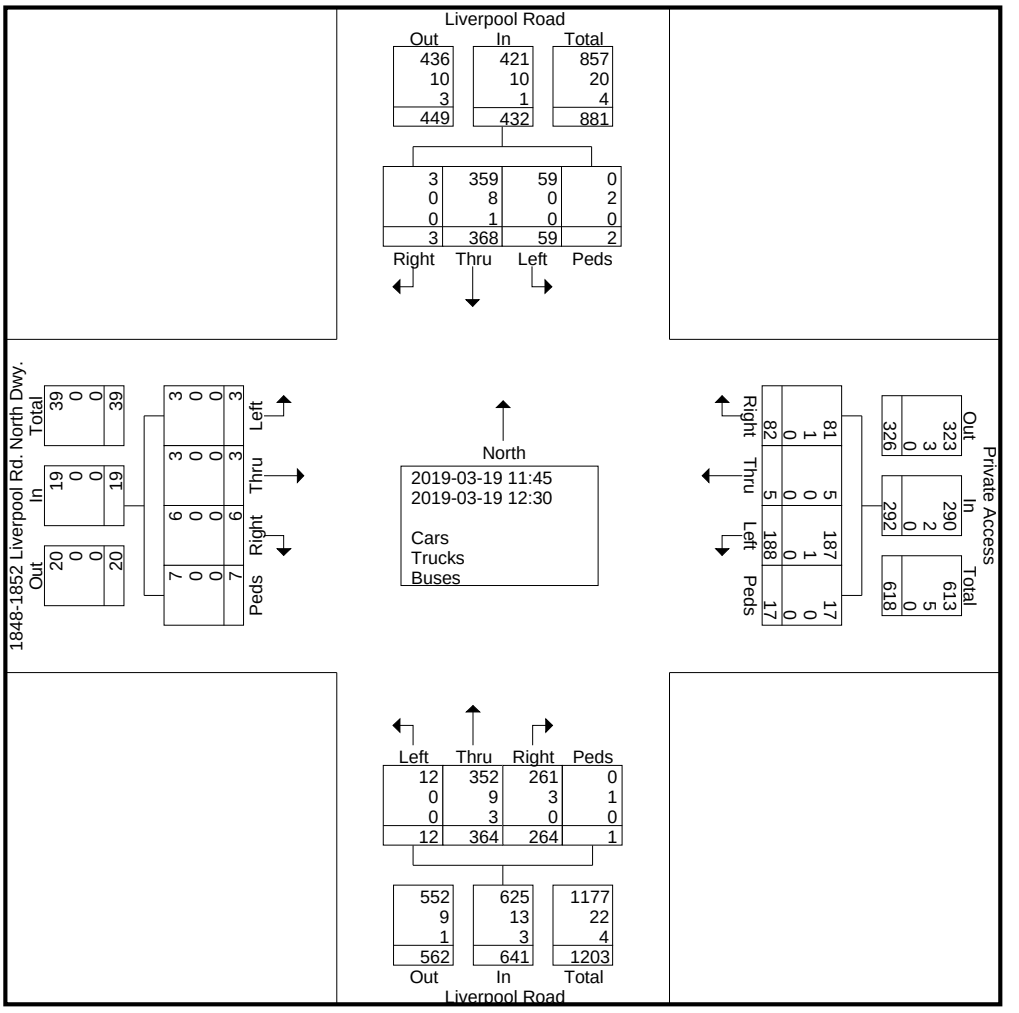
Project No: 19225.200
Location: Liverppol+North Site Access
Weather: Good
Surveyor(s): BW + MY

File Name : 19225_Liverpool_1294Kingston NorthAll
Site Code : 19225130
Start Date : 2019-03-19
Page No : 1

Groups Printed- Cars - Trucks - Buses

	Liverpool Road Southbound					Private Access Westbound					Liverpool Road Northbound					1848-1852 Liverpool Rd. North Dwy. Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
11:45	11	104	0	1	116	41	0	16	4	61	3	89	81	0	173	0	0	1	1	2	352
Total	11	104	0	1	116	41	0	16	4	61	3	89	81	0	173	0	0	1	1	2	352
12:00	18	85	1	0	104	52	4	18	8	82	3	99	56	0	158	1	1	0	1	3	347
12:15	15	92	0	1	108	50	0	29	1	80	3	88	68	0	159	0	1	2	1	4	351
12:30	15	87	2	0	104	45	1	19	4	69	3	88	59	1	151	2	1	3	4	10	334
Grand Total	59	368	3	2	432	188	5	82	17	292	12	364	264	1	641	3	3	6	7	19	1384
Apprch %	13.7	85.2	0.7	0.5		64.4	1.7	28.1	5.8		1.9	56.8	41.2	0.2		15.8	15.8	31.6	36.8		
Total %	4.3	26.6	0.2	0.1	31.2	13.6	0.4	5.9	1.2	21.1	0.9	26.3	19.1	0.1	46.3	0.2	0.2	0.4	0.5	1.4	
Cars	59	359	3	0	421	187	5	81	17	290	12	352	261	0	625	3	3	6	7	19	1355
% Cars	100	97.6	100	0	97.5	99.5	100	98.8	100	99.3	100	96.7	98.9	0	97.5	100	100	100	100	100	97.9
Trucks	0	8	0	2	10	1	0	1	0	2	0	9	3	1	13	0	0	0	0	0	25
% Trucks	0	2.2	0	100	2.3	0.5	0	1.2	0	0.7	0	2.5	1.1	100	2	0	0	0	0	0	1.8
Buses	0	1	0	0	1	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	4
% Buses	0	0.3	0	0	0.2	0	0	0	0	0	0	0.8	0	0	0.5	0	0	0	0	0	0.3

Natural Peak Hour



LEA Consulting Ltd

9th Floor, 625 COchrane Drive
Markham, Ontario, L3R 9R9

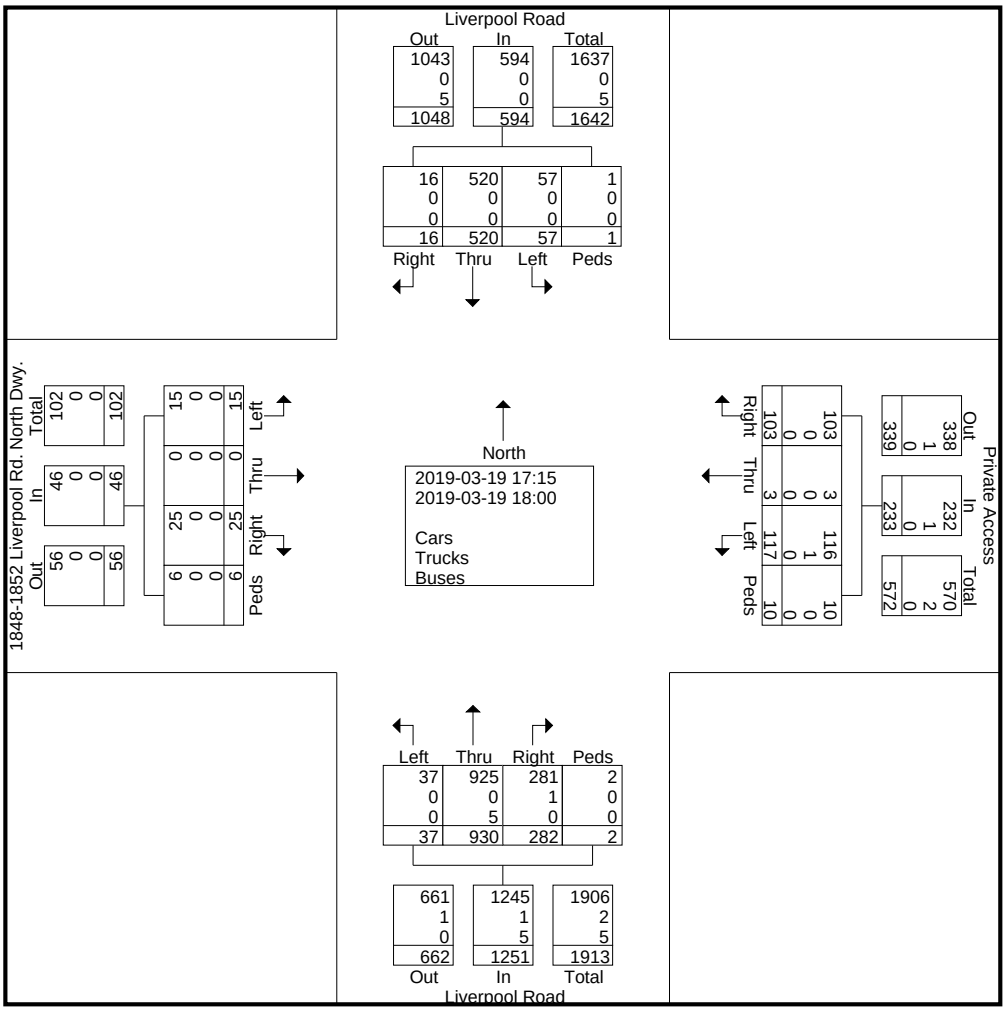
Project No: 19225.200
Location: Liverppol+North Site Access
Weather: Good
Surveyor(s): BW + MY

File Name : 19225_Liverpool_1294Kingston NorthAll
Site Code : 19225130
Start Date : 2019-03-19
Page No : 1

Groups Printed- Cars - Trucks - Buses

	Liverpool Road Southbound					Private Access Westbound					Liverpool Road Northbound					1848-1852 Liverpool Rd. North Dwy. Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
17:15	10	122	7	1	140	31	1	38	3	73	9	252	74	1	336	1	0	6	0	7	556
17:30	8	101	5	0	114	27	1	17	4	49	10	241	72	0	323	9	0	4	1	14	500
17:45	15	149	1	0	165	28	1	23	3	55	12	234	62	0	308	3	0	9	3	15	543
Total	33	372	13	1	419	86	3	78	10	177	31	727	208	1	967	13	0	19	4	36	1599
18:00	24	148	3	0	175	31	0	25	0	56	6	203	74	1	284	2	0	6	2	10	525
Grand Total	57	520	16	1	594	117	3	103	10	233	37	930	282	2	1251	15	0	25	6	46	2124
Apprch %	9.6	87.5	2.7	0.2		50.2	1.3	44.2	4.3		3	74.3	22.5	0.2		32.6	0	54.3	13		
Total %	2.7	24.5	0.8	0	28	5.5	0.1	4.8	0.5	11	1.7	43.8	13.3	0.1	58.9	0.7	0	1.2	0.3	2.2	
Cars	57	520	16	1	594	116	3	103	10	232	37	925	281	2	1245	15	0	25	6	46	2117
% Cars	100	100	100	100	100	99.1	100	100	100	99.6	100	99.5	99.6	100	99.5	100	0	100	100	100	99.7
Trucks	0	0	0	0	0	1	0	0	0	1	0	0	1	0	1	0	0	0	0	0	2
% Trucks	0	0	0	0	0	0.9	0	0	0	0.4	0	0	0.4	0	0.1	0	0	0	0	0	0.1
Buses	0	0	0	0	0	0	0	0	0	0	0	5	0	0	5	0	0	0	0	0	5
% Buses	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0.4	0	0	0	0	0	0.2

Natural Peak Hour



The Regional Municipality of Durham

Works Department
Traffic Operations Centre

101 CONSUMERS DR.
P.O. BOX 623
WHITBY ON L1N 6A3
CANADA
905-666-8116
1-866-786-8116
Fax: 905-666-8826
E-mail:
traffic@durhamca

www.durham.ca

Susan Siopis, P.Eng.

December 13, 2018

Lea Consulting Ltd
625 Cochrane Dr
MARKHAM ON L3R 9R9

ATTENTION: Anatole Kung

RE: Kingston Rd & Glennana Dr
Liverpool Rd & Kingston Rd
Liverpool Rd & Glennana Dr

Signal Timings – AM, PM and Saturday Peaks
Our File: 263-T02-2018
246-T02-2018
247-T02-2018

Attached is a detailed summary of the signal timings for the above-noted intersections, as requested. The signal timings at these locations can vary by time of day depending on the signal program in effect from the Region's Advanced Traffic Management System.

I trust this information will be of assistance to you.

Yours truly,

Leslie Potvin
Traffic Engineering Analyst

LP/ra

Encl.

Signal Timings – AM, PM and Saturday Peaks

Liverpool Road and Glenanna Dr

This intersection operates in a Semi-Actuated mode of control with Liverpool Road assigned as the main street

Time Of Day	Cycle Length (sec.)		Liverpool Rd NB/SB (sec.)		Glennana Dr EB/WB (sec.)	
			NB	SB	EB	WB
		Min Green	N/A	N/A	8.0	8.0
		Amber	4.6	4.6	3.7	3.7
		All Red	2.1	2.1	2.2	2.2
		Veh Ext	N/A	N/A	3.0	3.0
AM Peak 5:30 to 9:00	100	Max Green	59.3	59.3	28.1	28.1
PM Peak 14:30 to 19:00	100	Max Green	57.3	57.3	30.1	30.1
Saturday 8:00 to 21:00	100	Max Green	57.3	57.3	30.1	30.1

Kingston Road and Glenanna Dr

This intersection operates in a Semi-Actuated mode of control with Kingston Road assigned as the main street

Time Of Day	Cycle Length (sec.)		Kingston Rd EBL/WBL (sec.)		Kingston Rd EB/WB (sec.)		Glenanna Rd NBL/SBL (sec.)		Glenanna Rd NB/SB (sec.)	
			EBL	WBL	EB	WB	NBL	SBL	NB	SB
		Min Green	0.0	5.0	N/A	N/A	5.0	5.0	8.0	8.0
		Amber	0.0	3.0	4.2	4.2	3.0	3.0	3.3	3.3
		All Red	N/A	N/A	2.2	2.2	N/A	N/A	3.7	3.7
		Veh Ext	0.0	3.0	N/A	N/A	3.0	3.0	3.0	3.0
AM Peak 5:30 to 9:00	100	Max Green	0.0	6.0	32.6	41.6	6.0	6.0	36.0	36.0
PM Peak 14:30 to 21:00	100	Max Green	0.0	6.0	33.6	42.6	6.0	6.0	35.0	35.0
Saturday 8:00 to 21:00	100	Max Green	0.0	6.0	28.6	37.6	7.0	7.0	39.0	39.0

Kingston Road and Liverpool

This intersection operates in a Fixed mode of control with Kingston Road assigned as the main street

Time Of Day	Cycle Length (sec.)		Kingston Rd EBL/WBL (sec.)		Kingston Rd EB/WB (sec.)		Liverpool Rd NBL/SBL (sec.)		Liverpool Rd NB/SB (sec.)	
			EBL	WBL	EB	WB	NBL	SBL	NB	SB
		Min Green	5.0	5.0	N/A	N/A	5.0	5.0	N/A	N/A
		Amber	3.0	3.0	4.2	4.2	3.0	3.0	3.7	3.7
		All Red	N/A	N/A	2.8	2.8	N/A	N/A	3.2	3.2
		Veh Ext	3.0	3.0	N/A	N/A	3.0	3.0	N/A	N/A
AM Peak 5:30 to 9:00	100	Max Green	11.0	11.0	29.0	29.0	9.0	9.0	31.1	31.1
PM Peak 14:30 to 21:00	100	Max Green	7.0	9.0	33.0	35.0	7.0	6.0	32.1	31.1
Saturday 8:00 to 21:00	100	Max Green	7.0	15.0	28.0	36.0	6.0	6.0	31.1	31.1

APPENDIX B

Existing Intersection Capacity Analysis

A.M. Peak Hour

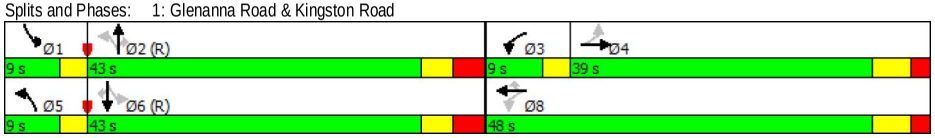
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	388	93	96	562	122	52	73	64	190	102	26
Future Volume (vph)	10	388	93	96	562	122	52	73	64	190	102	26
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2
Total Lost time (s)	6.4	6.4		3.0	6.4	6.4	3.0	7.0	7.0	3.0	7.0	7.0
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.98		1.00	1.00	0.96	1.00	1.00	0.93	1.00	1.00	0.88
Flpb, ped/bikes	0.99	1.00		0.99	1.00	1.00	0.94	1.00	1.00	0.97	1.00	1.00
Frt	1.00	0.97		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1567	3155		1650	3400	1464	1629	1860	1397	1641	1773	1365
Flt Permitted	0.42	1.00		0.26	1.00	1.00	0.69	1.00	1.00	0.65	1.00	1.00
Satd. Flow (perm)	694	3155		450	3400	1464	1175	1860	1397	1131	1773	1365
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	11	422	101	104	611	133	57	79	70	207	111	28
RTOR Reduction (vph)	0	24	0	0	0	0	0	0	43	0	0	16
Lane Group Flow (vph)	11	499	0	104	611	133	57	79	27	207	111	12
Confl. Peds. (#/hr)	8		25	25		8	35		34	34		35
Heavy Vehicles (%)	9%	8%	8%	4%	5%	1%	0%	1%	3%	2%	6%	0%
Turn Type	Perm	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4		3	8		5	2		1	6	
Permitted Phases	4			8		8	2		2	6		6
Actuated Green, G (s)	21.7	21.7		33.2	33.2	33.2	44.5	38.5	38.5	53.4	44.4	44.4
Effective Green, g (s)	21.7	21.7		33.2	33.2	33.2	44.5	38.5	38.5	53.4	44.4	44.4
Actuated g/C Ratio	0.22	0.22		0.33	0.33	0.33	0.44	0.38	0.38	0.53	0.44	0.44
Clearance Time (s)	6.4	6.4		3.0	6.4	6.4	3.0	7.0	7.0	3.0	7.0	7.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	150	684		251	1128	486	550	716	537	664	787	606
v/s Ratio Prot		c0.16		0.04	c0.18		0.01	0.04		c0.04	0.06	
v/s Ratio Perm	0.02			0.10		0.09	0.04		0.02	c0.13		0.01
v/c Ratio	0.07	0.73		0.41	0.54	0.27	0.10	0.11	0.05	0.31	0.14	0.02
Uniform Delay, d1	31.2	36.4		24.5	27.2	24.5	16.0	19.8	19.3	12.5	16.5	15.6
Progression Factor	0.59	0.73		1.00	1.00	1.00	1.00	1.00	1.00	0.83	0.88	1.00
Incremental Delay, d2	0.2	3.7		1.1	0.5	0.3	0.1	0.3	0.2	0.3	0.4	0.1
Delay (s)	18.5	30.4		25.6	27.7	24.8	16.0	20.1	19.5	10.6	14.9	15.7
Level of Service	B	C		C	C	C	B	C	B	B	B	B
Approach Delay (s)		30.2			27.0			18.7			12.4	
Approach LOS		C			C			B			B	

Intersection Summary				
HCM 2000 Control Delay	24.4	HCM 2000 Level of Service	C	
HCM 2000 Volume to Capacity ratio	0.46			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	19.4	
Intersection Capacity Utilization	54.7%	ICU Level of Service	A	
Analysis Period (min)	15			
c Critical Lane Group				

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations											
Traffic Volume (vph)	10	388	96	562	122	52	73	64	190	102	26
Future Volume (vph)	10	388	96	562	122	52	73	64	190	102	26
Lane Group Flow (vph)	11	523	104	611	133	57	79	70	207	111	28
Turn Type	Perm	NA	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4	3	8		5	2		1	6	
Permitted Phases	4		8		8	2		2	6		6
Detector Phase	4	4	3	8	8	5	2	2	1	6	6
Switch Phase											
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	8.0	8.0	5.0	8.0	8.0
Minimum Split (s)	24.4	24.4	8.0	24.4	24.4	8.0	25.4	25.4	8.0	25.4	25.4
Total Split (s)	39.0	39.0	9.0	48.0	48.0	9.0	43.0	43.0	9.0	43.0	43.0
Total Split (%)	39.0%	39.0%	9.0%	48.0%	48.0%	9.0%	43.0%	43.0%	9.0%	43.0%	43.0%
Yellow Time (s)	4.2	4.2	3.0	4.2	4.2	3.0	3.3	3.3	3.0	3.3	3.3
All-Red Time (s)	2.2	2.2	0.0	2.2	2.2	0.0	3.7	3.7	0.0	3.7	3.7
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.4	6.4	3.0	6.4	6.4	3.0	7.0	7.0	3.0	7.0	7.0
Lead/Lag	Lag	Lag	Lead			Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?											
Recall Mode	None	None	None	None	None	None	C-Min	C-Min	None	C-Min	C-Min
v/c Ratio	0.07	0.74	0.37	0.55	0.28	0.09	0.11	0.12	0.29	0.14	0.04
Control Delay	18.1	31.2	23.3	28.6	24.3	12.9	25.2	3.1	11.2	18.3	2.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.1	31.2	23.3	28.6	24.3	12.9	25.2	3.1	11.2	18.3	2.2
Queue Length 50th (m)	0.8	20.8	13.9	52.2	19.5	4.9	10.3	0.0	19.5	17.7	0.2
Queue Length 95th (m)	m2.2	24.1	22.1	59.3	29.6	13.2	25.8	5.7	49.6	33.6	2.3
Internal Link Dist (m)		393.2		523.9			174.6			416.6	
Turn Bay Length (m)	42.6		33.0		23.2	25.4		25.0	27.3		16.5
Base Capacity (vph)	226	1049	278	1424	613	615	788	651	711	824	689
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.05	0.50	0.37	0.43	0.22	0.09	0.10	0.11	0.29	0.13	0.04

Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 70
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Glenanna Road & Kingston Road



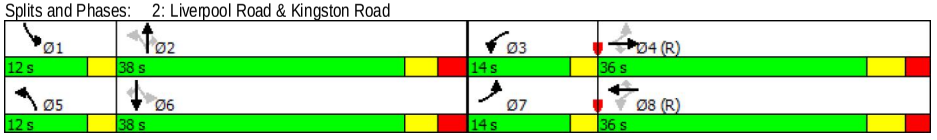
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	92	377	254	178	471	47	215	437	122	79	783	99
Future Volume (vph)	92	377	254	178	471	47	215	437	122	79	783	99
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2
Total Lost time (s)	3.0	7.0	7.0	3.0	7.0	7.0	3.0	6.9	6.9	3.0	6.9	6.9
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.96	1.00	1.00	0.96	1.00	1.00	0.91	1.00	1.00	0.95
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.98	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1652	3368	1462	1639	3400	1487	1691	3500	1279	1663	3500	1413
Flt Permitted	0.40	1.00	1.00	0.39	1.00	1.00	0.17	1.00	1.00	0.48	1.00	1.00
Satd. Flow (perm)	698	3368	1462	668	3400	1487	311	3500	1279	841	3500	1413
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	100	410	276	193	512	51	234	475	133	86	851	108
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	80	0	0	71
Lane Group Flow (vph)	100	410	276	193	512	51	234	475	53	86	851	37
Confl. Peds. (#/hr)	15		19	9		15			25	25		22
Heavy Vehicles (%)	4%	6%	1%	5%	5%	0%	2%	2%	10%	2%	2%	4%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		6
Actuated Green, G (s)	31.0	23.3	23.3	36.8	26.2	26.2	49.2	39.5	39.5	41.2	34.5	34.5
Effective Green, g (s)	31.0	23.3	23.3	36.8	26.2	26.2	49.2	39.5	39.5	41.2	34.5	34.5
Actuated g/C Ratio	0.31	0.23	0.23	0.37	0.26	0.26	0.49	0.40	0.40	0.41	0.34	0.34
Clearance Time (s)	3.0	7.0	7.0	3.0	7.0	7.0	3.0	6.9	6.9	3.0	6.9	6.9
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	289	784	340	348	890	389	314	1382	505	401	1207	487
v/s Ratio Prot	0.03	0.12		c0.06	0.15		c0.09	0.14		0.01	0.24	
v/s Ratio Perm	0.08		c0.19	0.14		0.03	c0.28		0.04	0.07		0.03
v/c Ratio	0.35	0.52	0.81	0.55	0.58	0.13	0.75	0.34	0.10	0.21	0.71	0.08
Uniform Delay, d1	25.4	33.5	36.3	22.9	32.1	28.2	17.6	21.2	19.1	18.2	28.3	22.0
Progression Factor	1.00	1.00	1.00	2.35	1.85	1.93	1.00	1.00	1.00	0.86	0.90	0.80
Incremental Delay, d2	0.7	2.5	18.7	1.8	2.6	0.7	9.2	0.7	0.4	0.3	3.4	0.3
Delay (s)	26.1	36.0	55.0	55.6	61.8	55.0	26.8	21.9	19.5	15.9	28.9	17.9
Level of Service	C	D	D	E	E	E	C	C	B	B	C	B
Approach Delay (s)		41.4			59.8			22.9			26.7	
Approach LOS		D			E			C			C	

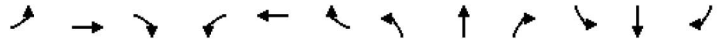
Intersection Summary				
HCM 2000 Control Delay	36.4	HCM 2000 Level of Service	D	
HCM 2000 Volume to Capacity ratio	0.76			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	19.9	
Intersection Capacity Utilization	76.7%	ICU Level of Service	D	
Analysis Period (min)	15			
c Critical Lane Group				

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	92	377	254	178	471	47	215	437	122	79	783	99
Future Volume (vph)	92	377	254	178	471	47	215	437	122	79	783	99
Lane Group Flow (vph)	100	410	276	193	512	51	234	475	133	86	851	108
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phase	7	4	4	3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	11.9	25.0	25.0	9.5	25.0	25.0	9.5	24.9	24.9	8.0	24.9	24.9
Total Split (s)	14.0	36.0	36.0	14.0	36.0	36.0	12.0	38.0	38.0	12.0	38.0	38.0
Total Split (%)	14.0%	36.0%	36.0%	14.0%	36.0%	36.0%	12.0%	38.0%	38.0%	12.0%	38.0%	38.0%
Yellow Time (s)	3.0	4.2	4.2	3.0	4.2	4.2	3.0	3.7	3.7	3.0	3.7	3.7
All-Red Time (s)	0.0	2.8	2.8	0.0	2.8	2.8	0.0	3.2	3.2	0.0	3.2	3.2
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	3.0	7.0	7.0	3.0	7.0	7.0	3.0	6.9	6.9	3.0	6.9	6.9
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?												
Recall Mode	None	C-Min	C-Min	None	C-Min	C-Min	None	Max	Max	None	Max	Max
v/c Ratio	0.29	0.51	0.79	0.52	0.55	0.12	0.73	0.34	0.23	0.19	0.72	0.20
Control Delay	19.2	34.6	51.8	48.6	59.8	53.4	31.7	24.2	5.6	12.9	30.8	4.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	19.2	34.6	51.8	48.6	59.8	53.4	31.7	24.2	5.6	12.9	30.8	4.9
Queue Length 50th (m)	12.1	37.8	52.4	39.0	58.2	10.7	25.9	37.2	0.0	7.6	84.9	0.5
Queue Length 95th (m)	21.0	49.8	78.5	60.5	75.3	22.8	#69.0	55.5	13.4	15.2	93.5	8.2
Internal Link Dist (m)		667.5			393.2			242.2			35.5	
Turn Bay Length (m)	33.5		49.1	103.2		61.6	46.2		51.8	47.9		39.9
Base Capacity (vph)	376	976	423	375	987	432	322	1381	585	464	1183	549
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.27	0.42	0.65	0.51	0.52	0.12	0.73	0.34	0.23	0.19	0.72	0.20

Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 13 (13%), Referenced to phase 4:EBTL and 8:WBTL, Start of Green
Natural Cycle: 75
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 2: Liverpool Road & Kingston Road





Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	8	0	14	106	1	59	18	395	163	94	833	19
Future Volume (Veh/h)	8	0	14	106	1	59	18	395	163	94	833	19
Sign Control		Stop			Stop			Free			Free	
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	0	15	115	1	64	20	429	177	102	905	21
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								TWLTL			TWLTL	
Median storage veh)								2			2	
Upstream signal (m)								140			216	
pX, platoon unblocked	0.93	0.93	0.98	0.93	0.93	0.91	0.98			0.91		
vC, conflicting volume	1438	1766	463	1229	1688	303	926			606		
vC1, stage 1 conf vol	1120	1120		558	558							
vC2, stage 2 conf vol	319	646		672	1130							
vCu, unblocked vol	1200	1553	402	974	1469	51	876			382		
tC, single (s)	7.5	6.5	7.2	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)	6.5	5.5		6.5	5.5							
tF (s)	3.5	4.0	3.4	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	96	100	97	65	100	93	97			90		
cM capacity (veh/h)	203	233	552	332	227	927	761			1073		

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	24	115	65	20	286	320	102	603	323
Volume Left	9	115	0	20	0	0	102	0	0
Volume Right	15	0	64	0	0	177	0	0	21
cSH	336	332	885	761	1700	1700	1073	1700	1700
Volume to Capacity	0.07	0.35	0.07	0.03	0.17	0.19	0.10	0.35	0.19
Queue Length 95th (m)	1.8	12.1	1.9	0.6	0.0	0.0	2.5	0.0	0.0
Control Delay (s)	16.5	21.5	9.4	9.9	0.0	0.0	8.7	0.0	0.0
Lane LOS	C	C	A	A			A		
Approach Delay (s)	16.5	17.1		0.3			0.9		
Approach LOS	C	C							

Intersection Summary					
Average Delay	2.5				
Intersection Capacity Utilization	49.5%	ICU Level of Service		A	
Analysis Period (min)	15				

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	11	0	576	950	3
Future Volume (Veh/h)	0	11	0	576	950	3
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	12	0	626	1033	3
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	TWLTL	
Median storage veh)					2	
Upstream signal (m)				59	297	
pX, platoon unblocked	0.91					
vC, conflicting volume	1348	260	1036			
vC1, stage 1 conf vol	1034					
vC2, stage 2 conf vol	313					
vCu, unblocked vol	1179	260	1036			
tC, single (s)	6.8	7.1	4.1			
tC, 2 stage (s)	5.8					
tF (s)	3.5	3.4	2.2			
p0 queue free %	100	98	100			
cM capacity (veh/h)	297	718	679			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2	SB 3	SB 4
Volume Total	12	209	417	295	295	295	151
Volume Left	0	0	0	0	0	0	0
Volume Right	12	0	0	0	0	0	3
cSH	718	679	1700	1700	1700	1700	1700
Volume to Capacity	0.02	0.00	0.25	0.17	0.17	0.17	0.09
Queue Length 95th (m)	0.4	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	10.1	0.0	0.0	0.0	0.0	0.0	0.0
Lane LOS	B						
Approach Delay (s)	10.1	0.0		0.0			
Approach LOS	B						

Intersection Summary				
Average Delay	0.1			
Intersection Capacity Utilization	25.9%	ICU Level of Service		A
Analysis Period (min)	15			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	47	138	255	72	87	56	115	315	32	73	619	69
Future Volume (vph)	47	138	255	72	87	56	115	315	32	73	619	69
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2
Total Lost time (s)	5.9	5.9	5.9	5.9	5.9		6.7	6.7		6.7	6.7	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	0.99	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		0.99	1.00		0.99	1.00	
Frt	1.00	1.00	0.85	1.00	0.94		1.00	0.99		1.00	0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1658	1773	1513	1675	1717		1657	3347		1645	3407	
Flt Permitted	0.55	1.00	1.00	0.57	1.00		0.36	1.00		0.53	1.00	
Satd. Flow (perm)	963	1773	1513	1006	1717		635	3347		914	3407	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	51	150	277	78	95	61	125	342	35	79	673	75
RTOR Reduction (vph)	0	0	203	0	28	0	0	5	0	0	6	0
Lane Group Flow (vph)	51	150	74	78	128	0	125	372	0	79	742	0
Confl. Peds. (#/hr)							11		8	8		11
Heavy Vehicles (%)	4%	6%	2%	3%	3%	3%	3%	4%	14%	4%	3%	0%
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)	14.0	14.0	14.0	14.0	14.0		73.4	73.4		73.4	73.4	
Effective Green, g (s)	14.0	14.0	14.0	14.0	14.0		73.4	73.4		73.4	73.4	
Actuated g/C Ratio	0.14	0.14	0.14	0.14	0.14		0.73	0.73		0.73	0.73	
Clearance Time (s)	5.9	5.9	5.9	5.9	5.9		6.7	6.7		6.7	6.7	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	134	248	211	140	240		466	2456		670	2500	
v/s Ratio Prot		c0.08			0.07			0.11			c0.22	
v/s Ratio Perm	0.05		0.05	0.08			0.20			0.09		
v/c Ratio	0.38	0.60	0.35	0.56	0.54		0.27	0.15		0.12	0.30	
Uniform Delay, d1	39.1	40.4	38.9	40.1	40.0		4.4	4.0		3.9	4.5	
Progression Factor	1.00	1.00	1.00	1.31	1.38		0.77	0.73		1.00	1.00	
Incremental Delay, d2	1.8	4.1	1.0	4.7	2.3		1.4	0.1		0.4	0.3	
Delay (s)	40.9	44.5	39.9	57.1	57.6		4.8	3.1		4.2	4.8	
Level of Service	D	D	D	E	E		A	A		A	A	
Approach Delay (s)		41.5			57.4			3.5			4.8	
Approach LOS		D			E			A			A	

Intersection Summary				
HCM 2000 Control Delay	19.1	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.35			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.6	
Intersection Capacity Utilization	61.5%	ICU Level of Service	B	
Analysis Period (min)	15			
c Critical Lane Group				

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations									
Traffic Volume (vph)	47	138	255	72	87	115	315	73	619
Future Volume (vph)	47	138	255	72	87	115	315	73	619
Lane Group Flow (vph)	51	150	277	78	156	125	377	79	748
Turn Type	Perm	NA	Perm	Perm	NA	Perm	NA	Perm	NA
Protected Phases		4			8		2		6
Permitted Phases	4		4	8		2		6	
Detector Phase	4	4	4	8	8	2	2	6	6
Switch Phase									
Minimum Initial (s)	8.0	8.0	8.0	5.0	5.0	5.0	5.0	8.0	8.0
Minimum Split (s)	23.9	23.9	23.9	23.9	23.9	24.7	24.7	24.7	24.7
Total Split (s)	34.0	34.0	34.0	34.0	34.0	66.0	66.0	66.0	66.0
Total Split (%)	34.0%	34.0%	34.0%	34.0%	34.0%	66.0%	66.0%	66.0%	66.0%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	4.6	4.6	4.6	4.6
All-Red Time (s)	2.2	2.2	2.2	2.2	2.2	2.1	2.1	2.1	2.1
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.9	5.9	5.9	5.9	5.9	6.7	6.7	6.7	6.7
Lead/Lag									
Lead-Lag Optimize?									
Recall Mode	None	None	None	None	None	C-Min	C-Min	C-Min	C-Min
v/c Ratio	0.38	0.61	0.67	0.56	0.58	0.27	0.15	0.12	0.30
Control Delay	45.7	50.2	16.5	66.1	51.8	5.7	3.2	5.2	5.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	45.7	50.2	16.5	66.1	51.8	5.7	3.2	5.2	5.1
Queue Length 50th (m)	9.6	29.2	7.5	16.6	26.9	4.7	6.0	3.9	22.0
Queue Length 95th (m)	20.2	46.6	31.7	32.6	49.1	11.1	12.6	10.6	37.7
Internal Link Dist (m)		107.2			416.6		192.1		478.0
Turn Bay Length (m)	22.0			24.3		24.4		46.2	
Base Capacity (vph)	270	498	594	282	505	467	2463	671	2507
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.19	0.30	0.47	0.28	0.31	0.27	0.15	0.12	0.30

Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 55
Control Type: Actuated-Coordinated

Splits and Phases: 6: Liverpool Road & Glenanna Road

P.M. Peak Hour

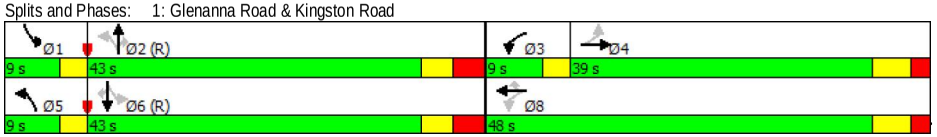
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	24	1158	143	156	581	132	102	177	194	178	199	36
Future Volume (vph)	24	1158	143	156	581	132	102	177	194	178	199	36
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2
Total Lost time (s)	6.4	6.4		3.0	6.4	6.4	3.0	7.0	7.0	3.0	7.0	7.0
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.98		1.00	1.00	0.90	1.00	1.00	0.91	1.00	1.00	0.84
Flpb, ped/bikes	0.97	1.00		1.00	1.00	1.00	0.96	1.00	1.00	0.97	1.00	1.00
Frt	1.00	0.98		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1665	3367		1658	3500	1373	1649	1879	1385	1673	1824	1295
Flt Permitted	0.41	1.00		0.08	1.00	1.00	0.47	1.00	1.00	0.53	1.00	1.00
Satd. Flow (perm)	722	3367		147	3500	1373	814	1879	1385	935	1824	1295
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	26	1259	155	170	632	143	111	192	211	193	216	39
RTOR Reduction (vph)	0	8	0	0	0	41	0	0	171	0	0	32
Lane Group Flow (vph)	26	1406	0	170	632	102	111	192	40	193	216	7
Confl. Peds. (#/hr)	30		55	55		30	91		50	50		91
Heavy Vehicles (%)	0%	2%	5%	4%	2%	1%	0%	0%	1%	0%	3%	0%
Turn Type	Perm	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4		3	8		5	2		1	6	
Permitted Phases	4			8		8	2		2	6		6
Actuated Green, G (s)	44.5	44.5		60.3	60.3	60.3	23.3	17.3	17.3	23.3	17.3	17.3
Effective Green, g (s)	44.5	44.5		60.3	60.3	60.3	23.3	17.3	17.3	23.3	17.3	17.3
Actuated g/C Ratio	0.44	0.44		0.60	0.60	0.60	0.23	0.17	0.17	0.23	0.17	0.17
Clearance Time (s)	6.4	6.4		3.0	6.4	6.4	3.0	7.0	7.0	3.0	7.0	7.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	321	1498		282	2110	827	239	325	239	262	315	224
v/s Ratio Prot		c0.42		c0.08	0.18		0.03	0.10		c0.04	0.12	
v/s Ratio Perm	0.04			0.29		0.07	0.08		0.03	c0.13		0.01
v/c Ratio	0.08	0.94		0.60	0.30	0.12	0.46	0.59	0.17	0.74	0.69	0.03
Uniform Delay, d1	16.0	26.5		20.5	9.6	8.5	31.6	38.1	35.2	34.7	38.8	34.4
Progression Factor	0.46	0.51		1.00	1.00	1.00	1.00	1.00	1.00	1.04	1.05	1.00
Incremental Delay, d2	0.1	6.3		3.6	0.1	0.1	1.4	7.7	1.5	10.3	11.5	0.2
Delay (s)	7.4	19.7		24.1	9.7	8.6	33.1	45.8	36.7	46.4	52.3	34.6
Level of Service	A	B		C	A	A	C	D	D	D	D	C
Approach Delay (s)		19.4			12.1			39.3			48.2	
Approach LOS		B			B			D			D	

Intersection Summary				
HCM 2000 Control Delay	24.3	HCM 2000 Level of Service	C	
HCM 2000 Volume to Capacity ratio	0.83			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	19.4	
Intersection Capacity Utilization	88.4%	ICU Level of Service	E	
Analysis Period (min)	15			
c Critical Lane Group				

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations											
Traffic Volume (vph)	24	1158	156	581	132	102	177	194	178	199	36
Future Volume (vph)	24	1158	156	581	132	102	177	194	178	199	36
Lane Group Flow (vph)	26	1414	170	632	143	111	192	211	193	216	39
Turn Type	Perm	NA	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4	3	8		5	2		1	6	
Permitted Phases	4		8		8	2		2	6		6
Detector Phase	4	4	3	8	8	5	2	2	1	6	6
Switch Phase											
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	24.4	24.4	8.0	24.4	24.4	8.0	25.0	25.0	8.0	25.0	25.0
Total Split (s)	39.0	39.0	9.0	48.0	48.0	9.0	43.0	43.0	9.0	43.0	43.0
Total Split (%)	39.0%	39.0%	9.0%	48.0%	48.0%	9.0%	43.0%	43.0%	9.0%	43.0%	43.0%
Yellow Time (s)	4.2	4.2	3.0	4.2	4.2	3.0	3.3	3.3	3.0	3.3	3.3
All-Red Time (s)	2.2	2.2	0.0	2.2	2.2	0.0	3.7	3.7	0.0	3.7	3.7
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.4	6.4	3.0	6.4	6.4	3.0	7.0	7.0	3.0	7.0	7.0
Lead/Lag	Lag	Lag	Lead			Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?											
Recall Mode	None	None	None	None	None	None	C-Min	C-Min	None	C-Min	C-Min
v/c Ratio	0.08	0.94	0.59	0.30	0.16	0.42	0.59	0.51	0.65	0.69	0.13
Control Delay	9.2	23.7	25.0	10.7	4.1	30.0	44.9	9.8	40.2	51.5	1.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	9.2	23.7	25.0	10.7	4.1	30.0	44.9	9.8	40.2	51.5	1.5
Queue Length 50th (m)	0.9	154.9	15.7	30.4	3.1	16.8	36.5	0.7	34.6	44.0	0.1
Queue Length 95th (m)	m2.4	m#202.8	39.7	47.9	13.0	27.9	55.0	19.2	44.4	62.9	0.3
Internal Link Dist (m)		393.2		523.9			174.6			416.6	
Turn Bay Length (m)	42.6		33.0		23.2	25.4		25.0	27.3		16.5
Base Capacity (vph)	321	1506	287	2110	868	265	676	631	296	656	532
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.08	0.94	0.59	0.30	0.16	0.42	0.28	0.33	0.65	0.33	0.07

Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Glenanna Road & Kingston Road



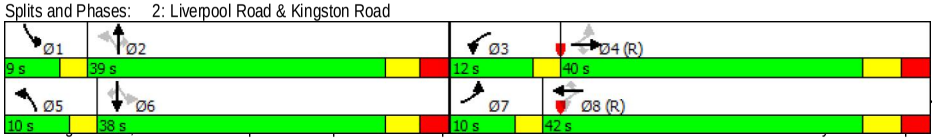
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	217	1022	330	226	502	79	302	875	278	114	345	84
Future Volume (vph)	217	1022	330	226	502	79	302	875	278	114	345	84
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2
Total Lost time (s)	3.0	7.4	7.4	3.0	7.4	7.4	3.0	6.9	6.9	3.0	6.9	6.9
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.94	1.00	1.00	0.95	1.00	1.00	0.85	1.00	1.00	0.93
Flpb, ped/bikes	0.99	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1695	3500	1416	1708	3500	1431	1667	3535	1273	1675	3570	1397
Flt Permitted	0.42	1.00	1.00	0.11	1.00	1.00	0.48	1.00	1.00	0.13	1.00	1.00
Satd. Flow (perm)	746	3500	1416	204	3500	1431	846	3535	1273	237	3570	1397
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	236	1111	359	246	546	86	328	951	302	124	375	91
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	143	0	0	64
Lane Group Flow (vph)	236	1111	359	246	546	86	328	951	159	124	375	27
Confl. Peds. (#/hr)	26		32	32		26	34		48	48		34
Heavy Vehicles (%)	1%	2%	2%	1%	2%	2%	2%	1%	3%	3%	0%	3%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		6
Actuated Green, G (s)	40.2	32.6	32.6	45.6	35.3	35.3	37.8	30.8	30.8	35.8	29.8	29.8
Effective Green, g (s)	40.2	32.6	32.6	45.6	35.3	35.3	37.8	30.8	30.8	35.8	29.8	29.8
Actuated g/C Ratio	0.40	0.33	0.33	0.46	0.35	0.35	0.38	0.31	0.31	0.36	0.30	0.30
Clearance Time (s)	3.0	7.4	7.4	3.0	7.4	7.4	3.0	6.9	6.9	3.0	6.9	6.9
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	372	1141	461	247	1235	505	377	1088	392	171	1063	416
v/s Ratio Prot	0.05	0.32		c0.10	0.16		c0.06	c0.27		0.04	0.11	
v/s Ratio Perm	0.21		0.25	c0.35		0.06	0.27		0.13	0.22		0.02
v/c Ratio	0.63	0.97	0.78	1.00	0.44	0.17	0.87	0.87	0.41	0.73	0.35	0.07
Uniform Delay, d1	21.4	33.3	30.4	26.3	24.8	22.3	27.3	32.8	27.4	24.4	27.5	25.1
Progression Factor	1.00	1.00	1.00	1.66	1.49	1.51	1.00	1.00	1.00	1.11	0.98	1.42
Incremental Delay, d2	3.5	21.0	12.2	55.1	1.1	0.7	19.1	8.0	0.7	14.1	0.2	0.1
Delay (s)	24.9	54.3	42.7	98.9	38.0	34.4	46.4	40.7	28.1	41.4	27.3	35.9
Level of Service	C	D	D	F	D	C	D	D	C	D	C	D
Approach Delay (s)		47.8			54.7			39.5			31.5	
Approach LOS		D			D			D			C	

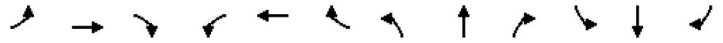
Intersection Summary				
HCM 2000 Control Delay	44.3	HCM 2000 Level of Service	D	
HCM 2000 Volume to Capacity ratio	0.98			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	20.3	
Intersection Capacity Utilization	89.9%	ICU Level of Service	E	
Analysis Period (min)	15			
c Critical Lane Group				

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	217	1022	330	226	502	79	302	875	278	114	345	84
Future Volume (vph)	217	1022	330	226	502	79	302	875	278	114	345	84
Lane Group Flow (vph)	236	1111	359	246	546	86	328	951	302	124	375	91
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phase	7	4	4	3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	8.0	25.4	25.4	8.5	25.4	25.4	8.0	24.9	24.9	8.0	24.9	24.9
Total Split (s)	10.0	40.0	40.0	12.0	42.0	42.0	10.0	39.0	39.0	9.0	38.0	38.0
Total Split (%)	10.0%	40.0%	40.0%	12.0%	42.0%	42.0%	10.0%	39.0%	39.0%	9.0%	38.0%	38.0%
Yellow Time (s)	3.0	4.2	4.2	3.0	4.2	4.2	3.0	3.7	3.7	3.0	3.7	3.7
All-Red Time (s)	0.0	3.2	3.2	0.0	3.2	3.2	0.0	3.2	3.2	0.0	3.2	3.2
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	3.0	7.4	7.4	3.0	7.4	7.4	3.0	6.9	6.9	3.0	6.9	6.9
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?												
Recall Mode	None	C-Min	C-Min	None	C-Min	C-Min	None	Min	Min	None	Min	Min
v/c Ratio	0.59	0.97	0.78	0.96	0.44	0.17	0.81	0.87	0.57	0.69	0.35	0.18
Control Delay	23.3	55.2	43.9	81.6	38.6	35.8	39.5	42.9	13.7	40.8	27.9	5.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	23.3	55.2	43.9	81.6	38.6	35.8	39.5	42.9	13.7	40.8	27.9	5.4
Queue Length 50th (m)	27.4	116.8	65.6	~46.2	57.3	15.6	44.4	94.1	14.3	13.5	28.9	0.0
Queue Length 95th (m)	43.9	#163.0	#111.1	#88.4	74.7	29.4	#78.5	120.3	41.6	#33.5	42.0	8.6
Internal Link Dist (m)		667.5			393.2			242.2			35.5	
Turn Bay Length (m)	33.5		49.1	103.2		61.6	46.2		51.8	47.9		39.9
Base Capacity (vph)	402	1141	461	255	1237	506	406	1134	548	180	1110	512
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.59	0.97	0.78	0.96	0.44	0.17	0.81	0.84	0.55	0.69	0.34	0.18

Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 13 (13%), Referenced to phase 4:EBTL and 8:WBTL, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 2: Liverpool Road & Kingston Road





Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	18	1	24	123	3	98	41	883	247	76	382	19
Future Volume (Veh/h)	18	1	24	123	3	98	41	883	247	76	382	19
Sign Control		Stop			Stop			Free			Free	
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	1	26	134	3	107	45	960	268	83	415	21
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								TWLTL			TWLTL	
Median storage veh)								2			2	
Upstream signal (m)								140			216	
pX, platoon unblocked	0.75	0.75		0.75	0.75	0.75				0.75		
vC, conflicting volume	1270	1910	218	1584	1786	614	436			1228		
vC1, stage 1 conf vol	592	592		1184	1184							
vC2, stage 2 conf vol	678	1318		400	602							
vCu, unblocked vol	684	1540	218	1104	1374	0	436			627		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)	6.5	5.5		6.5	5.5							
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	94	100	97	54	99	87	96			88		
cM capacity (veh/h)	362	200	792	288	276	812	1134			720		

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	47	134	110	45	640	588	83	277	159
Volume Left	20	134	0	45	0	0	83	0	0
Volume Right	26	0	107	0	0	268	0	0	21
cSH	505	288	771	1134	1700	1700	720	1700	1700
Volume to Capacity	0.09	0.46	0.14	0.04	0.38	0.35	0.12	0.16	0.09
Queue Length 95th (m)	2.5	18.6	4.0	1.0	0.0	0.0	3.1	0.0	0.0
Control Delay (s)	12.9	27.9	10.4	8.3	0.0	0.0	10.6	0.0	0.0
Lane LOS	B	D	B	A			B		
Approach Delay (s)	12.9	20.0		0.3			1.7		
Approach LOS	B	C							

Intersection Summary				
Average Delay	3.2			
Intersection Capacity Utilization	60.0%	ICU Level of Service	B	
Analysis Period (min)	15			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	21	0	1171	522	7
Future Volume (Veh/h)	0	21	0	1171	522	7
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	23	0	1273	567	8
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	TWLTL	
Median storage veh)					2	
Upstream signal (m)				59	297	
pX, platoon unblocked	0.74					
vC, conflicting volume	1208	146	575			
vC1, stage 1 conf vol	571					
vC2, stage 2 conf vol	636					
vCu, unblocked vol	592	146	575			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)	5.8					
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	97	100			
cM capacity (veh/h)	495	881	1008			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2	SB 3	SB 4
Volume Total	23	424	849	162	162	162	89
Volume Left	0	0	0	0	0	0	0
Volume Right	23	0	0	0	0	0	8
cSH	881	1008	1700	1700	1700	1700	1700
Volume to Capacity	0.03	0.00	0.50	0.10	0.10	0.10	0.05
Queue Length 95th (m)	0.6	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	9.2	0.0	0.0	0.0	0.0	0.0	0.0
Lane LOS	A						
Approach Delay (s)	9.2	0.0		0.0			
Approach LOS	A						

Intersection Summary			
Average Delay	0.1		
Intersection Capacity Utilization	42.4%	ICU Level of Service	A
Analysis Period (min)	15		

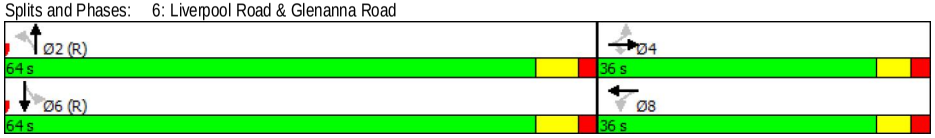
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	45	72	115	55	145	44	351	575	73	67	307	30
Future Volume (vph)	45	72	115	55	145	44	351	575	73	67	307	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2
Total Lost time (s)	5.9	5.9	5.9	5.9	5.9		6.7	6.7		6.7	6.7	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00		0.99	1.00	
Frt	1.00	1.00	0.85	1.00	0.97		1.00	0.98		1.00	0.99	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1725	1824	1543	1725	1791		1708	3448		1713	3522	
Flt Permitted	0.43	1.00	1.00	0.71	1.00		0.53	1.00		0.38	1.00	
Satd. Flow (perm)	788	1824	1543	1282	1791		958	3448		685	3522	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	49	78	125	60	158	48	382	625	79	73	334	33
RTOR Reduction (vph)	0	0	105	0	13	0	0	7	0	0	5	0
Lane Group Flow (vph)	49	78	20	60	193	0	382	697	0	73	362	0
Confl. Peds. (#/hr)									11	11		
Heavy Vehicles (%)	0%	3%	0%	0%	1%	2%	1%	1%	5%	0%	0%	0%
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)	16.0	16.0	16.0	16.0	16.0		71.4	71.4		71.4	71.4	
Effective Green, g (s)	16.0	16.0	16.0	16.0	16.0		71.4	71.4		71.4	71.4	
Actuated g/C Ratio	0.16	0.16	0.16	0.16	0.16		0.71	0.71		0.71	0.71	
Clearance Time (s)	5.9	5.9	5.9	5.9	5.9		6.7	6.7		6.7	6.7	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	126	291	246	205	286		684	2461		489	2514	
v/s Ratio Prot		0.04			c0.11			0.20			0.10	
v/s Ratio Perm	0.06		0.01	0.05			c0.40			0.11		
v/c Ratio	0.39	0.27	0.08	0.29	0.67		0.56	0.28		0.15	0.14	
Uniform Delay, d1	37.6	36.9	35.7	37.0	39.5		6.8	5.1		4.6	4.6	
Progression Factor	1.00	1.00	1.00	0.69	0.76		0.68	0.56		1.00	1.00	
Incremental Delay, d2	2.0	0.5	0.1	0.8	6.0		2.5	0.2		0.6	0.1	
Delay (s)	39.6	37.4	35.9	26.4	36.2		7.0	3.1		5.2	4.7	
Level of Service	D	D	D	C	D		A	A		A	A	
Approach Delay (s)		37.1			34.0			4.5			4.8	
Approach LOS		D			C			A			A	

Intersection Summary				
HCM 2000 Control Delay	12.4	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.58			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.6	
Intersection Capacity Utilization	66.9%	ICU Level of Service	C	
Analysis Period (min)	15			
c Critical Lane Group				

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations									
Traffic Volume (vph)	45	72	115	55	145	351	575	67	307
Future Volume (vph)	45	72	115	55	145	351	575	67	307
Lane Group Flow (vph)	49	78	125	60	206	382	704	73	367
Turn Type	Perm	NA	Perm	Perm	NA	Perm	NA	Perm	NA
Protected Phases		4			8		2		6
Permitted Phases	4		4	8		2		6	
Detector Phase	4	4	4	8	8	2	2	6	6
Switch Phase									
Minimum Initial (s)	8.0	8.0	8.0	8.0	8.0	5.0	5.0	5.0	5.0
Minimum Split (s)	23.9	23.9	23.9	23.9	23.9	24.7	24.7	24.7	24.7
Total Split (s)	36.0	36.0	36.0	36.0	36.0	64.0	64.0	64.0	64.0
Total Split (%)	36.0%	36.0%	36.0%	36.0%	36.0%	64.0%	64.0%	64.0%	64.0%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	4.6	4.6	4.6	4.6
All-Red Time (s)	2.2	2.2	2.2	2.2	2.2	2.1	2.1	2.1	2.1
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.9	5.9	5.9	5.9	5.9	6.7	6.7	6.7	6.7
Lead/Lag									
Lead-Lag Optimize?									
Recall Mode	None	None	None	None	None	C-Min	C-Min	C-Min	C-Min
v/c Ratio	0.39	0.27	0.36	0.29	0.69	0.56	0.29	0.15	0.15
Control Delay	45.0	37.4	9.1	27.9	39.1	8.2	3.3	6.5	5.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	45.0	37.4	9.1	27.9	39.1	8.2	3.3	6.5	5.0
Queue Length 50th (m)	9.1	14.1	0.0	5.5	16.4	19.6	17.0	4.1	10.2
Queue Length 95th (m)	19.6	25.9	14.7	21.9	62.7	m85.2	m8.8	11.4	18.8
Internal Link Dist (m)		107.2			416.6		192.1		478.0
Turn Bay Length (m)	22.0			24.3		24.4		46.2	
Base Capacity (vph)	237	549	551	385	550	683	2466	489	2518
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.21	0.14	0.23	0.16	0.37	0.56	0.29	0.15	0.15

Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 6: Liverpool Road & Glenanna Road



APPENDIX C

Transportation Tomorrow Survey Residential Site Distribution Calculation and 10th Edition ITE LUC 222 Multifamily Housing (High Rise) Trip Generation Information

Land Use: 222
Multifamily Housing (High-Rise)

Description

High-rise multifamily housing includes apartments, townhouses, and condominiums that have more than 10 levels (floors). They are likely to have one or more elevators. Multifamily housing (low-rise) (Land Use 220), multifamily housing (mid-rise) (Land Use 221), off-campus student apartment (Land Use 225), and high-rise residential with 1st-floor commercial (Land Use 232) are related land uses.

Additional Data

In prior editions of *Trip Generation Manual*, the high-rise multifamily housing sites were further divided into rental and condominium categories. An investigation of vehicle trip data found no clear differences in trip making patterns between the rental and condominium sites within the ITE database. As more data are compiled for future editions, this land use classification can be reinvestigated.

For the 12 sites for which both the number of residents and the number of occupied dwelling units were available, there were an average of 1.57 residents per occupied dwelling unit.

For the 26 sites for which the numbers of both total dwelling units and occupied dwelling units were available, an average of 98.4 percent of the total dwelling units were occupied.

Time-of-day distribution data for this land use are presented in Appendix A. For the eight dense multi-use sites for which 24-hour time-of-day person trip data were collected, the overall highest vehicle volumes during the AM and PM on a weekday were between 7:30 and 8:30 a.m. and 5:30 and 6:30 p.m., respectively. The Saturday and Sunday peak hours for person trips were between 5:00 and 6:00 p.m. and 4:45 and 5:45 p.m., respectively.

For the six center city core sites for which 24-hour time-of-day person trip data were collected, the overall highest vehicle volumes during the AM and PM on a weekday were between 8:00 and 9:00 a.m. and 6:00 and 7:00 p.m., respectively. The Saturday and Sunday peak hours for person trips were between 11:30 a.m. and 12:30 p.m. and 11:00 a.m. and 12:00 p.m., respectively.

For the 12 sites for which data were provided for both occupied dwelling units and residents, there was an average of 1.57 residents per occupied dwelling unit.

For the 26 sites for which data were provided for both occupied dwelling units and total dwelling units, an average of 98.4 percent of the units were occupied.

The average numbers of person trips per vehicle trip at the three center city core sites at which both person trip and vehicle trip data were collected were as follows:

- 2.52 during Weekday, Peak Hour of Adjacent Street Traffic, one hour between 7 and 9 a.m.
- 2.70 during Weekday, AM Peak Hour of Generator
- 1.88 during Weekday, Peak Hour of Adjacent Street Traffic, one hour between 4 and 6 p.m.
- 2.22 during Weekday, PM Peak Hour of Generator

The average numbers of person trips per vehicle trip at the six dense multi-use urban sites at which both person trip and vehicle trip data were collected were as follows:

- 2.81 during Weekday, Peak Hour of Adjacent Street Traffic, one hour between 7 and 9 a.m.
- 2.49 during Weekday, AM Peak Hour of Generator
- 2.17 during Weekday, Peak Hour of Adjacent Street Traffic, one hour between 4 and 6 p.m.
- 2.85 during Weekday, PM Peak Hour of Generator

The sites were surveyed in the 1980s, the 2000s, and the 2010s in California, District of Columbia, Maryland, New Jersey, New York, Ontario (CAN), Oregon, Pennsylvania, Virginia, and Washington.

Source Numbers

105, 168, 169, 187, 305, 321, 356, 818, 862, 901, 910, 949, 963, 964, 966, 967

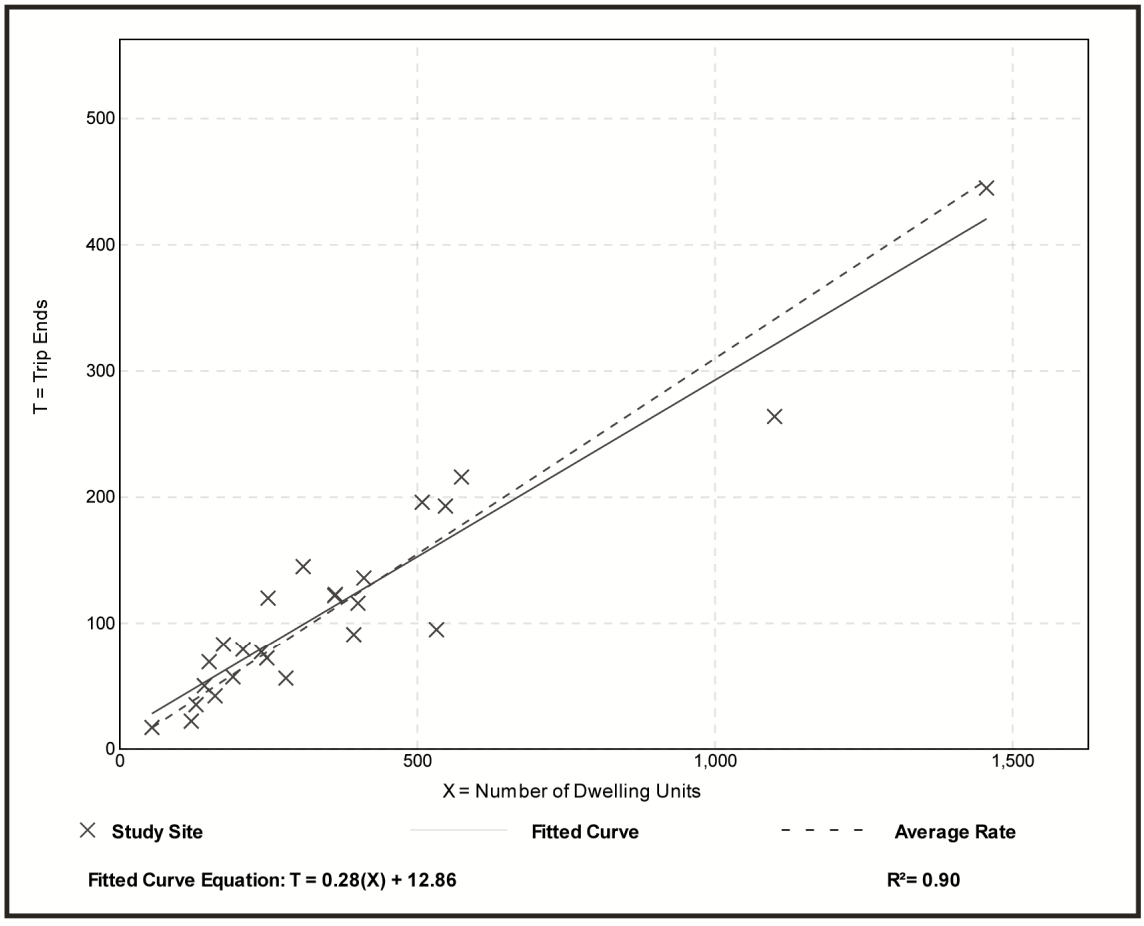
Multifamily Housing (High-Rise)
(222)

Vehicle Trip Ends vs: **Dwelling Units**
On a: **Weekday,**
Peak Hour of Adjacent Street Traffic,
One Hour Between 7 and 9 a.m.
Setting/Location: **General Urban/Suburban**
Number of Studies: 25
Avg. Num. of Dwelling Units: 372
Directional Distribution: 24% entering, 76% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.31	0.18 - 0.48	0.08

Data Plot and Equation



Multifamily Housing (High-Rise)
(222)

Vehicle Trip Ends vs: **Dwelling Units**
On a: **Weekday,**
Peak Hour of Adjacent Street Traffic,
One Hour Between 4 and 6 p.m.
Setting/Location: **General Urban/Suburban**
Number of Studies: 25
Avg. Num. of Dwelling Units: 372
Directional Distribution: 61% entering, 39% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.36	0.23 - 0.53	0.06

Data Plot and Equation

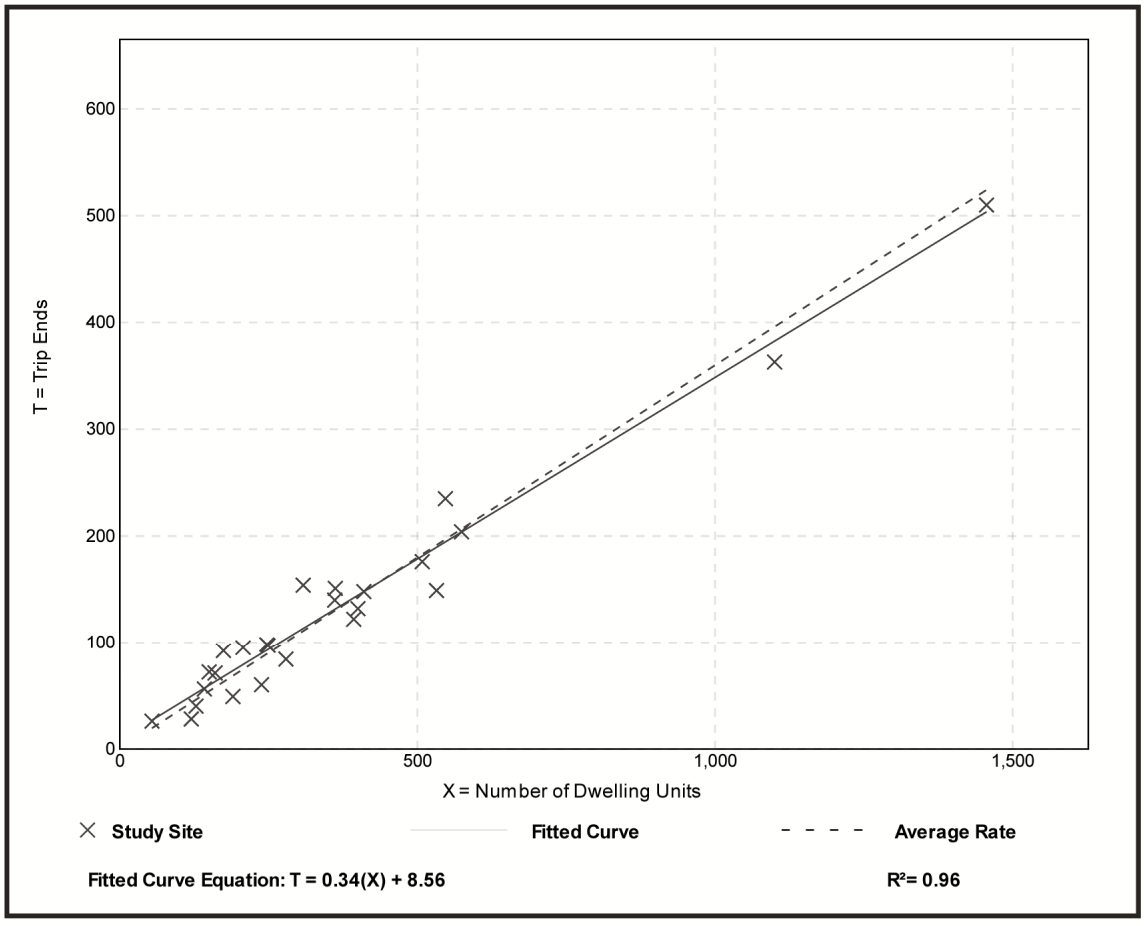


EXHIBIT 1

Transporation Tomorrow Survey Modal Share

Wed Nov 21 2018 12:39:07 GMT-0500 (Eastern Standard Time) - Run Time: 2285ms

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: 2006 GTA zone of origin - gta06_orig
Column: Primary travel mode of trip - mode_prime

RowG:(1041,1040,1042)
ColG:
TblG:

Filters:
No Filters

Trip 2016
Table:

Transit excluding GO rail	Auto driver	GO rail only	Joint GO rail and local transit	Auto passenger	Walk
482	7168	86	81	1826	115
5%	73%	1%	1%	19%	1%

Single Occupant vehicle (auto driver)	73%
Non signal occupant vehicle (All other modes)	27%

EXHIBIT 2

Calculation of Residential Site Distribution using Transportsation Tomorrow Survey Data

Thu Nov 01 2018 17:05:02 GMT-0400 (Eastern Daylight Time) - Run Time: 2206ms

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: 2006 GTA zone of origin - gta06_orig
Column: 2006 GTA zone of destination - gta06_dest

(Start time of trip - start_time In 700-900
and
Primary travel mode of trip - mode_prime In D,M,T,P
and
Trip purpose - trip_purp In 1, 2
and
2006 GTA zone of origin - gta06_orig In 1040
and
2006 GTA zone of destination - gta06_dest In 1-9999)

Trip 2016
ROW : gta06_orig
COLUMN : gta06_dest

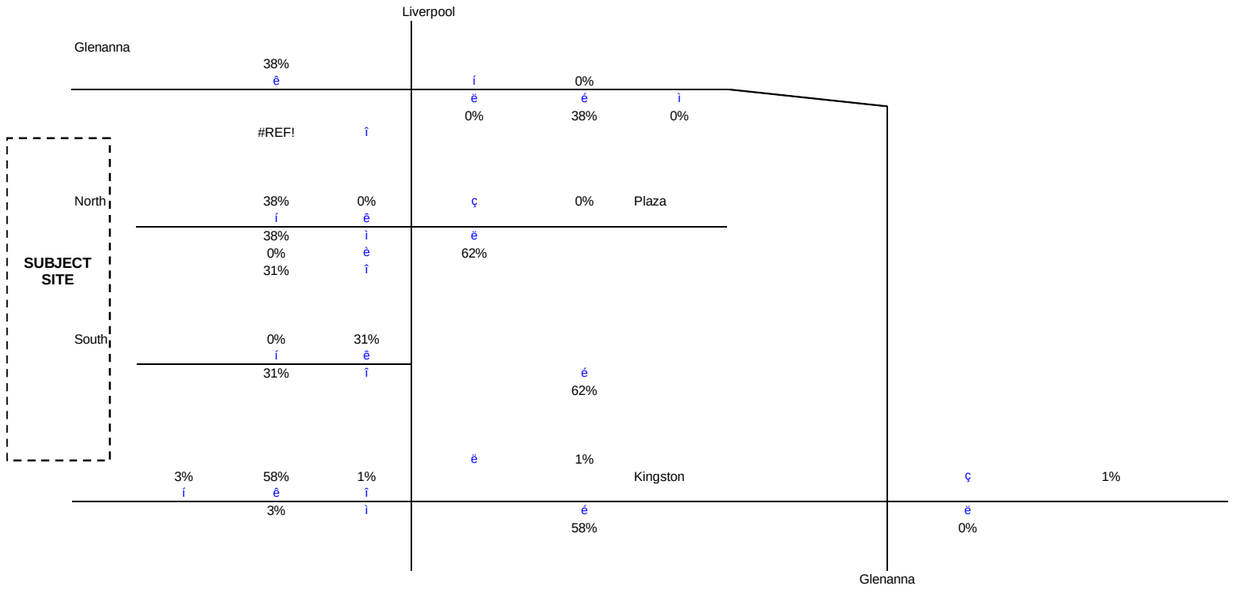
gta06_orig	gta06_dest	total
1040	47	31
1040	491	40
1040	560	9
1040	623	10
1040	1051	21
1040	1053	8
1040	1088	62
1040	1152	13
1040	1199	19
1040	2072	71
1040	2371	54
1040	2387	44
1040	2401	17
1040	2715	33
1040	9998	30

Zone of Destination	Number of Trips	Destination Municipality	General Direction 1	General Direction 2	Path
47	31	Toronto	West	NW Bay/Welles	SB Liverpool, WB Hwy 401 / SB DVP
491	40	Toronto	West	SE McCowan/H	SB Liverpool, WB Hwy 401
560	9	Toronto	West	N Morningside/I	SB Liverpool, WB On Kingston
623	10	Toronto	West	NE Morningside	SB Liverpool, WB Hwy 401
1051	21	Durham	South	SE Liverpool/Hv	SB Liverpool, EB Bayly
1053	8	Durham	South	SE Sandy Beac	SB Liverpool, EB Bayly
1088	62	Durham	Southeast	SE Church/Bayl	SB Liverpool, EB Bayly
1152	13	Durham	East	NW Brock St/Ba	SB Liverpool, EB Hwy 401
1199	19	Durham	East	NE Simcoe/King	SB Liverpool, EB Hwy 401
2072	71	York	Northwest	NW Hwy 400/R	NB Liverpool, WB Hwy 407, WB Rutherford
2371	54	York	Northwest	NE Hwy 404/Ste	SB Liverpool, WB Hwy 401, NB Hwy 404
2387	44	York	Northwest	NE Rodick/Appl	NB Liverpool, WB Hwy 407, NB Warden
2401	17	York	Northwest	NE Birchmount/	NB Liverpool, WB Hwy 407, SB Kennedy
2715	33	York	Northwest	NE Hwy 48/Beth	NB Liverpool, WB Hwy 407, NB Markham
9998	30	External, Undefined	North, East Wes	33% N, 33% W,	33% NB, 17% WB Hwy 401, 16% WB Kingston, 17% EB Hwy 401, 16% EB
	462				

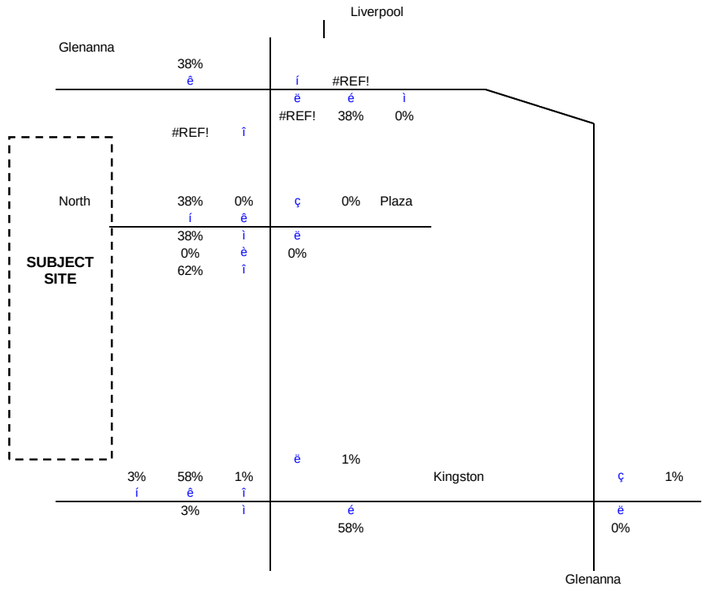
Percentage Splits						Percentage Splits					
Kingston/Liverpool			Liverpool/Glenanna			Kingston/Liverpool			Liverpool/Glenanna		
SBL	SBT	SBR	NBL	NBT	NBR	SBL	SBT	SBR	NBL	NBT	NBR
	100%					0	31	0	0	0	0
	100%					0	40	0	0	0	0
		100%				0	0	9	0	0	0
	100%					0	10	0	0	0	0
	100%					0	21	0	0	0	0
	100%					0	8	0	0	0	0
	100%					0	62	0	0	0	0
	100%					0	13	0	0	0	0
	100%					0	19	0	0	0	0
				100%		0	0	0	0	71	0
	100%					0	54	0	0	0	0
				100%		0	0	0	0	44	0
				100%		0	0	0	0	17	0
				100%		0	0	0	0	33	0
12%	43%	12%		33%		4	***12***	4	0	10	0
						4	270	13	0	175	0
											462
						1%	58%	3%	0%	38%	0%
											100%

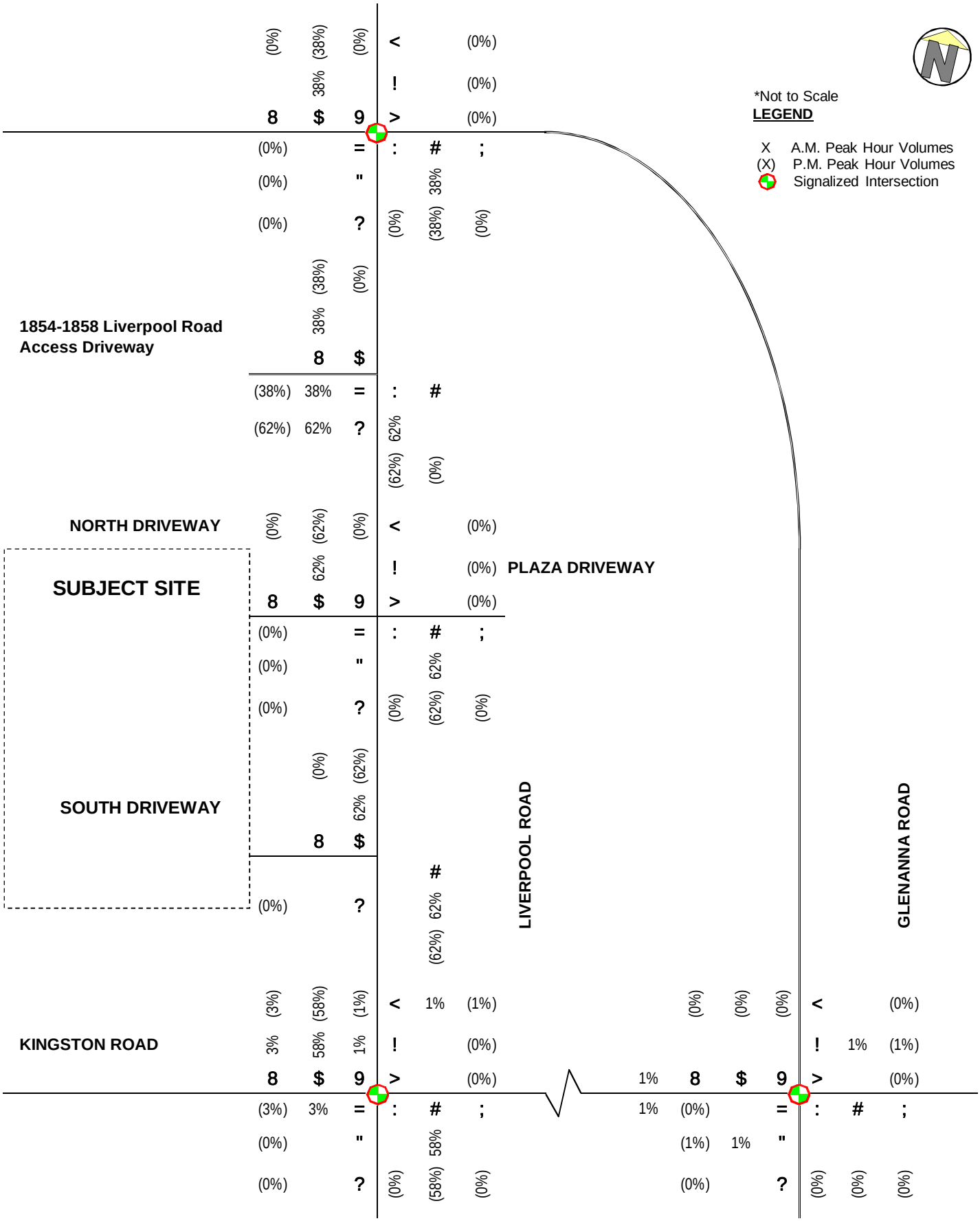
11 22

North Access Full, South as Right-In/Right-Out



North Access Only



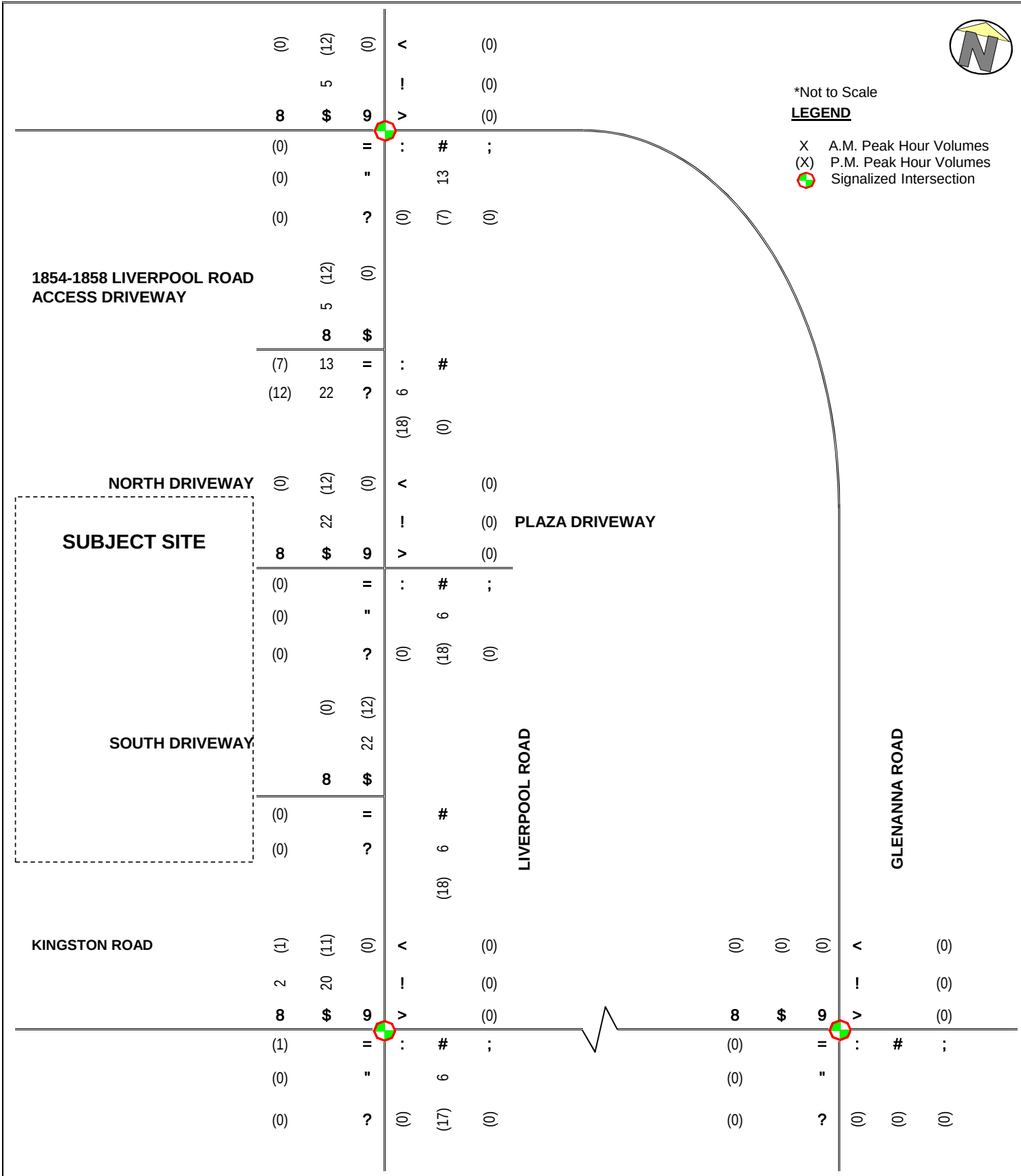


PROPOSED REDEVELOPMENT (1294 Kingston Rd., 1848 Liverpool Rd., and 1852 Liverpool Rd.)

FIGURE **C1**

Background Development Site Distribution

Column 28

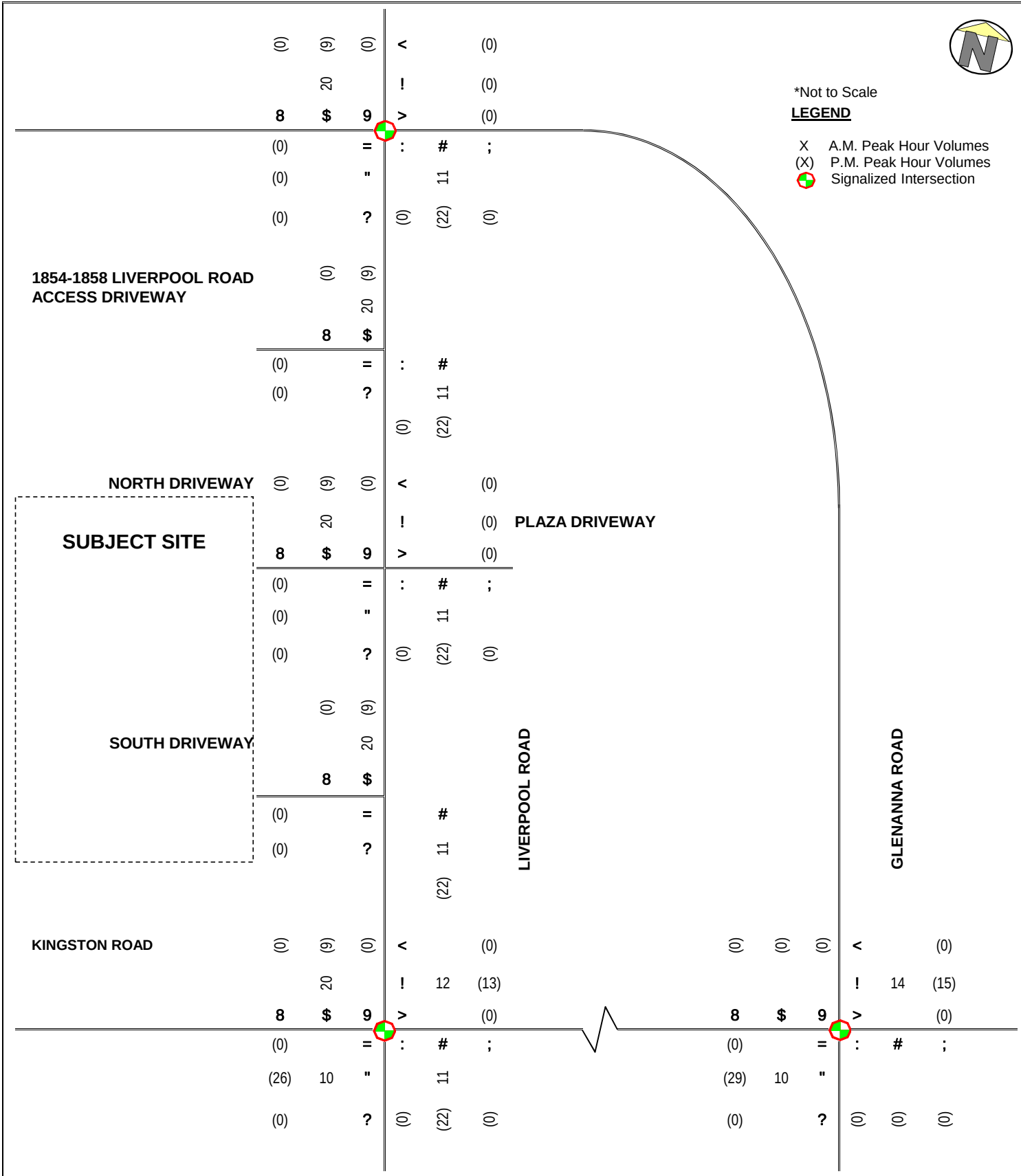


PROPOSED REDEVELOPMENT (1294 Kingston Rd., 1848 Liverpool Rd., and 1852 Liverpool Rd.)

FIGURE **C2**

Background Development Site Traffic

Column 30

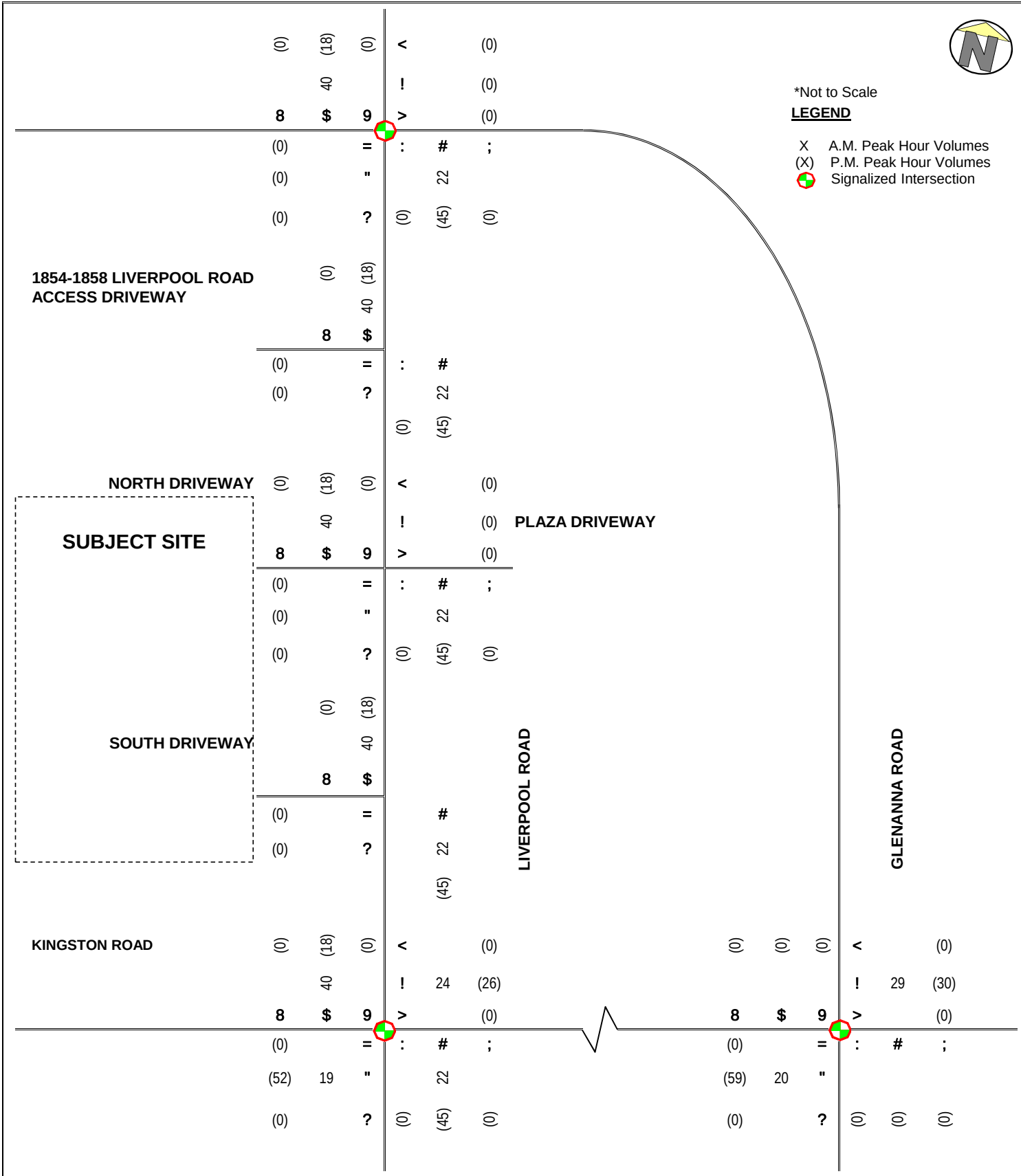


PROPOSED REDEVELOPMENT (1294 Kingston Rd., 1848 Liverpool Rd., and 1852 Liverpool Rd.)

FIGURE **C3**

CORRIDOR GROWTH (5 Years to 2024)

Column 42



PROPOSED REDEVELOPMENT (1294 Kingston Rd., 1848 Liverpool Rd., and 1852 Liverpool Rd.)

FIGURE **C4**

CORRIDOR GROWTH (10 Years To 2029)

Column 46

APPENDIX D

Future Background Intersection Capacity Analysis

Two-Access

Year 2024

A.M. Peak Hour

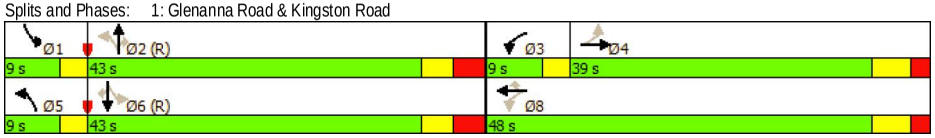
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	398	93	96	576	122	52	73	64	190	102	26
Future Volume (vph)	10	398	93	96	576	122	52	73	64	190	102	26
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2
Total Lost time (s)	6.4	6.4		3.0	6.4	6.4	3.0	7.0	7.0	3.0	7.0	7.0
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.98		1.00	1.00	0.96	1.00	1.00	0.93	1.00	1.00	0.88
Flpb, ped/bikes	0.99	1.00		1.00	1.00	1.00	0.94	1.00	1.00	0.97	1.00	1.00
Frt	1.00	0.97		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1568	3158		1650	3400	1464	1629	1860	1397	1641	1773	1365
Flt Permitted	0.41	1.00		0.25	1.00	1.00	0.69	1.00	1.00	0.65	1.00	1.00
Satd. Flow (perm)	684	3158		442	3400	1464	1175	1860	1397	1130	1773	1365
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	11	433	101	104	626	133	57	79	70	207	111	28
RTOR Reduction (vph)	0	23	0	0	0	0	0	0	43	0	0	16
Lane Group Flow (vph)	11	511	0	104	626	133	57	79	27	207	111	12
Confl. Peds. (#/hr)	8		25	25		8	35		34	34		35
Heavy Vehicles (%)	9%	8%	8%	4%	5%	1%	0%	1%	3%	2%	6%	0%
Turn Type	Perm	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4		3	8		5	2		1	6	
Permitted Phases	4			8		8	2		2	6		6
Actuated Green, G (s)	22.1	22.1		33.5	33.5	33.5	44.1	38.1	38.1	53.1	44.1	44.1
Effective Green, g (s)	22.1	22.1		33.5	33.5	33.5	44.1	38.1	38.1	53.1	44.1	44.1
Actuated g/C Ratio	0.22	0.22		0.34	0.34	0.34	0.44	0.38	0.38	0.53	0.44	0.44
Clearance Time (s)	6.4	6.4		3.0	6.4	6.4	3.0	7.0	7.0	3.0	7.0	7.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	151	697		249	1139	490	545	708	532	661	781	601
v/s Ratio Prot		c0.16		0.04	c0.18		0.01	0.04		c0.04	0.06	
v/s Ratio Perm	0.02			0.10		0.09	0.04		0.02	c0.13		0.01
v/c Ratio	0.07	0.73		0.42	0.55	0.27	0.10	0.11	0.05	0.31	0.14	0.02
Uniform Delay, d1	30.8	36.2		24.3	27.1	24.3	16.2	20.0	19.5	12.6	16.7	15.8
Progression Factor	0.58	0.72		1.00	1.00	1.00	1.00	1.00	1.00	0.82	0.87	1.00
Incremental Delay, d2	0.2	3.8		1.1	0.5	0.3	0.1	0.3	0.2	0.3	0.4	0.1
Delay (s)	18.0	29.9		25.4	27.6	24.6	16.3	20.3	19.7	10.6	14.9	15.8
Level of Service	B	C		C	C	C	B	C	B	B	B	B
Approach Delay (s)		29.6			26.9			19.0			12.4	
Approach LOS		C			C			B			B	

Intersection Summary				
HCM 2000 Control Delay	24.3	HCM 2000 Level of Service	C	
HCM 2000 Volume to Capacity ratio	0.47			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	19.4	
Intersection Capacity Utilization	54.8%	ICU Level of Service	A	
Analysis Period (min)	15			
c Critical Lane Group				

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations											
Traffic Volume (vph)	10	398	96	576	122	52	73	64	190	102	26
Future Volume (vph)	10	398	96	576	122	52	73	64	190	102	26
Lane Group Flow (vph)	11	534	104	626	133	57	79	70	207	111	28
Turn Type	Perm	NA	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4	3	8		5	2		1	6	
Permitted Phases	4		8		8	2		2	6		6
Detector Phase	4	4	3	8	8	5	2	2	1	6	6
Switch Phase											
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	8.0	8.0	5.0	8.0	8.0
Minimum Split (s)	24.4	24.4	8.0	24.4	24.4	8.0	25.4	25.4	8.0	25.4	25.4
Total Split (s)	39.0	39.0	9.0	48.0	48.0	9.0	43.0	43.0	9.0	43.0	43.0
Total Split (%)	39.0%	39.0%	9.0%	48.0%	48.0%	9.0%	43.0%	43.0%	9.0%	43.0%	43.0%
Yellow Time (s)	4.2	4.2	3.0	4.2	4.2	3.0	3.3	3.3	3.0	3.3	3.3
All-Red Time (s)	2.2	2.2	0.0	2.2	2.2	0.0	3.7	3.7	0.0	3.7	3.7
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.4	6.4	3.0	6.4	6.4	3.0	7.0	7.0	3.0	7.0	7.0
Lead/Lag	Lag	Lag	Lead			Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?											
Recall Mode	None	None	None	None	None	None	C-Min	C-Min	None	C-Min	C-Min
v/c Ratio	0.07	0.74	0.38	0.56	0.28	0.09	0.11	0.12	0.29	0.14	0.04
Control Delay	17.6	30.7	23.1	28.6	24.0	13.0	25.5	3.1	11.2	18.3	2.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	17.6	30.7	23.1	28.6	24.0	13.0	25.5	3.1	11.2	18.3	2.1
Queue Length 50th (m)	0.8	20.8	13.9	53.4	19.4	4.9	10.3	0.0	19.6	17.7	0.2
Queue Length 95th (m)	m2.1	23.5	21.9	60.5	29.4	13.3	25.9	5.7	49.3	33.8	2.3
Internal Link Dist (m)		393.2		523.9			174.6			416.6	
Turn Bay Length (m)	42.6		33.0		23.2	25.4		25.0	27.3		16.5
Base Capacity (vph)	222	1050	277	1426	614	610	784	648	706	819	686
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.05	0.51	0.38	0.44	0.22	0.09	0.10	0.11	0.29	0.14	0.04

Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 70
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Glenanna Road & Kingston Road



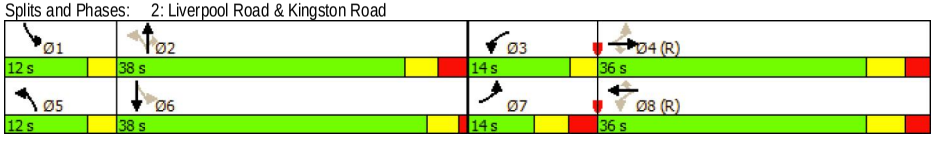
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	92	387	254	178	483	47	215	454	122	79	823	101
Future Volume (vph)	92	387	254	178	483	47	215	454	122	79	823	101
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2
Total Lost time (s)	6.9	7.0	7.0	3.0	7.0	7.0	3.0	6.9	6.9	3.0	4.5	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.91	
Frpb, ped/bikes	1.00	1.00	0.96	1.00	1.00	0.96	1.00	1.00	0.91	1.00	0.99	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.98	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1653	3368	1462	1638	3400	1487	1690	3500	1279	1665	4910	
Flt Permitted	0.34	1.00	1.00	0.41	1.00	1.00	0.17	1.00	1.00	0.47	1.00	
Satd. Flow (perm)	600	3368	1462	701	3400	1487	295	3500	1279	827	4910	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	100	421	276	193	525	51	234	493	133	86	895	110
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	80	0	15	0
Lane Group Flow (vph)	100	421	276	193	525	51	234	493	53	86	990	0
Confl. Peds. (#/hr)	15		19	9		15	22		25	25		22
Heavy Vehicles (%)	4%	6%	1%	5%	5%	0%	2%	2%	10%	2%	2%	4%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		
Actuated Green, G (s)	29.0	23.3	23.3	34.9	24.3	24.3	49.2	39.5	39.5	43.6	36.9	
Effective Green, g (s)	29.0	23.3	23.3	34.9	24.3	24.3	49.2	39.5	39.5	43.6	36.9	
Actuated g/C Ratio	0.29	0.23	0.23	0.35	0.24	0.24	0.49	0.40	0.40	0.44	0.37	
Clearance Time (s)	6.9	7.0	7.0	3.0	7.0	7.0	3.0	6.9	6.9	3.0	4.5	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	234	784	340	343	826	361	308	1382	505	416	1811	
v/s Ratio Prot	0.02	0.13		c0.06	0.15		c0.09	0.14		0.01	0.20	
v/s Ratio Perm	0.10		c0.19	0.14		0.03	c0.28		0.04	0.08		
v/c Ratio	0.43	0.54	0.81	0.56	0.64	0.14	0.76	0.36	0.10	0.21	0.55	
Uniform Delay, d1	27.0	33.6	36.3	24.2	33.9	29.7	17.1	21.3	19.1	16.8	24.9	
Progression Factor	1.00	1.00	1.00	2.34	1.82	1.90	1.00	1.00	1.00	0.90	0.89	
Incremental Delay, d2	1.3	2.6	18.7	2.0	3.5	0.8	10.3	0.7	0.4	0.2	1.2	
Delay (s)	28.3	36.3	55.0	58.6	65.2	57.3	27.4	22.0	19.5	15.4	23.4	
Level of Service	C	D	D	E	E	E	C	C	B	B	C	
Approach Delay (s)		41.7			63.0			23.1			22.8	
Approach LOS		D			E			C			C	

Intersection Summary				
HCM 2000 Control Delay	36.0	HCM 2000 Level of Service	D	
HCM 2000 Volume to Capacity ratio	0.81			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	23.8	
Intersection Capacity Utilization	71.4%	ICU Level of Service	C	
Analysis Period (min)	15			
c Critical Lane Group				

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations											
Traffic Volume (vph)	92	387	254	178	483	47	215	454	122	79	823
Future Volume (vph)	92	387	254	178	483	47	215	454	122	79	823
Lane Group Flow (vph)	100	421	276	193	525	51	234	493	133	86	1005
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA
Protected Phases	7	4		3	8		5	2		1	6
Permitted Phases	4		4	8		8	2		2	6	
Detector Phase	7	4	4	3	8	8	5	2	2	1	6
Switch Phase											
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	11.9	25.0	25.0	9.5	25.0	25.0	9.5	24.9	24.9	8.0	22.5
Total Split (s)	14.0	36.0	36.0	14.0	36.0	36.0	12.0	38.0	38.0	12.0	38.0
Total Split (%)	14.0%	36.0%	36.0%	14.0%	36.0%	36.0%	12.0%	38.0%	38.0%	12.0%	38.0%
Yellow Time (s)	3.7	4.2	4.2	3.0	4.2	4.2	3.0	3.7	3.7	3.0	3.5
All-Red Time (s)	3.2	2.8	2.8	0.0	2.8	2.8	0.0	3.2	3.2	0.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.9	7.0	7.0	3.0	7.0	7.0	3.0	6.9	6.9	3.0	4.5
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag
Lead-Lag Optimize?											
Recall Mode	None	C-Min	C-Min	None	C-Min	C-Min	None	Max	Max	None	Max
v/c Ratio	0.39	0.52	0.79	0.52	0.59	0.13	0.74	0.36	0.22	0.19	0.56
Control Delay	24.0	34.9	51.8	48.5	61.4	54.2	33.2	24.4	4.1	13.5	24.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	24.0	34.9	51.8	48.5	61.4	54.2	33.2	24.4	4.1	13.5	24.2
Queue Length 50th (m)	13.0	39.0	52.4	39.4	60.0	10.9	25.9	38.7	0.0	7.7	52.0
Queue Length 95th (m)	22.7	51.3	78.5	60.6	77.0	22.8	#71.6	57.7	10.3	16.3	70.4
Internal Link Dist (m)		667.5			393.2			242.2			35.5
Turn Bay Length (m)	33.5		49.1	103.2		61.6	46.2		51.8	47.9	
Base Capacity (vph)	260	976	423	376	987	431	315	1382	617	464	1794
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.38	0.43	0.65	0.51	0.53	0.12	0.74	0.36	0.22	0.19	0.56

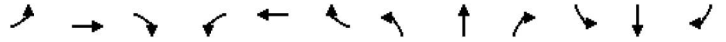
Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 13 (13%), Referenced to phase 4:EBTL and 8:WBTL, Start of Green
Natural Cycle: 70
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 2: Liverpool Road & Kingston Road



4: Liverpool Road & North Site Access/Plaza Access

Weekday AM Peak Hour



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	8	0	14	106	1	59	18	412	163	94	875	19
Future Volume (Veh/h)	8	0	14	106	1	59	18	412	163	94	875	19
Sign Control		Stop			Stop			Free			Free	
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	0	15	115	1	64	20	448	177	102	951	21
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								TWLTL			TWLTL	
Median storage veh)								2			2	
Upstream signal (m)								140			216	
pX, platoon unblocked	0.92	0.92	0.97	0.92	0.92	0.91	0.97			0.91		
vC, conflicting volume	1494	1830	486	1271	1752	312	972			625		
vC1, stage 1 conf vol	1166	1166		576	576							
vC2, stage 2 conf vol	328	665		694	1176							
vCu, unblocked vol	1226	1590	409	985	1506	46	910			389		
tC, single (s)	7.5	6.5	7.2	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)	6.5	5.5		6.5	5.5							
tF (s)	3.5	4.0	3.4	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	95	100	97	65	100	93	97			90		
cM capacity (veh/h)	192	223	543	325	217	928	734			1060		

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	24	115	65	20	299	326	102	634	338
Volume Left	9	115	0	20	0	0	102	0	0
Volume Right	15	0	64	0	0	177	0	0	21
cSH	322	325	883	734	1700	1700	1060	1700	1700
Volume to Capacity	0.07	0.35	0.07	0.03	0.18	0.19	0.10	0.37	0.20
Queue Length 95th (m)	1.9	12.4	1.9	0.7	0.0	0.0	2.5	0.0	0.0
Control Delay (s)	17.1	22.0	9.4	10.0	0.0	0.0	8.8	0.0	0.0
Lane LOS	C	C	A	B			A		
Approach Delay (s)	17.1	17.5		0.3			0.8		
Approach LOS	C	C							

Intersection Summary					
Average Delay	2.4				
Intersection Capacity Utilization	50.7%	ICU Level of Service		A	
Analysis Period (min)	15				

3: Liverpool Road & South Site Access

Weekday AM Peak Hour

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	11	0	593	992	3
Future Volume (Veh/h)	0	11	0	593	992	3
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	12	0	645	1078	3
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	TWLTL	
Median storage veh)					2	
Upstream signal (m)				59	297	
pX, platoon unblocked	0.90					
vC, conflicting volume	1402	271	1081			
vC1, stage 1 conf vol	1080					
vC2, stage 2 conf vol	322					
vCu, unblocked vol	1231	271	1081			
tC, single (s)	6.8	7.1	4.1			
tC, 2 stage (s)	5.8					
tF (s)	3.5	3.4	2.2			
p0 queue free %	100	98	100			
cM capacity (veh/h)	281	706	653			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2	SB 3	SB 4
Volume Total	12	322	322	308	308	308	157
Volume Left	0	0	0	0	0	0	0
Volume Right	12	0	0	0	0	0	3
cSH	706	1700	1700	1700	1700	1700	1700
Volume to Capacity	0.02	0.19	0.19	0.18	0.18	0.18	0.09
Queue Length 95th (m)	0.4	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	10.2	0.0	0.0	0.0	0.0	0.0	0.0
Lane LOS	B						
Approach Delay (s)	10.2	0.0		0.0			
Approach LOS	B						

Intersection Summary				
Average Delay	0.1			
Intersection Capacity Utilization	24.4%	ICU Level of Service		A
Analysis Period (min)	15			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	47	138	255	72	87	56	115	339	32	73	644	69
Future Volume (vph)	47	138	255	72	87	56	115	339	32	73	644	69
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2
Total Lost time (s)	5.9	5.9	5.9	5.9	5.9		6.7	6.7		6.7	6.7	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		0.99	1.00		0.99	1.00	
Frt	1.00	1.00	0.85	1.00	0.94		1.00	0.99		1.00	0.99	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1658	1773	1513	1675	1717		1658	3352		1646	3409	
Flt Permitted	0.55	1.00	1.00	0.57	1.00		0.35	1.00		0.51	1.00	
Satd. Flow (perm)	963	1773	1513	1006	1717		615	3352		892	3409	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	51	150	277	78	95	61	125	368	35	79	700	75
RTOR Reduction (vph)	0	0	191	0	28	0	0	5	0	0	5	0
Lane Group Flow (vph)	51	150	86	78	128	0	125	398	0	79	770	0
Confl. Peds. (#/hr)							11		8	8		11
Heavy Vehicles (%)	4%	6%	2%	3%	3%	3%	3%	4%	14%	4%	3%	0%
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)	14.0	14.0	14.0	14.0	14.0		73.4	73.4		73.4	73.4	
Effective Green, g (s)	14.0	14.0	14.0	14.0	14.0		73.4	73.4		73.4	73.4	
Actuated g/C Ratio	0.14	0.14	0.14	0.14	0.14		0.73	0.73		0.73	0.73	
Clearance Time (s)	5.9	5.9	5.9	5.9	5.9		6.7	6.7		6.7	6.7	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	134	248	211	140	240		451	2460		654	2502	
v/s Ratio Prot		c0.08			0.07			0.12			c0.23	
v/s Ratio Perm	0.05		0.06	0.08			0.20			0.09		
v/c Ratio	0.38	0.60	0.41	0.56	0.54		0.28	0.16		0.12	0.31	
Uniform Delay, d1	39.1	40.4	39.2	40.1	40.0		4.4	4.0		3.9	4.6	
Progression Factor	1.00	1.00	1.00	1.28	1.35		0.73	0.70		1.00	1.00	
Incremental Delay, d2	1.8	4.1	1.3	4.7	2.3		1.5	0.1		0.4	0.3	
Delay (s)	40.9	44.5	40.5	55.9	56.3		4.7	2.9		4.3	4.9	
Level of Service	D	D	D	E	E		A	A		A	A	
Approach Delay (s)		41.8			56.2			3.4			4.8	
Approach LOS		D			E			A			A	

Intersection Summary				
HCM 2000 Control Delay	18.6	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.36			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.6	
Intersection Capacity Utilization	62.1%	ICU Level of Service	B	
Analysis Period (min)	15			
c Critical Lane Group				

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations									
Traffic Volume (vph)	47	138	255	72	87	115	339	73	644
Future Volume (vph)	47	138	255	72	87	115	339	73	644
Lane Group Flow (vph)	51	150	277	78	156	125	403	79	775
Turn Type	Perm	NA	Perm	Perm	NA	Perm	NA	Perm	NA
Protected Phases		4			8		2		6
Permitted Phases	4		4	8		2		6	
Detector Phase	4	4	4	8	8	2	2	6	6
Switch Phase									
Minimum Initial (s)	8.0	8.0	8.0	5.0	5.0	5.0	5.0	8.0	8.0
Minimum Split (s)	23.9	23.9	23.9	23.9	23.9	24.7	24.7	24.7	24.7
Total Split (s)	34.0	34.0	34.0	34.0	34.0	66.0	66.0	66.0	66.0
Total Split (%)	34.0%	34.0%	34.0%	34.0%	34.0%	66.0%	66.0%	66.0%	66.0%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	4.6	4.6	4.6	4.6
All-Red Time (s)	2.2	2.2	2.2	2.2	2.2	2.1	2.1	2.1	2.1
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.9	5.9	5.9	5.9	5.9	6.7	6.7	6.7	6.7
Lead/Lag									
Lead-Lag Optimize?									
Recall Mode	None	None	None	None	None	C-Min	C-Min	C-Min	C-Min
v/c Ratio	0.38	0.60	0.69	0.55	0.58	0.28	0.16	0.12	0.31
Control Delay	45.5	49.9	18.7	64.6	50.6	5.6	3.2	5.3	5.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	45.5	49.9	18.7	64.6	50.6	5.6	3.2	5.3	5.3
Queue Length 50th (m)	9.6	29.2	10.2	16.7	26.9	4.1	6.4	3.9	23.2
Queue Length 95th (m)	20.1	46.4	34.8	30.9	46.4	10.4	12.6	10.8	40.0
Internal Link Dist (m)		107.2			416.6		192.1		478.0
Turn Bay Length (m)	22.0			24.3		24.4		46.2	
Base Capacity (vph)	270	498	584	282	505	452	2464	654	2504
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.19	0.30	0.47	0.28	0.31	0.28	0.16	0.12	0.31

Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 55
Control Type: Actuated-Coordinated

Splits and Phases: 6: Liverpool Road & Glenanna Road

P.M. Peak Hour

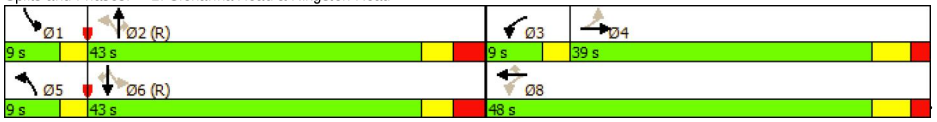
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	24	1184	141	156	595	132	119	177	194	178	199	36
Future Volume (vph)	24	1184	141	156	595	132	119	177	194	178	199	36
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2
Total Lost time (s)	6.4	6.4		3.0	6.4	6.4	3.0	7.0	7.0	3.0	7.0	7.0
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.98		1.00	1.00	0.90	1.00	1.00	0.91	1.00	1.00	0.73
Flpb, ped/bikes	0.97	1.00		1.00	1.00	1.00	0.93	1.00	1.00	0.97	1.00	1.00
Frt	1.00	0.98		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1666	3371		1658	3500	1373	1599	1879	1385	1673	1824	1130
Flt Permitted	0.41	1.00		0.08	1.00	1.00	0.47	1.00	1.00	0.53	1.00	1.00
Satd. Flow (perm)	712	3371		147	3500	1373	790	1879	1385	935	1824	1130
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	26	1287	153	170	647	143	129	192	211	193	216	39
RTOR Reduction (vph)	0	8	0	0	0	40	0	0	171	0	0	32
Lane Group Flow (vph)	26	1432	0	170	647	103	129	192	40	193	216	7
Confl. Peds. (#/hr)	30		55	55		30	91		50	50		91
Heavy Vehicles (%)	0%	2%	5%	4%	2%	1%	0%	0%	1%	0%	3%	0%
Turn Type	Perm	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4		3	8		5	2		1	6	
Permitted Phases	4			8		8	2		2	6		6
Actuated Green, G (s)	44.5	44.5		60.3	60.3	60.3	23.3	17.3	17.3	23.3	17.3	17.3
Effective Green, g (s)	44.5	44.5		60.3	60.3	60.3	23.3	17.3	17.3	23.3	17.3	17.3
Actuated g/C Ratio	0.44	0.44		0.60	0.60	0.60	0.23	0.17	0.17	0.23	0.17	0.17
Clearance Time (s)	6.4	6.4		3.0	6.4	6.4	3.0	7.0	7.0	3.0	7.0	7.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	316	1500		282	2110	827	232	325	239	262	315	195
v/s Ratio Prot		c0.42		c0.08	0.18		0.03	0.10		c0.04	0.12	
v/s Ratio Perm	0.04			0.29		0.07	0.10		0.03	c0.13		0.01
v/c Ratio	0.08	0.95		0.60	0.31	0.12	0.56	0.59	0.17	0.74	0.69	0.03
Uniform Delay, d1	16.0	26.8		20.8	9.7	8.5	32.5	38.1	35.2	34.7	38.8	34.4
Progression Factor	0.48	0.56		1.00	1.00	1.00	1.00	1.00	1.00	1.06	1.07	1.00
Incremental Delay, d2	0.1	8.0		3.6	0.1	0.1	2.9	7.7	1.5	10.3	11.5	0.3
Delay (s)	7.7	23.0		24.4	9.8	8.6	35.4	45.8	36.7	47.1	53.1	34.7
Level of Service	A	C		C	A	A	D	D	D	D	D	C
Approach Delay (s)		22.7			12.2			39.7			48.9	
Approach LOS		C			B			D			D	

Intersection Summary				
HCM 2000 Control Delay	25.8	HCM 2000 Level of Service	C	
HCM 2000 Volume to Capacity ratio	0.84			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	19.4	
Intersection Capacity Utilization	89.0%	ICU Level of Service	E	
Analysis Period (min)	15			
c Critical Lane Group				

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations											
Traffic Volume (vph)	24	1184	156	595	132	119	177	194	178	199	36
Future Volume (vph)	24	1184	156	595	132	119	177	194	178	199	36
Lane Group Flow (vph)	26	1440	170	647	143	129	192	211	193	216	39
Turn Type	Perm	NA	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4	3	8		5	2		1	6	
Permitted Phases	4		8		8	2		2	6		6
Detector Phase	4	4	3	8	8	5	2	2	1	6	6
Switch Phase											
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	24.4	24.4	8.0	24.4	24.4	8.0	25.0	25.0	8.0	25.0	25.0
Total Split (s)	39.0	39.0	9.0	48.0	48.0	9.0	43.0	43.0	9.0	43.0	43.0
Total Split (%)	39.0%	39.0%	9.0%	48.0%	48.0%	9.0%	43.0%	43.0%	9.0%	43.0%	43.0%
Yellow Time (s)	4.2	4.2	3.0	4.2	4.2	3.0	3.3	3.3	3.0	3.3	3.3
All-Red Time (s)	2.2	2.2	0.0	2.2	2.2	0.0	3.7	3.7	0.0	3.7	3.7
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.4	6.4	3.0	6.4	6.4	3.0	7.0	7.0	3.0	7.0	7.0
Lead/Lag	Lag	Lag	Lead			Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?											
Recall Mode	None	None	None	None	None	None	C-Min	C-Min	None	C-Min	C-Min
v/c Ratio	0.08	0.96	0.59	0.31	0.16	0.51	0.59	0.51	0.65	0.69	0.14
Control Delay	9.6	27.0	25.0	10.8	4.2	33.2	44.9	9.8	40.8	52.3	2.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	9.6	27.0	25.0	10.8	4.2	33.2	44.9	9.8	40.8	52.3	2.0
Queue Length 50th (m)	0.9	157.8	15.7	31.3	3.2	19.7	36.5	0.7	34.2	44.2	0.0
Queue Length 95th (m)	m2.8	m#216.6	39.7	49.2	13.2	31.7	55.0	19.2	42.2	65.4	1.0
Internal Link Dist (m)		393.2		523.9			174.6			416.6	
Turn Bay Length (m)	42.6		33.0		23.2	25.4		25.0	27.3		16.5
Base Capacity (vph)	316	1507	287	2110	868	252	676	631	296	656	472
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.08	0.96	0.59	0.31	0.16	0.51	0.28	0.33	0.65	0.33	0.08

Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Glenanna Road & Kingston Road



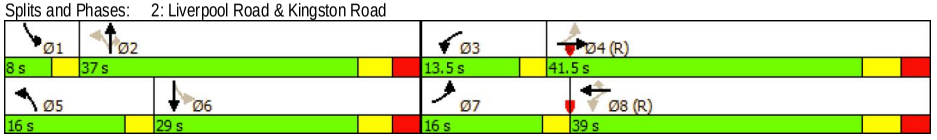
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	215	1048	330	226	515	77	302	935	278	109	370	84
Future Volume (vph)	215	1048	330	226	515	77	302	935	278	109	370	84
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2
Total Lost time (s)	3.0	7.4	7.4	3.0	7.4	7.4	3.0	6.9	6.9	3.0	6.9	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.91	
Frpb, ped/bikes	1.00	1.00	0.94	1.00	1.00	0.95	1.00	1.00	0.85	1.00	0.99	
Flpb, ped/bikes	0.99	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1699	3500	1416	1708	3500	1431	1677	3535	1273	1670	4898	
Flt Permitted	0.35	1.00	1.00	0.12	1.00	1.00	0.37	1.00	1.00	0.18	1.00	
Satd. Flow (perm)	627	3500	1416	219	3500	1431	660	3535	1273	318	4898	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	234	1139	359	246	560	84	328	1016	302	118	402	91
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	152	0	37	0
Lane Group Flow (vph)	234	1139	359	246	560	84	328	1016	150	118	456	0
Confl. Peds. (#/hr)	26		32	32		26	34		48	48		34
Heavy Vehicles (%)	1%	2%	2%	1%	2%	2%	2%	1%	3%	3%	0%	3%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		
Actuated Green, G (s)	45.9	34.1	34.1	43.3	32.8	32.8	38.1	30.1	30.1	27.1	22.1	
Effective Green, g (s)	45.9	34.1	34.1	43.3	32.8	32.8	38.1	30.1	30.1	27.1	22.1	
Actuated g/C Ratio	0.46	0.34	0.34	0.43	0.33	0.33	0.38	0.30	0.30	0.27	0.22	
Clearance Time (s)	3.0	7.4	7.4	3.0	7.4	7.4	3.0	6.9	6.9	3.0	6.9	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	414	1193	482	251	1148	469	383	1064	383	153	1082	
v/s Ratio Prot	c0.07	c0.33		c0.10	0.16		c0.11	c0.29		0.04	0.09	
v/s Ratio Perm	0.19		0.25	0.32		0.06	0.21		0.12	0.17		
v/c Ratio	0.57	0.95	0.74	0.98	0.49	0.18	0.86	0.95	0.39	0.77	0.42	
Uniform Delay, d1	17.3	32.2	29.1	25.3	26.9	24.0	24.8	34.3	27.7	31.0	33.5	
Progression Factor	1.00	1.00	1.00	1.36	1.44	1.45	1.00	1.00	1.00	1.09	1.04	
Incremental Delay, d2	1.8	17.2	10.0	50.2	1.4	0.8	16.9	17.6	0.7	21.0	0.3	
Delay (s)	19.1	49.4	39.1	84.6	40.1	35.5	41.7	51.9	28.4	54.9	35.0	
Level of Service	B	D	D	F	D	D	D	D	C	D	D	
Approach Delay (s)		43.2			51.9			45.6			38.8	
Approach LOS		D			D			D			D	

Intersection Summary				
HCM 2000 Control Delay	45.0	HCM 2000 Level of Service	D	
HCM 2000 Volume to Capacity ratio	0.98			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	20.3	
Intersection Capacity Utilization	92.0%	ICU Level of Service	F	
Analysis Period (min)	15			
c Critical Lane Group				

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations											
Traffic Volume (vph)	215	1048	330	226	515	77	302	935	278	109	370
Future Volume (vph)	215	1048	330	226	515	77	302	935	278	109	370
Lane Group Flow (vph)	234	1139	359	246	560	84	328	1016	302	118	493
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA
Protected Phases	7	4		3	8		5	2		1	6
Permitted Phases	4		4	8		8	2		2	6	
Detector Phase	7	4	4	3	8	8	5	2	2	1	6
Switch Phase											
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	8.0	25.4	25.4	8.5	25.4	25.4	8.0	24.9	24.9	8.0	24.9
Total Split (s)	16.0	41.5	41.5	13.5	39.0	39.0	16.0	37.0	37.0	8.0	29.0
Total Split (%)	16.0%	41.5%	41.5%	13.5%	39.0%	39.0%	16.0%	37.0%	37.0%	8.0%	29.0%
Yellow Time (s)	3.0	4.2	4.2	3.0	4.2	4.2	3.0	3.7	3.7	3.0	3.7
All-Red Time (s)	0.0	3.2	3.2	0.0	3.2	3.2	0.0	3.2	3.2	0.0	3.2
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	3.0	7.4	7.4	3.0	7.4	7.4	3.0	6.9	6.9	3.0	6.9
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag
Lead-Lag Optimize?											
Recall Mode	None	C-Min	C-Min	None	C-Min	C-Min	None	Min	Min	None	Min
v/c Ratio	0.53	0.95	0.74	0.95	0.49	0.18	0.80	0.95	0.57	0.72	0.44
Control Delay	18.2	50.2	40.2	73.2	41.0	37.1	38.6	53.8	13.4	48.3	32.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.2	50.2	40.2	73.2	41.0	37.1	38.6	53.8	13.4	48.3	32.9
Queue Length 50th (m)	25.4	118.2	64.0	40.6	61.7	15.3	47.1	106.5	13.0	13.6	26.1
Queue Length 95th (m)	40.7	#163.6	#102.7	#82.4	76.8	29.1	#85.2	#149.6	40.5	#34.0	41.3
Internal Link Dist (m)		667.5			393.2			242.2			35.5
Turn Bay Length (m)	33.5		49.1	103.2		61.6	46.2		51.8	47.9	
Base Capacity (vph)	461	1193	482	260	1146	468	408	1064	534	165	1118
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.51	0.95	0.74	0.95	0.49	0.18	0.80	0.95	0.57	0.72	0.44

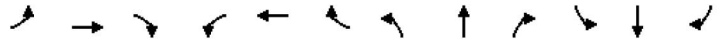
Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 13 (13%), Referenced to phase 4:EBTL and 8:WBTL, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 2: Liverpool Road & Kingston Road



4: Liverpool Road & North Site Access/Plaza Access

Weekday PM Peak (Optimized)



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	23	0	21	123	1	98	57	923	247	76	398	34
Future Volume (Veh/h)	23	0	21	123	1	98	57	923	247	76	398	34
Sign Control		Stop			Stop			Free			Free	
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)	25	0	23	134	1	107	62	1003	268	83	433	37
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								TWLTL			TWLTL	
Median storage veh)								2			2	
Upstream signal (m)								140			216	
pX, platoon unblocked	0.72	0.72		0.72	0.72	0.72				0.72		
vC, conflicting volume	1350	2012	235	1666	1897	636	470			1271		
vC1, stage 1 conf vol	618	618		1261	1261							
vC2, stage 2 conf vol	733	1395		406	636							
vCu, unblocked vol	719	1634	235	1156	1474	0	470			609		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)	6.5	5.5		6.5	5.5							
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	93	100	97	50	100	86	94			88		
cM capacity (veh/h)	343	179	773	267	251	786	1102			708		

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	48	134	108	62	669	602	83	289	181
Volume Left	25	134	0	62	0	0	83	0	0
Volume Right	23	0	107	0	0	268	0	0	37
cSH	468	267	771	1102	1700	1700	708	1700	1700
Volume to Capacity	0.10	0.50	0.14	0.06	0.39	0.35	0.12	0.17	0.11
Queue Length 95th (m)	2.7	20.9	3.9	1.4	0.0	0.0	3.2	0.0	0.0
Control Delay (s)	13.6	31.4	10.4	8.5	0.0	0.0	10.8	0.0	0.0
Lane LOS	B	D	B	A			B		
Approach Delay (s)	13.6	22.0		0.4			1.6		
Approach LOS	B	C							

Intersection Summary				
Average Delay	3.4			
Intersection Capacity Utilization	59.2%	ICU Level of Service	B	
Analysis Period (min)	15			

3: Liverpool Road & South Site Access

Weekday PM Peak (Optimized)

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	23	0	1227	540	2
Future Volume (Veh/h)	0	23	0	1227	540	2
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	25	0	1334	587	2
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	TWLTL	
Median storage veh)					2	
Upstream signal (m)				59	297	
pX, platoon unblocked	0.72					
vC, conflicting volume	1255	148	589			
vC1, stage 1 conf vol	588					
vC2, stage 2 conf vol	667					
vCu, unblocked vol	564	148	589			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)	5.8					
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	97	100			
cM capacity (veh/h)	486	879	996			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2	SB 3	SB 4
Volume Total	25	445	889	168	168	168	86
Volume Left	0	0	0	0	0	0	0
Volume Right	25	0	0	0	0	0	2
cSH	879	996	1700	1700	1700	1700	1700
Volume to Capacity	0.03	0.00	0.52	0.10	0.10	0.10	0.05
Queue Length 95th (m)	0.7	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	9.2	0.0	0.0	0.0	0.0	0.0	0.0
Lane LOS	A						
Approach Delay (s)	9.2	0.0		0.0			
Approach LOS	A						

Intersection Summary				
Average Delay	0.1			
Intersection Capacity Utilization	37.3%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	45	72	110	52	145	44	347	614	72	67	346	30
Future Volume (vph)	45	72	110	52	145	44	347	614	72	67	346	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2
Total Lost time (s)	5.9	5.9	5.9	5.9	5.9		6.7	6.7		6.7	6.7	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00		0.99	1.00	
Frt	1.00	1.00	0.85	1.00	0.97		1.00	0.98		1.00	0.99	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1725	1824	1543	1725	1791		1708	3454		1714	3527	
Flt Permitted	0.43	1.00	1.00	0.71	1.00		0.51	1.00		0.36	1.00	
Satd. Flow (perm)	788	1824	1543	1282	1791		920	3454		654	3527	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	49	78	120	57	158	48	377	667	78	73	376	33
RTOR Reduction (vph)	0	0	101	0	13	0	0	6	0	0	4	0
Lane Group Flow (vph)	49	78	19	57	193	0	377	739	0	73	405	0
Confl. Peds. (#/hr)									11	11		
Heavy Vehicles (%)	0%	3%	0%	0%	1%	2%	1%	1%	5%	0%	0%	0%
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)	16.0	16.0	16.0	16.0	16.0		71.4	71.4		71.4	71.4	
Effective Green, g (s)	16.0	16.0	16.0	16.0	16.0		71.4	71.4		71.4	71.4	
Actuated g/C Ratio	0.16	0.16	0.16	0.16	0.16		0.71	0.71		0.71	0.71	
Clearance Time (s)	5.9	5.9	5.9	5.9	5.9		6.7	6.7		6.7	6.7	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	126	291	246	205	286		656	2466		466	2518	
v/s Ratio Prot		0.04			c0.11			0.21			0.11	
v/s Ratio Perm	0.06		0.01	0.04			c0.41			0.11		
v/c Ratio	0.39	0.27	0.08	0.28	0.67		0.57	0.30		0.16	0.16	
Uniform Delay, d1	37.6	36.9	35.7	36.9	39.5		6.9	5.2		4.6	4.6	
Progression Factor	1.00	1.00	1.00	0.69	0.76		0.70	0.49		1.00	1.00	
Incremental Delay, d2	2.0	0.5	0.1	0.7	6.0		2.4	0.2		0.7	0.1	
Delay (s)	39.6	37.4	35.9	26.1	36.0		7.3	2.7		5.3	4.8	
Level of Service	D	D	D	C	D		A	A		A	A	
Approach Delay (s)		37.1			33.8			4.3			4.8	
Approach LOS		D			C			A			A	

Intersection Summary				
HCM 2000 Control Delay	11.9	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.59			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.6	
Intersection Capacity Utilization	67.7%	ICU Level of Service	C	
Analysis Period (min)	15			
c Critical Lane Group				

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations									
Traffic Volume (vph)	45	72	110	52	145	347	614	67	346
Future Volume (vph)	45	72	110	52	145	347	614	67	346
Lane Group Flow (vph)	49	78	120	57	206	377	745	73	409
Turn Type	Perm	NA	Perm	Perm	NA	Perm	NA	Perm	NA
Protected Phases		4			8		2		6
Permitted Phases	4		4	8		2		6	
Detector Phase	4	4	4	8	8	2	2	6	6
Switch Phase									
Minimum Initial (s)	8.0	8.0	8.0	8.0	8.0	5.0	5.0	5.0	5.0
Minimum Split (s)	23.9	23.9	23.9	23.9	23.9	24.7	24.7	24.7	24.7
Total Split (s)	36.0	36.0	36.0	36.0	36.0	64.0	64.0	64.0	64.0
Total Split (%)	36.0%	36.0%	36.0%	36.0%	36.0%	64.0%	64.0%	64.0%	64.0%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	4.6	4.6	4.6	4.6
All-Red Time (s)	2.2	2.2	2.2	2.2	2.2	2.1	2.1	2.1	2.1
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.9	5.9	5.9	5.9	5.9	6.7	6.7	6.7	6.7
Lead/Lag									
Lead-Lag Optimize?									
Recall Mode	None	None	None	None	None	C-Min	C-Min	C-Min	C-Min
v/c Ratio	0.39	0.27	0.34	0.28	0.69	0.57	0.30	0.16	0.16
Control Delay	45.0	37.4	9.2	27.4	38.9	8.6	2.9	6.6	5.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	45.0	37.4	9.2	27.4	38.9	8.6	2.9	6.6	5.1
Queue Length 50th (m)	9.1	14.1	0.0	5.2	17.4	13.8	12.8	4.1	11.7
Queue Length 95th (m)	19.6	25.9	14.4	21.5	61.4	m75.2	m6.6	11.5	21.1
Internal Link Dist (m)		107.2			416.6		192.1		478.0
Turn Bay Length (m)	22.0			24.3		24.4		46.2	
Base Capacity (vph)	237	549	548	385	550	656	2470	466	2521
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.21	0.14	0.22	0.15	0.37	0.57	0.30	0.16	0.16

Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 6: Liverpool Road & Glenanna Road

Year 2029

A.M. Peak Hour

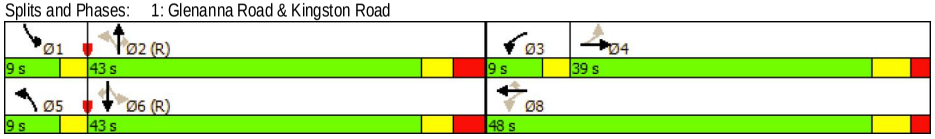
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	408	93	96	591	122	52	73	64	190	102	26
Future Volume (vph)	10	408	93	96	591	122	52	73	64	190	102	26
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2
Total Lost time (s)	6.4	6.4		3.0	6.4	6.4	3.0	7.0	7.0	3.0	7.0	7.0
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.98		1.00	1.00	0.96	1.00	1.00	0.93	1.00	1.00	0.93
Flpb, ped/bikes	0.99	1.00		1.00	1.00	1.00	0.97	1.00	1.00	0.97	1.00	1.00
Frt	1.00	0.97		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1568	3161		1651	3400	1464	1667	1860	1397	1641	1773	1436
Flt Permitted	0.41	1.00		0.25	1.00	1.00	0.69	1.00	1.00	0.65	1.00	1.00
Satd. Flow (perm)	673	3161		436	3400	1464	1203	1860	1397	1129	1773	1436
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	11	443	101	104	642	133	57	79	70	207	111	28
RTOR Reduction (vph)	0	22	0	0	0	0	0	0	44	0	0	16
Lane Group Flow (vph)	11	522	0	104	642	133	57	79	26	207	111	12
Confl. Peds. (#/hr)	8		25	25		8	35		34	34		35
Heavy Vehicles (%)	9%	8%	8%	4%	5%	1%	0%	1%	3%	2%	6%	0%
Turn Type	Perm	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4		3	8		5	2		1	6	
Permitted Phases	4			8		8	2		2	6		6
Actuated Green, G (s)	22.5	22.5		33.9	33.9	33.9	43.7	37.7	37.7	52.7	43.7	43.7
Effective Green, g (s)	22.5	22.5		33.9	33.9	33.9	43.7	37.7	37.7	52.7	43.7	43.7
Actuated g/C Ratio	0.22	0.22		0.34	0.34	0.34	0.44	0.38	0.38	0.53	0.44	0.44
Clearance Time (s)	6.4	6.4		3.0	6.4	6.4	3.0	7.0	7.0	3.0	7.0	7.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	151	711		249	1152	496	553	701	526	656	774	627
v/s Ratio Prot		c0.16		0.03	c0.19		0.01	0.04		c0.04	0.06	
v/s Ratio Perm	0.02			0.11		0.09	0.04		0.02	c0.13		0.01
v/c Ratio	0.07	0.73		0.42	0.56	0.27	0.10	0.11	0.05	0.32	0.14	0.02
Uniform Delay, d1	30.5	36.0		24.0	26.9	24.0	16.4	20.3	19.8	12.9	16.9	16.0
Progression Factor	0.57	0.72		1.00	1.00	1.00	1.00	1.00	1.00	0.81	0.86	1.00
Incremental Delay, d2	0.2	3.7		1.1	0.6	0.3	0.1	0.3	0.2	0.3	0.4	0.1
Delay (s)	17.5	29.6		25.2	27.5	24.3	16.5	20.6	20.0	10.7	15.0	16.0
Level of Service	B	C		C	C	C	B	C	B	B	B	B
Approach Delay (s)		29.3			26.8			19.2			12.5	
Approach LOS		C			C			B			B	

Intersection Summary				
HCM 2000 Control Delay	24.2	HCM 2000 Level of Service	C	
HCM 2000 Volume to Capacity ratio	0.47			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	19.4	
Intersection Capacity Utilization	54.9%	ICU Level of Service	A	
Analysis Period (min)	15			
c Critical Lane Group				

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations											
Traffic Volume (vph)	10	408	96	591	122	52	73	64	190	102	26
Future Volume (vph)	10	408	96	591	122	52	73	64	190	102	26
Lane Group Flow (vph)	11	544	104	642	133	57	79	70	207	111	28
Turn Type	Perm	NA	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4	3	8		5	2		1	6	
Permitted Phases	4		8		8	2		2	6		6
Detector Phase	4	4	3	8	8	5	2	2	1	6	6
Switch Phase											
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	8.0	8.0	5.0	8.0	8.0
Minimum Split (s)	24.4	24.4	8.0	24.4	24.4	8.0	25.4	25.4	8.0	25.4	25.4
Total Split (s)	39.0	39.0	9.0	48.0	48.0	9.0	43.0	43.0	9.0	43.0	43.0
Total Split (%)	39.0%	39.0%	9.0%	48.0%	48.0%	9.0%	43.0%	43.0%	9.0%	43.0%	43.0%
Yellow Time (s)	4.2	4.2	3.0	4.2	4.2	3.0	3.3	3.3	3.0	3.3	3.3
All-Red Time (s)	2.2	2.2	0.0	2.2	2.2	0.0	3.7	3.7	0.0	3.7	3.7
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.4	6.4	3.0	6.4	6.4	3.0	7.0	7.0	3.0	7.0	7.0
Lead/Lag	Lag	Lag	Lead			Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?											
Recall Mode	None	None	None	None	None	None	C-Min	C-Min	None	C-Min	C-Min
v/c Ratio	0.07	0.74	0.38	0.57	0.27	0.09	0.11	0.12	0.29	0.14	0.04
Control Delay	17.1	30.6	22.9	28.5	23.7	13.2	25.8	3.1	11.2	18.4	2.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	17.1	30.6	22.9	28.5	23.7	13.2	25.8	3.1	11.2	18.4	2.0
Queue Length 50th (m)	0.8	21.0	13.8	54.9	19.3	5.0	10.4	0.0	20.2	17.8	0.2
Queue Length 95th (m)	m2.1	23.4	21.7	61.9	29.2	13.4	26.1	5.7	44.4	33.8	2.3
Internal Link Dist (m)		393.2		523.9			174.6			416.6	
Turn Bay Length (m)	42.6		33.0		23.2	25.4		25.0	27.3		16.5
Base Capacity (vph)	219	1049	277	1428	615	624	780	645	703	813	715
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.05	0.52	0.38	0.45	0.22	0.09	0.10	0.11	0.29	0.14	0.04

Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 70
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Glenanna Road & Kingston Road



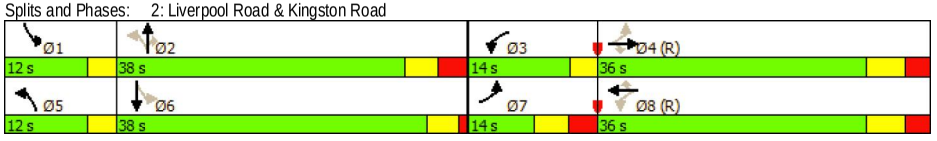
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	92	396	254	178	495	47	215	465	122	79	843	101
Future Volume (vph)	92	396	254	178	495	47	215	465	122	79	843	101
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2
Total Lost time (s)	6.9	7.0	7.0	3.0	7.0	7.0	3.0	6.9	6.9	3.0	4.5	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.91	
Frpb, ped/bikes	1.00	1.00	0.96	1.00	1.00	0.96	1.00	1.00	0.91	1.00	0.99	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.98	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1654	3368	1462	1638	3400	1487	1690	3500	1279	1665	4912	
Flt Permitted	0.33	1.00	1.00	0.40	1.00	1.00	0.16	1.00	1.00	0.47	1.00	
Satd. Flow (perm)	579	3368	1462	686	3400	1487	281	3500	1279	818	4912	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	100	430	276	193	538	51	234	505	133	86	916	110
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	80	0	14	0
Lane Group Flow (vph)	100	430	276	193	538	51	234	505	53	86	1012	0
Confl. Peds. (#/hr)	15		19	9		15	22		25	25		22
Heavy Vehicles (%)	4%	6%	1%	5%	5%	0%	2%	2%	10%	2%	2%	4%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		
Actuated Green, G (s)	29.0	23.3	23.3	34.9	24.3	24.3	49.2	39.5	39.5	43.4	36.7	
Effective Green, g (s)	29.0	23.3	23.3	34.9	24.3	24.3	49.2	39.5	39.5	43.4	36.7	
Actuated g/C Ratio	0.29	0.23	0.23	0.35	0.24	0.24	0.49	0.40	0.40	0.43	0.37	
Clearance Time (s)	6.9	7.0	7.0	3.0	7.0	7.0	3.0	6.9	6.9	3.0	4.5	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	229	784	340	340	826	361	305	1382	505	411	1802	
v/s Ratio Prot	0.02	0.13		c0.06	0.16		c0.09	0.14		0.01	0.21	
v/s Ratio Perm	0.10		c0.19	0.14		0.03	c0.28		0.04	0.08		
v/c Ratio	0.44	0.55	0.81	0.57	0.65	0.14	0.77	0.37	0.10	0.21	0.56	
Uniform Delay, d1	27.0	33.7	36.3	24.2	34.0	29.7	17.3	21.4	19.1	16.9	25.2	
Progression Factor	1.00	1.00	1.00	2.35	1.82	1.90	1.00	1.00	1.00	0.95	0.92	
Incremental Delay, d2	1.3	2.8	18.7	2.1	3.7	0.8	11.0	0.7	0.4	0.2	1.2	
Delay (s)	28.4	36.5	55.0	58.9	65.7	57.2	28.2	22.1	19.5	16.3	24.4	
Level of Service	C	D	D	E	E	E	C	C	B	B	C	
Approach Delay (s)		41.8			63.4			23.4			23.8	
Approach LOS		D			E			C			C	

Intersection Summary				
HCM 2000 Control Delay	36.4	HCM 2000 Level of Service	D	
HCM 2000 Volume to Capacity ratio	0.82			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	23.8	
Intersection Capacity Utilization	71.8%	ICU Level of Service	C	
Analysis Period (min)	15			
c Critical Lane Group				

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations											
Traffic Volume (vph)	92	396	254	178	495	47	215	465	122	79	843
Future Volume (vph)	92	396	254	178	495	47	215	465	122	79	843
Lane Group Flow (vph)	100	430	276	193	538	51	234	505	133	86	1026
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA
Protected Phases	7	4		3	8		5	2		1	6
Permitted Phases	4		4	8		8	2		2	6	
Detector Phase	7	4	4	3	8	8	5	2	2	1	6
Switch Phase											
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	11.9	25.0	25.0	9.5	25.0	25.0	9.5	24.9	24.9	8.0	22.5
Total Split (s)	14.0	36.0	36.0	14.0	36.0	36.0	12.0	38.0	38.0	12.0	38.0
Total Split (%)	14.0%	36.0%	36.0%	14.0%	36.0%	36.0%	12.0%	38.0%	38.0%	12.0%	38.0%
Yellow Time (s)	3.7	4.2	4.2	3.0	4.2	4.2	3.0	3.7	3.7	3.0	3.5
All-Red Time (s)	3.2	2.8	2.8	0.0	2.8	2.8	0.0	3.2	3.2	0.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.9	7.0	7.0	3.0	7.0	7.0	3.0	6.9	6.9	3.0	4.5
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag
Lead-Lag Optimize?											
Recall Mode	None	C-Min	C-Min	None	C-Min	C-Min	None	Max	Max	None	Max
v/c Ratio	0.40	0.53	0.79	0.52	0.60	0.13	0.75	0.37	0.22	0.20	0.57
Control Delay	24.2	35.1	51.8	48.8	61.8	54.1	34.3	24.5	4.1	14.2	25.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	24.2	35.1	51.8	48.8	61.8	54.1	34.3	24.5	4.1	14.2	25.2
Queue Length 50th (m)	13.0	39.8	52.4	39.5	61.5	10.9	25.9	39.8	0.0	7.5	53.3
Queue Length 95th (m)	22.7	52.4	78.5	61.3	78.8	23.0	#73.8	59.1	10.4	17.6	76.0
Internal Link Dist (m)		667.5			393.2			242.2			35.5
Turn Bay Length (m)	33.5		49.1	103.2		61.6	46.2		51.8	47.9	
Base Capacity (vph)	256	976	423	372	987	431	312	1382	597	455	1786
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.39	0.44	0.65	0.52	0.55	0.12	0.75	0.37	0.22	0.19	0.57

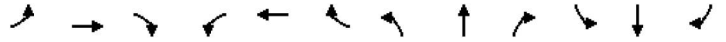
Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 13 (13%), Referenced to phase 4:EBTL and 8:WBTL, Start of Green
Natural Cycle: 70
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 2: Liverpool Road & Kingston Road



4: Liverpool Road & North Site Access/Plaza Access

Weekday AM Peak Hour



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	8	0	14	106	1	59	18	423	163	94	895	19
Future Volume (Veh/h)	8	0	14	106	1	59	18	423	163	94	895	19
Sign Control		Stop			Stop			Free			Free	
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	0	15	115	1	64	20	460	177	102	973	21
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								TWLTL			TWLTL	
Median storage veh)								2			2	
Upstream signal (m)								140			216	
pX, platoon unblocked	0.92	0.92	0.96	0.92	0.92	0.91	0.96			0.91		
vC, conflicting volume	1522	1864	497	1294	1786	318	994			637		
vC1, stage 1 conf vol	1188	1188		588	588							
vC2, stage 2 conf vol	334	677		706	1198							
vCu, unblocked vol	1229	1599	405	982	1515	42	920			394		
tC, single (s)	7.5	6.5	7.2	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)	6.5	5.5		6.5	5.5							
tF (s)	3.5	4.0	3.4	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	95	100	97	64	100	93	97			90		
cM capacity (veh/h)	188	219	543	324	212	930	723			1053		

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	24	115	65	20	307	330	102	649	345
Volume Left	9	115	0	20	0	0	102	0	0
Volume Right	15	0	64	0	0	177	0	0	21
cSH	318	324	884	723	1700	1700	1053	1700	1700
Volume to Capacity	0.08	0.36	0.07	0.03	0.18	0.19	0.10	0.38	0.20
Queue Length 95th (m)	1.9	12.5	1.9	0.7	0.0	0.0	2.6	0.0	0.0
Control Delay (s)	17.3	22.1	9.4	10.1	0.0	0.0	8.8	0.0	0.0
Lane LOS	C	C	A	B			A		
Approach Delay (s)	17.3	17.5		0.3			0.8		
Approach LOS	C	C							

Intersection Summary				
Average Delay	2.4			
Intersection Capacity Utilization	51.2%	ICU Level of Service	A	
Analysis Period (min)	15			

3: Liverpool Road & South Site Access

Weekday AM Peak Hour

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	11	0	604	1012	3
Future Volume (Veh/h)	0	11	0	604	1012	3
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	12	0	657	1100	3
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	TWLTL	
Median storage veh)					2	
Upstream signal (m)				59	297	
pX, platoon unblocked	0.90					
vC, conflicting volume	1430	276	1103			
vC1, stage 1 conf vol	1102					
vC2, stage 2 conf vol	328					
vCu, unblocked vol	1256	276	1103			
tC, single (s)	6.8	7.1	4.1			
tC, 2 stage (s)	5.8					
tF (s)	3.5	3.4	2.2			
p0 queue free %	100	98	100			
cM capacity (veh/h)	274	700	640			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2	SB 3	SB 4
Volume Total	12	328	328	314	314	314	160
Volume Left	0	0	0	0	0	0	0
Volume Right	12	0	0	0	0	0	3
cSH	700	1700	1700	1700	1700	1700	1700
Volume to Capacity	0.02	0.19	0.19	0.18	0.18	0.18	0.09
Queue Length 95th (m)	0.4	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	10.2	0.0	0.0	0.0	0.0	0.0	0.0
Lane LOS	B						
Approach Delay (s)	10.2	0.0		0.0			
Approach LOS	B						

Intersection Summary				
Average Delay	0.1			
Intersection Capacity Utilization	24.7%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	47	138	255	72	87	56	115	350	32	73	664	69
Future Volume (vph)	47	138	255	72	87	56	115	350	32	73	664	69
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2
Total Lost time (s)	5.9	5.9	5.9	5.9	5.9		6.7	6.7		6.7	6.7	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		0.99	1.00		0.99	1.00	
Frt	1.00	1.00	0.85	1.00	0.94		1.00	0.99		1.00	0.99	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1658	1773	1513	1675	1717		1658	3355		1646	3410	
Flt Permitted	0.55	1.00	1.00	0.57	1.00		0.34	1.00		0.51	1.00	
Satd. Flow (perm)	967	1773	1513	1010	1717		600	3355		882	3410	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	51	150	277	78	95	61	125	380	35	79	722	75
RTOR Reduction (vph)	0	0	181	0	27	0	0	5	0	0	5	0
Lane Group Flow (vph)	51	150	96	78	129	0	125	410	0	79	792	0
Confl. Peds. (#/hr)							11		8	8		11
Heavy Vehicles (%)	4%	6%	2%	3%	3%	3%	3%	4%	14%	4%	3%	0%
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)	14.2	14.2	14.2	14.2	14.2		73.2	73.2		73.2	73.2	
Effective Green, g (s)	14.2	14.2	14.2	14.2	14.2		73.2	73.2		73.2	73.2	
Actuated g/C Ratio	0.14	0.14	0.14	0.14	0.14		0.73	0.73		0.73	0.73	
Clearance Time (s)	5.9	5.9	5.9	5.9	5.9		6.7	6.7		6.7	6.7	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	137	251	214	143	243		439	2455		645	2496	
v/s Ratio Prot		c0.08			0.07			0.12			c0.23	
v/s Ratio Perm	0.05		0.06	0.08			0.21			0.09		
v/c Ratio	0.37	0.60	0.45	0.55	0.53		0.28	0.17		0.12	0.32	
Uniform Delay, d1	38.9	40.2	39.3	39.9	39.8		4.5	4.1		3.9	4.7	
Progression Factor	1.00	1.00	1.00	1.22	1.30		0.70	0.66		1.00	1.00	
Incremental Delay, d2	1.7	3.8	1.5	4.2	2.1		1.6	0.1		0.4	0.3	
Delay (s)	40.6	44.0	40.8	53.0	53.9		4.7	2.8		4.3	5.0	
Level of Service	D	D	D	D	D		A	A		A	A	
Approach Delay (s)		41.8			53.6			3.3			5.0	
Approach LOS		D			D			A			A	

Intersection Summary				
HCM 2000 Control Delay	18.2	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.36			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.6	
Intersection Capacity Utilization	62.7%	ICU Level of Service	B	
Analysis Period (min)	15			
c Critical Lane Group				

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations									
Traffic Volume (vph)	47	138	255	72	87	115	350	73	664
Future Volume (vph)	47	138	255	72	87	115	350	73	664
Lane Group Flow (vph)	51	150	277	78	156	125	415	79	797
Turn Type	Perm	NA	Perm	Perm	NA	Perm	NA	Perm	NA
Protected Phases		4			8		2		6
Permitted Phases	4		4	8		2		6	
Detector Phase	4	4	4	8	8	2	2	6	6
Switch Phase									
Minimum Initial (s)	8.0	8.0	8.0	5.0	5.0	5.0	5.0	8.0	8.0
Minimum Split (s)	23.9	23.9	23.9	23.9	23.9	24.7	24.7	24.7	24.7
Total Split (s)	34.0	34.0	34.0	34.0	34.0	66.0	66.0	66.0	66.0
Total Split (%)	34.0%	34.0%	34.0%	34.0%	34.0%	66.0%	66.0%	66.0%	66.0%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	4.6	4.6	4.6	4.6
All-Red Time (s)	2.2	2.2	2.2	2.2	2.2	2.1	2.1	2.1	2.1
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.9	5.9	5.9	5.9	5.9	6.7	6.7	6.7	6.7
Lead/Lag									
Lead-Lag Optimize?									
Recall Mode	None	None	None	None	None	C-Min	C-Min	C-Min	C-Min
v/c Ratio	0.37	0.60	0.70	0.55	0.58	0.29	0.17	0.12	0.32
Control Delay	44.9	49.3	20.6	61.6	48.6	5.7	3.1	5.4	5.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	44.9	49.3	20.6	61.6	48.6	5.7	3.1	5.4	5.4
Queue Length 50th (m)	9.6	29.2	12.3	16.8	27.1	4.0	6.4	3.9	24.0
Queue Length 95th (m)	19.9	46.0	37.1	28.4	42.1	9.7	11.8	11.1	42.6
Internal Link Dist (m)		107.2			416.6		192.1		478.0
Turn Bay Length (m)	22.0			24.3		24.4		46.2	
Base Capacity (vph)	271	498	576	283	505	438	2460	645	2502
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.19	0.30	0.48	0.28	0.31	0.29	0.17	0.12	0.32

Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 55
Control Type: Actuated-Coordinated

Splits and Phases: 6: Liverpool Road & Glenanna Road

P.M. Peak Hour

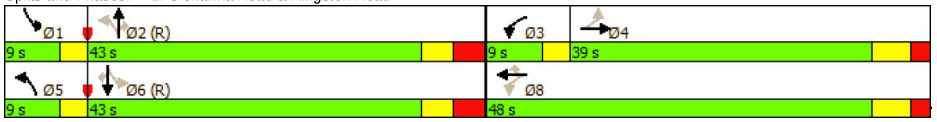
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	24	1217	143	156	611	132	120	177	194	178	199	36
Future Volume (vph)	24	1217	143	156	611	132	120	177	194	178	199	36
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2
Total Lost time (s)	6.4	6.4		3.0	6.4	6.4	3.0	7.0	7.0	3.0	7.0	7.0
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.98		1.00	1.00	0.90	1.00	1.00	0.91	1.00	1.00	0.73
Flpb, ped/bikes	0.97	1.00		1.00	1.00	1.00	0.93	1.00	1.00	0.97	1.00	1.00
Frt	1.00	0.98		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1668	3373		1658	3500	1373	1599	1879	1385	1673	1824	1130
Flt Permitted	0.40	1.00		0.08	1.00	1.00	0.47	1.00	1.00	0.53	1.00	1.00
Satd. Flow (perm)	701	3373		147	3500	1373	790	1879	1385	935	1824	1130
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	26	1323	155	170	664	143	130	192	211	193	216	39
RTOR Reduction (vph)	0	7	0	0	0	39	0	0	171	0	0	32
Lane Group Flow (vph)	26	1471	0	170	664	104	130	192	40	193	216	7
Confl. Peds. (#/hr)	30		55	55		30	91		50	50		91
Heavy Vehicles (%)	0%	2%	5%	4%	2%	1%	0%	0%	1%	0%	3%	0%
Turn Type	Perm	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4		3	8		5	2		1	6	
Permitted Phases	4			8		8	2		2	6		6
Actuated Green, G (s)	44.5	44.5		60.3	60.3	60.3	23.3	17.3	17.3	23.3	17.3	17.3
Effective Green, g (s)	44.5	44.5		60.3	60.3	60.3	23.3	17.3	17.3	23.3	17.3	17.3
Actuated g/C Ratio	0.44	0.44		0.60	0.60	0.60	0.23	0.17	0.17	0.23	0.17	0.17
Clearance Time (s)	6.4	6.4		3.0	6.4	6.4	3.0	7.0	7.0	3.0	7.0	7.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	311	1500		282	2110	827	232	325	239	262	315	195
v/s Ratio Prot		c0.44		c0.08	0.19		0.03	0.10		c0.04	0.12	
v/s Ratio Perm	0.04			0.29		0.08	0.10		0.03	c0.13		0.01
v/c Ratio	0.08	0.98		0.60	0.31	0.13	0.56	0.59	0.17	0.74	0.69	0.03
Uniform Delay, d1	16.0	27.3		21.1	9.7	8.5	32.6	38.1	35.2	34.7	38.8	34.4
Progression Factor	0.48	0.55		1.00	1.00	1.00	1.00	1.00	1.00	1.07	1.08	1.00
Incremental Delay, d2	0.1	11.4		3.6	0.1	0.1	3.1	7.7	1.5	10.3	11.5	0.3
Delay (s)	7.7	26.5		24.8	9.8	8.6	35.7	45.8	36.7	47.6	53.5	34.7
Level of Service	A	C		C	A	A	D	D	D	D	D	C
Approach Delay (s)		26.2			12.2			39.7			49.3	
Approach LOS		C			B			D			D	

Intersection Summary				
HCM 2000 Control Delay	27.3	HCM 2000 Level of Service	C	
HCM 2000 Volume to Capacity ratio	0.85			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	19.4	
Intersection Capacity Utilization	90.0%	ICU Level of Service	E	
Analysis Period (min)	15			
c Critical Lane Group				

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations											
Traffic Volume (vph)	24	1217	156	611	132	120	177	194	178	199	36
Future Volume (vph)	24	1217	156	611	132	120	177	194	178	199	36
Lane Group Flow (vph)	26	1478	170	664	143	130	192	211	193	216	39
Turn Type	Perm	NA	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4	3	8		5	2		1	6	
Permitted Phases	4		8		8	2		2	6		6
Detector Phase	4	4	3	8	8	5	2	2	1	6	6
Switch Phase											
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	24.4	24.4	8.0	24.4	24.4	8.0	25.0	25.0	8.0	25.0	25.0
Total Split (s)	39.0	39.0	9.0	48.0	48.0	9.0	43.0	43.0	9.0	43.0	43.0
Total Split (%)	39.0%	39.0%	9.0%	48.0%	48.0%	9.0%	43.0%	43.0%	9.0%	43.0%	43.0%
Yellow Time (s)	4.2	4.2	3.0	4.2	4.2	3.0	3.3	3.3	3.0	3.3	3.3
All-Red Time (s)	2.2	2.2	0.0	2.2	2.2	0.0	3.7	3.7	0.0	3.7	3.7
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.4	6.4	3.0	6.4	6.4	3.0	7.0	7.0	3.0	7.0	7.0
Lead/Lag	Lag	Lag	Lead			Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?											
Recall Mode	None	None	None	None	None	None	C-Min	C-Min	None	C-Min	C-Min
v/c Ratio	0.08	0.98	0.59	0.31	0.16	0.52	0.59	0.51	0.65	0.69	0.14
Control Delay	9.5	30.4	25.0	10.9	4.3	33.4	44.9	9.8	41.2	52.6	2.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	9.5	30.4	25.0	10.9	4.3	33.4	44.9	9.8	41.2	52.6	2.1
Queue Length 50th (m)	0.9	162.1	15.7	32.2	3.4	19.9	36.5	0.7	34.3	44.1	0.0
Queue Length 95th (m)	m2.7	m#219.3	39.7	50.6	13.4	32.0	55.0	19.2	41.0	66.7	1.5
Internal Link Dist (m)		393.2		523.9			174.6			416.6	
Turn Bay Length (m)	42.6		33.0		23.2	25.4		25.0	27.3		16.5
Base Capacity (vph)	311	1507	287	2110	867	252	676	631	296	656	472
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.08	0.98	0.59	0.31	0.16	0.52	0.28	0.33	0.65	0.33	0.08

Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Glenanna Road & Kingston Road



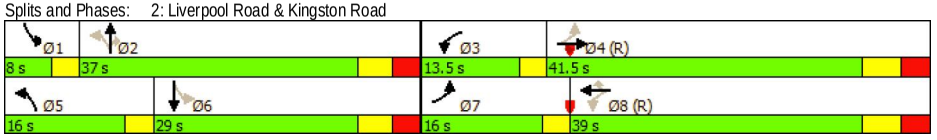
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	218	1074	330	226	528	79	302	937	278	114	374	85
Future Volume (vph)	218	1074	330	226	528	79	302	937	278	114	374	85
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2
Total Lost time (s)	3.0	7.4	7.4	3.0	7.4	7.4	3.0	6.9	6.9	3.0	6.9	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.91	
Frpb, ped/bikes	1.00	1.00	0.94	1.00	1.00	0.95	1.00	1.00	0.85	1.00	0.99	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1700	3500	1416	1708	3500	1431	1677	3535	1273	1670	4898	
Flt Permitted	0.34	1.00	1.00	0.12	1.00	1.00	0.37	1.00	1.00	0.18	1.00	
Satd. Flow (perm)	607	3500	1416	220	3500	1431	652	3535	1273	318	4898	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	237	1167	359	246	574	86	328	1018	302	124	407	92
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	152	0	37	0
Lane Group Flow (vph)	237	1167	359	246	574	86	328	1018	150	124	462	0
Confl. Peds. (#/hr)	26		32	32		26	34		48	48		34
Heavy Vehicles (%)	1%	2%	2%	1%	2%	2%	2%	1%	3%	3%	0%	3%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		
Actuated Green, G (s)	46.0	34.1	34.1	43.2	32.7	32.7	38.1	30.1	30.1	27.1	22.1	
Effective Green, g (s)	46.0	34.1	34.1	43.2	32.7	32.7	38.1	30.1	30.1	27.1	22.1	
Actuated g/C Ratio	0.46	0.34	0.34	0.43	0.33	0.33	0.38	0.30	0.30	0.27	0.22	
Clearance Time (s)	3.0	7.4	7.4	3.0	7.4	7.4	3.0	6.9	6.9	3.0	6.9	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	409	1193	482	251	1144	467	381	1064	383	153	1082	
v/s Ratio Prot	c0.07	c0.33		c0.10	0.16		c0.11	c0.29		0.04	0.09	
v/s Ratio Perm	0.20		0.25	0.32		0.06	0.22		0.12	0.18		
v/c Ratio	0.58	0.98	0.74	0.98	0.50	0.18	0.86	0.96	0.39	0.81	0.43	
Uniform Delay, d1	17.4	32.6	29.1	25.4	27.1	24.1	24.9	34.3	27.7	31.8	33.5	
Progression Factor	1.00	1.00	1.00	1.37	1.44	1.45	1.00	1.00	1.00	1.12	1.05	
Incremental Delay, d2	2.0	21.3	10.0	50.1	1.5	0.8	17.7	17.9	0.7	26.6	0.3	
Delay (s)	19.3	53.9	39.1	84.9	40.6	35.8	42.6	52.2	28.4	62.3	35.5	
Level of Service	B	D	D	F	D	D	D	D	C	E	D	
Approach Delay (s)		46.3			52.2			45.9			40.8	
Approach LOS		D			D			D			D	

Intersection Summary				
HCM 2000 Control Delay	46.5	HCM 2000 Level of Service	D	
HCM 2000 Volume to Capacity ratio	0.99			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	20.3	
Intersection Capacity Utilization	93.0%	ICU Level of Service	F	
Analysis Period (min)	15			
c Critical Lane Group				

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations											
Traffic Volume (vph)	218	1074	330	226	528	79	302	937	278	114	374
Future Volume (vph)	218	1074	330	226	528	79	302	937	278	114	374
Lane Group Flow (vph)	237	1167	359	246	574	86	328	1018	302	124	499
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA
Protected Phases	7	4		3	8		5	2		1	6
Permitted Phases	4		4	8		8	2		2	6	
Detector Phase	7	4	4	3	8	8	5	2	2	1	6
Switch Phase											
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	8.0	25.4	25.4	8.5	25.4	25.4	8.0	24.9	24.9	8.0	24.9
Total Split (s)	16.0	41.5	41.5	13.5	39.0	39.0	16.0	37.0	37.0	8.0	29.0
Total Split (%)	16.0%	41.5%	41.5%	13.5%	39.0%	39.0%	16.0%	37.0%	37.0%	8.0%	29.0%
Yellow Time (s)	3.0	4.2	4.2	3.0	4.2	4.2	3.0	3.7	3.7	3.0	3.7
All-Red Time (s)	0.0	3.2	3.2	0.0	3.2	3.2	0.0	3.2	3.2	0.0	3.2
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	3.0	7.4	7.4	3.0	7.4	7.4	3.0	6.9	6.9	3.0	6.9
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag
Lead-Lag Optimize?											
Recall Mode	None	C-Min	C-Min	None	C-Min	C-Min	None	Min	Min	None	Min
v/c Ratio	0.55	0.98	0.74	0.95	0.50	0.18	0.81	0.96	0.57	0.75	0.45
Control Delay	18.6	54.8	40.2	73.5	41.4	37.4	39.2	54.1	13.4	53.0	33.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.6	54.8	40.2	73.5	41.4	37.4	39.2	54.1	13.4	53.0	33.3
Queue Length 50th (m)	25.7	122.6	64.0	40.7	63.3	15.7	47.1	106.8	13.0	14.3	26.9
Queue Length 95th (m)	41.1	#170.1	#102.7	#83.4	78.6	29.8	#85.9	#150.1	40.5	#37.8	43.2
Internal Link Dist (m)		667.5			393.2			242.2			35.5
Turn Bay Length (m)	33.5		49.1	103.2		61.6	46.2		51.8	47.9	
Base Capacity (vph)	453	1193	482	260	1145	468	405	1064	534	165	1118
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.52	0.98	0.74	0.95	0.50	0.18	0.81	0.96	0.57	0.75	0.45

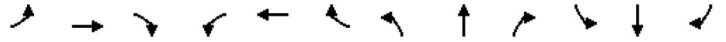
Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 13 (13%), Referenced to phase 4:EBTL and 8:WBTL, Start of Green
Natural Cycle: 100
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 2: Liverpool Road & Kingston Road



4: Liverpool Road & North Site Access/Plaza Access

Weekday PM Peak (Optimized)



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	18	1	24	123	3	98	41	946	247	76	412	19
Future Volume (Veh/h)	18	1	24	123	3	98	41	946	247	76	412	19
Sign Control		Stop			Stop			Free			Free	
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	1	26	134	3	107	45	1028	268	83	448	21
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								TWLTL			TWLTL	
Median storage veh)								2			2	
Upstream signal (m)								140			216	
pX, platoon unblocked	0.72	0.72		0.72	0.72	0.72				0.72		
vC, conflicting volume	1337	2010	234	1668	1887	648	469			1296		
vC1, stage 1 conf vol	624	624		1252	1252							
vC2, stage 2 conf vol	712	1386		416	635							
vCu, unblocked vol	695	1629	234	1155	1457	0	469			638		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)	6.5	5.5		6.5	5.5							
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	94	99	97	51	99	86	96			88		
cM capacity (veh/h)	343	186	773	274	261	785	1103			689		

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	47	134	110	45	685	611	83	299	170
Volume Left	20	134	0	45	0	0	83	0	0
Volume Right	26	0	107	0	0	268	0	0	21
cSH	483	274	744	1103	1700	1700	689	1700	1700
Volume to Capacity	0.10	0.49	0.15	0.04	0.40	0.36	0.12	0.18	0.10
Queue Length 95th (m)	2.6	20.1	4.1	1.0	0.0	0.0	3.3	0.0	0.0
Control Delay (s)	13.3	30.1	10.7	8.4	0.0	0.0	10.9	0.0	0.0
Lane LOS	B	D	B	A			B		
Approach Delay (s)	13.3	21.3		0.3			1.6		
Approach LOS	B	C							

Intersection Summary				
Average Delay	3.3			
Intersection Capacity Utilization	61.7%	ICU Level of Service	B	
Analysis Period (min)	15			

3: Liverpool Road & South Site Access

Weekday PM Peak (Optimized)

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	21	0	1234	552	7
Future Volume (Veh/h)	0	21	0	1234	552	7
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	23	0	1341	600	8
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	TWLTL	
Median storage veh)					2	
Upstream signal (m)				59	297	
pX, platoon unblocked	0.72					
vC, conflicting volume	1274	154	608			
vC1, stage 1 conf vol	604					
vC2, stage 2 conf vol	670					
vCu, unblocked vol	589	154	608			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)	5.8					
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	97	100			
cM capacity (veh/h)	477	871	980			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2	SB 3	SB 4
Volume Total	23	447	894	171	171	171	94
Volume Left	0	0	0	0	0	0	0
Volume Right	23	0	0	0	0	0	8
cSH	871	980	1700	1700	1700	1700	1700
Volume to Capacity	0.03	0.00	0.53	0.10	0.10	0.10	0.06
Queue Length 95th (m)	0.7	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	9.2	0.0	0.0	0.0	0.0	0.0	0.0
Lane LOS	A						
Approach Delay (s)	9.2	0.0		0.0			
Approach LOS	A						

Intersection Summary				
Average Delay	0.1			
Intersection Capacity Utilization	37.4%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	45	72	115	55	145	44	351	627	73	67	337	30
Future Volume (vph)	45	72	115	55	145	44	351	627	73	67	337	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2
Total Lost time (s)	5.9	5.9	5.9	5.9	5.9		6.7	6.7		6.7	6.7	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00		0.99	1.00	
Frt	1.00	1.00	0.85	1.00	0.97		1.00	0.98		1.00	0.99	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1725	1824	1543	1725	1791		1708	3454		1714	3526	
Flt Permitted	0.43	1.00	1.00	0.71	1.00		0.52	1.00		0.36	1.00	
Satd. Flow (perm)	788	1824	1543	1282	1791		929	3454		641	3526	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	49	78	125	60	158	48	382	682	79	73	366	33
RTOR Reduction (vph)	0	0	105	0	13	0	0	6	0	0	5	0
Lane Group Flow (vph)	49	78	20	60	193	0	382	755	0	73	394	0
Confl. Peds. (#/hr)									11	11		
Heavy Vehicles (%)	0%	3%	0%	0%	1%	2%	1%	1%	5%	0%	0%	0%
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)	16.0	16.0	16.0	16.0	16.0		71.4	71.4		71.4	71.4	
Effective Green, g (s)	16.0	16.0	16.0	16.0	16.0		71.4	71.4		71.4	71.4	
Actuated g/C Ratio	0.16	0.16	0.16	0.16	0.16		0.71	0.71		0.71	0.71	
Clearance Time (s)	5.9	5.9	5.9	5.9	5.9		6.7	6.7		6.7	6.7	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	126	291	246	205	286		663	2466		457	2517	
v/s Ratio Prot		0.04			c0.11			0.22			0.11	
v/s Ratio Perm	0.06		0.01	0.05			c0.41			0.11		
v/c Ratio	0.39	0.27	0.08	0.29	0.67		0.58	0.31		0.16	0.16	
Uniform Delay, d1	37.6	36.9	35.7	37.0	39.5		6.9	5.2		4.6	4.6	
Progression Factor	1.00	1.00	1.00	0.69	0.77		0.73	0.51		1.00	1.00	
Incremental Delay, d2	2.0	0.5	0.1	0.8	6.0		2.4	0.2		0.7	0.1	
Delay (s)	39.6	37.4	35.9	26.4	36.4		7.5	2.9		5.4	4.7	
Level of Service	D	D	D	C	D		A	A		A	A	
Approach Delay (s)		37.1			34.1			4.4			4.8	
Approach LOS		D			C			A			A	

Intersection Summary				
HCM 2000 Control Delay	12.1	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.59			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.6	
Intersection Capacity Utilization	67.7%	ICU Level of Service	C	
Analysis Period (min)	15			
c Critical Lane Group				

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations									
Traffic Volume (vph)	45	72	115	55	145	351	627	67	337
Future Volume (vph)	45	72	115	55	145	351	627	67	337
Lane Group Flow (vph)	49	78	125	60	206	382	761	73	399
Turn Type	Perm	NA	Perm	Perm	NA	Perm	NA	Perm	NA
Protected Phases		4			8		2		6
Permitted Phases	4		4	8		2		6	
Detector Phase	4	4	4	8	8	2	2	6	6
Switch Phase									
Minimum Initial (s)	8.0	8.0	8.0	8.0	8.0	5.0	5.0	5.0	5.0
Minimum Split (s)	23.9	23.9	23.9	23.9	23.9	24.7	24.7	24.7	24.7
Total Split (s)	36.0	36.0	36.0	36.0	36.0	64.0	64.0	64.0	64.0
Total Split (%)	36.0%	36.0%	36.0%	36.0%	36.0%	64.0%	64.0%	64.0%	64.0%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	4.6	4.6	4.6	4.6
All-Red Time (s)	2.2	2.2	2.2	2.2	2.2	2.1	2.1	2.1	2.1
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.9	5.9	5.9	5.9	5.9	6.7	6.7	6.7	6.7
Lead/Lag									
Lead-Lag Optimize?									
Recall Mode	None	None	None	None	None	C-Min	C-Min	C-Min	C-Min
v/c Ratio	0.39	0.27	0.36	0.29	0.69	0.58	0.31	0.16	0.16
Control Delay	45.0	37.4	9.1	28.0	39.2	8.8	3.1	6.7	5.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	45.0	37.4	9.1	28.0	39.2	8.8	3.1	6.7	5.1
Queue Length 50th (m)	9.1	14.1	0.0	5.6	29.1	12.5	11.7	4.1	11.4
Queue Length 95th (m)	19.6	25.9	14.7	23.1	60.4	m75.8	m14.5	11.6	20.5
Internal Link Dist (m)		107.2			416.6		192.1		478.0
Turn Bay Length (m)	22.0			24.3		24.4		46.2	
Base Capacity (vph)	237	549	551	385	550	662	2470	457	2521
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.21	0.14	0.23	0.16	0.37	0.58	0.31	0.16	0.16

Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 6: Liverpool Road & Glenanna Road

One-Access

Year 2024

A.M. Peak Hour

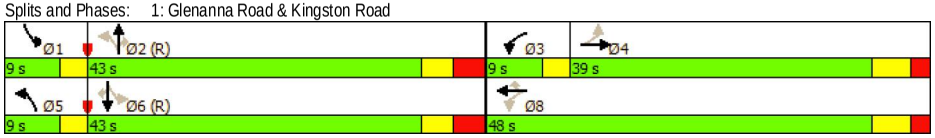
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	398	93	96	576	122	52	73	64	190	102	26
Future Volume (vph)	10	398	93	96	576	122	52	73	64	190	102	26
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2
Total Lost time (s)	6.4	6.4		3.0	6.4	6.4	3.0	7.0	7.0	3.0	7.0	7.0
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.98		1.00	1.00	0.96	1.00	1.00	0.93	1.00	1.00	0.88
Flpb, ped/bikes	0.99	1.00		1.00	1.00	1.00	0.94	1.00	1.00	0.97	1.00	1.00
Frt	1.00	0.97		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1568	3158		1650	3400	1464	1629	1860	1397	1641	1773	1365
Flt Permitted	0.41	1.00		0.25	1.00	1.00	0.69	1.00	1.00	0.65	1.00	1.00
Satd. Flow (perm)	684	3158		442	3400	1464	1175	1860	1397	1130	1773	1365
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	11	433	101	104	626	133	57	79	70	207	111	28
RTOR Reduction (vph)	0	23	0	0	0	0	0	0	43	0	0	16
Lane Group Flow (vph)	11	511	0	104	626	133	57	79	27	207	111	12
Confl. Peds. (#/hr)	8		25	25		8	35		34	34		35
Heavy Vehicles (%)	9%	8%	8%	4%	5%	1%	0%	1%	3%	2%	6%	0%
Turn Type	Perm	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4		3	8		5	2		1	6	
Permitted Phases	4			8		8	2		2	6		6
Actuated Green, G (s)	22.1	22.1		33.5	33.5	33.5	44.1	38.1	38.1	53.1	44.1	44.1
Effective Green, g (s)	22.1	22.1		33.5	33.5	33.5	44.1	38.1	38.1	53.1	44.1	44.1
Actuated g/C Ratio	0.22	0.22		0.34	0.34	0.34	0.44	0.38	0.38	0.53	0.44	0.44
Clearance Time (s)	6.4	6.4		3.0	6.4	6.4	3.0	7.0	7.0	3.0	7.0	7.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	151	697		249	1139	490	545	708	532	661	781	601
v/s Ratio Prot		c0.16		0.04	c0.18		0.01	0.04		c0.04	0.06	
v/s Ratio Perm	0.02			0.10		0.09	0.04		0.02	c0.13		0.01
v/c Ratio	0.07	0.73		0.42	0.55	0.27	0.10	0.11	0.05	0.31	0.14	0.02
Uniform Delay, d1	30.8	36.2		24.3	27.1	24.3	16.2	20.0	19.5	12.6	16.7	15.8
Progression Factor	0.58	0.72		1.00	1.00	1.00	1.00	1.00	1.00	0.82	0.87	1.00
Incremental Delay, d2	0.2	3.8		1.1	0.5	0.3	0.1	0.3	0.2	0.3	0.4	0.1
Delay (s)	18.0	30.0		25.4	27.6	24.6	16.3	20.3	19.7	10.6	14.9	15.8
Level of Service	B	C		C	C	C	B	C	B	B	B	B
Approach Delay (s)		29.8			26.9			19.0			12.4	
Approach LOS		C			C			B			B	

Intersection Summary				
HCM 2000 Control Delay	24.3	HCM 2000 Level of Service	C	
HCM 2000 Volume to Capacity ratio	0.47			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	19.4	
Intersection Capacity Utilization	54.8%	ICU Level of Service	A	
Analysis Period (min)	15			
c Critical Lane Group				

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations											
Traffic Volume (vph)	10	398	96	576	122	52	73	64	190	102	26
Future Volume (vph)	10	398	96	576	122	52	73	64	190	102	26
Lane Group Flow (vph)	11	534	104	626	133	57	79	70	207	111	28
Turn Type	Perm	NA	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4	3	8		5	2		1	6	
Permitted Phases	4		8		8	2		2	6		6
Detector Phase	4	4	3	8	8	5	2	2	1	6	6
Switch Phase											
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	8.0	8.0	5.0	8.0	8.0
Minimum Split (s)	24.4	24.4	8.0	24.4	24.4	8.0	25.4	25.4	8.0	25.4	25.4
Total Split (s)	39.0	39.0	9.0	48.0	48.0	9.0	43.0	43.0	9.0	43.0	43.0
Total Split (%)	39.0%	39.0%	9.0%	48.0%	48.0%	9.0%	43.0%	43.0%	9.0%	43.0%	43.0%
Yellow Time (s)	4.2	4.2	3.0	4.2	4.2	3.0	3.3	3.3	3.0	3.3	3.3
All-Red Time (s)	2.2	2.2	0.0	2.2	2.2	0.0	3.7	3.7	0.0	3.7	3.7
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.4	6.4	3.0	6.4	6.4	3.0	7.0	7.0	3.0	7.0	7.0
Lead/Lag	Lag	Lag	Lead			Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?											
Recall Mode	None	None	None	None	None	None	C-Min	C-Min	None	C-Min	C-Min
v/c Ratio	0.07	0.74	0.38	0.56	0.28	0.09	0.11	0.12	0.29	0.14	0.04
Control Delay	17.6	30.9	23.1	28.6	24.0	13.0	25.5	3.1	11.2	18.3	2.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	17.6	30.9	23.1	28.6	24.0	13.0	25.5	3.1	11.2	18.3	2.1
Queue Length 50th (m)	0.8	20.8	13.9	53.4	19.4	4.9	10.3	0.0	19.6	17.7	0.2
Queue Length 95th (m)	m2.2	24.1	21.9	60.5	29.4	13.3	25.9	5.7	49.3	33.8	2.3
Internal Link Dist (m)		393.2		523.9			174.6			416.6	
Turn Bay Length (m)	42.6		33.0		23.2	25.4		25.0	27.3		16.5
Base Capacity (vph)	222	1050	277	1426	614	610	784	648	706	819	686
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.05	0.51	0.38	0.44	0.22	0.09	0.10	0.11	0.29	0.14	0.04

Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 70
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Glenanna Road & Kingston Road



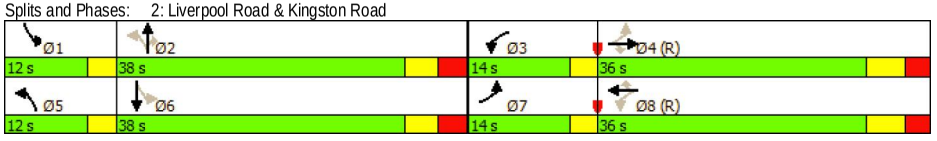
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	92	387	254	178	483	47	215	454	122	79	823	101
Future Volume (vph)	92	387	254	178	483	47	215	454	122	79	823	101
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2
Total Lost time (s)	3.0	7.0	7.0	3.0	7.0	7.0	3.0	6.9	6.9	3.0	6.9	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.91	
Frpb, ped/bikes	1.00	1.00	0.96	1.00	1.00	0.96	1.00	1.00	0.91	1.00	0.99	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.98	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1652	3368	1462	1639	3400	1487	1690	3500	1279	1665	4910	
Flt Permitted	0.39	1.00	1.00	0.38	1.00	1.00	0.18	1.00	1.00	0.47	1.00	
Satd. Flow (perm)	676	3368	1462	651	3400	1487	321	3500	1279	827	4910	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	100	421	276	193	525	51	234	493	133	86	895	110
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	80	0	14	0
Lane Group Flow (vph)	100	421	276	193	525	51	234	493	53	86	991	0
Confl. Peds. (#/hr)	15		19	9		15	22		25	25		22
Heavy Vehicles (%)	4%	6%	1%	5%	5%	0%	2%	2%	10%	2%	2%	4%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		
Actuated Green, G (s)	31.0	23.3	23.3	36.8	26.2	26.2	49.2	39.5	39.5	41.6	34.9	
Effective Green, g (s)	31.0	23.3	23.3	36.8	26.2	26.2	49.2	39.5	39.5	41.6	34.9	
Actuated g/C Ratio	0.31	0.23	0.23	0.37	0.26	0.26	0.49	0.40	0.40	0.42	0.35	
Clearance Time (s)	3.0	7.0	7.0	3.0	7.0	7.0	3.0	6.9	6.9	3.0	6.9	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	284	784	340	344	890	389	312	1382	505	400	1713	
v/s Ratio Prot	0.03	0.13		c0.06	0.15		c0.08	0.14		0.01	0.20	
v/s Ratio Perm	0.08		c0.19	0.15		0.03	c0.28		0.04	0.08		
v/c Ratio	0.35	0.54	0.81	0.56	0.59	0.13	0.75	0.36	0.10	0.21	0.58	
Uniform Delay, d1	25.4	33.6	36.3	22.9	32.2	28.2	16.6	21.3	19.1	18.0	26.5	
Progression Factor	1.00	1.00	1.00	2.35	1.84	1.92	1.00	1.00	1.00	0.90	0.92	
Incremental Delay, d2	0.8	2.6	18.7	2.0	2.7	0.7	9.7	0.7	0.4	0.3	1.4	
Delay (s)	26.2	36.3	55.0	55.9	62.1	54.8	26.3	22.0	19.5	16.5	25.7	
Level of Service	C	D	D	E	E	D	C	C	B	B	C	
Approach Delay (s)		41.5			60.0			22.8			25.0	
Approach LOS		D			E			C			C	

Intersection Summary				
HCM 2000 Control Delay	35.9	HCM 2000 Level of Service	D	
HCM 2000 Volume to Capacity ratio	0.77			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	19.9	
Intersection Capacity Utilization	73.4%	ICU Level of Service	D	
Analysis Period (min)	15			
c Critical Lane Group				

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations											
Traffic Volume (vph)	92	387	254	178	483	47	215	454	122	79	823
Future Volume (vph)	92	387	254	178	483	47	215	454	122	79	823
Lane Group Flow (vph)	100	421	276	193	525	51	234	493	133	86	1005
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA
Protected Phases	7	4		3	8		5	2		1	6
Permitted Phases	4		4	8		8	2		2	6	
Detector Phase	7	4	4	3	8	8	5	2	2	1	6
Switch Phase											
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	11.9	25.0	25.0	9.5	25.0	25.0	9.5	24.9	24.9	8.0	24.9
Total Split (s)	14.0	36.0	36.0	14.0	36.0	36.0	12.0	38.0	38.0	12.0	38.0
Total Split (%)	14.0%	36.0%	36.0%	14.0%	36.0%	36.0%	12.0%	38.0%	38.0%	12.0%	38.0%
Yellow Time (s)	3.0	4.2	4.2	3.0	4.2	4.2	3.0	3.7	3.7	3.0	3.7
All-Red Time (s)	0.0	2.8	2.8	0.0	2.8	2.8	0.0	3.2	3.2	0.0	3.2
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	3.0	7.0	7.0	3.0	7.0	7.0	3.0	6.9	6.9	3.0	6.9
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag
Lead-Lag Optimize?											
Recall Mode	None	C-Min	C-Min	None	C-Min	C-Min	None	Max	Max	None	Max
v/c Ratio	0.30	0.52	0.79	0.53	0.56	0.12	0.73	0.36	0.23	0.19	0.59
Control Delay	19.3	34.9	51.8	48.9	60.0	53.2	32.1	24.4	5.6	13.5	26.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	19.3	34.9	51.8	48.9	60.0	53.2	32.1	24.4	5.6	13.5	26.7
Queue Length 50th (m)	12.1	39.0	52.4	39.4	59.6	10.8	25.9	38.7	0.0	7.7	56.3
Queue Length 95th (m)	21.0	51.3	78.5	60.7	77.0	22.8	#67.9	57.7	13.4	16.3	76.2
Internal Link Dist (m)		667.5			393.2			242.2			116.1
Turn Bay Length (m)	33.5		49.1	103.2		61.6	46.2		51.8	47.9	
Base Capacity (vph)	369	976	423	370	987	431	319	1382	585	464	1696
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.27	0.43	0.65	0.52	0.53	0.12	0.73	0.36	0.23	0.19	0.59

Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 13 (13%), Referenced to phase 4:EBTL and 8:WBTL, Start of Green
Natural Cycle: 75
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 2: Liverpool Road & Kingston Road



Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations									
Traffic Volume (vph)	47	138	255	72	87	115	339	73	644
Future Volume (vph)	47	138	255	72	87	115	339	73	644
Lane Group Flow (vph)	51	150	277	78	156	125	403	79	775
Turn Type	Perm	NA	Perm	Perm	NA	Perm	NA	Perm	NA
Protected Phases		4			8		2		6
Permitted Phases	4		4	8		2		6	
Detector Phase	4	4	4	8	8	2	2	6	6
Switch Phase									
Minimum Initial (s)	8.0	8.0	8.0	5.0	5.0	5.0	5.0	8.0	8.0
Minimum Split (s)	23.9	23.9	23.9	23.9	23.9	24.7	24.7	24.7	24.7
Total Split (s)	34.0	34.0	34.0	34.0	34.0	66.0	66.0	66.0	66.0
Total Split (%)	34.0%	34.0%	34.0%	34.0%	34.0%	66.0%	66.0%	66.0%	66.0%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	4.6	4.6	4.6	4.6
All-Red Time (s)	2.2	2.2	2.2	2.2	2.2	2.1	2.1	2.1	2.1
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.9	5.9	5.9	5.9	5.9	6.7	6.7	6.7	6.7
Lead/Lag									
Lead-Lag Optimize?									
Recall Mode	None	None	None	None	None	C-Min	C-Min	C-Min	C-Min
v/c Ratio	0.38	0.60	0.69	0.55	0.58	0.28	0.16	0.12	0.31
Control Delay	45.5	49.9	18.7	64.6	50.6	5.6	3.1	5.3	5.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	45.5	49.9	18.7	64.6	50.6	5.6	3.1	5.3	5.3
Queue Length 50th (m)	9.6	29.2	10.2	16.7	26.9	4.9	6.3	3.9	23.2
Queue Length 95th (m)	20.1	46.4	34.8	30.9	46.3	10.1	12.3	10.8	40.0
Internal Link Dist (m)		107.2			416.6		192.1		478.0
Turn Bay Length (m)	22.0			24.3		24.4		46.2	
Base Capacity (vph)	270	498	584	282	505	452	2464	654	2504
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.19	0.30	0.47	0.28	0.31	0.28	0.16	0.12	0.31

Intersection Summary

Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 55
Control Type: Actuated-Coordinated

Splits and Phases: 6: Liverpool Road & Glenanna Road

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	8	0	25	106	1	59	18	412	163	94	872	22
Future Volume (Veh/h)	8	0	25	106	1	59	18	412	163	94	872	22
Sign Control		Stop			Stop			Free			Free	
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	0	27	115	1	64	20	448	177	102	948	24
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			TWLTL	
Median storage veh)											2	
Upstream signal (m)								140			216	
pX, platoon unblocked	0.92	0.92	0.97	0.92	0.92	0.91	0.97			0.91		
vC, conflicting volume	1492	1829	486	1282	1752	312	972			625		
vC1, stage 1 conf vol	1164	1164		576	576							
vC2, stage 2 conf vol	328	665		705	1176							
vCu, unblocked vol	1225	1589	409	997	1506	46	910			389		
tC, single (s)	7.5	6.5	7.3	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)	6.5	5.5		6.5	5.5							
tF (s)	3.5	4.0	3.5	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	95	100	95	63	100	93	97			90		
cM capacity (veh/h)	193	224	525	313	217	928	734			1060		

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	36	115	65	20	299	326	102	632	340
Volume Left	9	115	0	20	0	0	102	0	0
Volume Right	27	0	64	0	0	177	0	0	24
cSH	367	313	883	734	1700	1700	1060	1700	1700
Volume to Capacity	0.10	0.37	0.07	0.03	0.18	0.19	0.10	0.37	0.20
Queue Length 95th (m)	2.6	13.1	1.9	0.7	0.0	0.0	2.5	0.0	0.0
Control Delay (s)	15.9	23.0	9.4	10.0	0.0	0.0	8.8	0.0	0.0
Lane LOS	C	C	A	B			A		
Approach Delay (s)	15.9	18.1		0.3			0.8		
Approach LOS	C	C							

Intersection Summary

Average Delay	2.5				
Intersection Capacity Utilization	50.7%	ICU Level of Service		A	
Analysis Period (min)	15				

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	47	138	255	72	87	56	115	339	32	73	644	69
Future Volume (vph)	47	138	255	72	87	56	115	339	32	73	644	69
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2
Total Lost time (s)	5.9	5.9	5.9	5.9	5.9		6.7	6.7		6.7	6.7	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		0.99	1.00		0.99	1.00	
Frt	1.00	1.00	0.85	1.00	0.94		1.00	0.99		1.00	0.99	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1658	1773	1513	1675	1717		1658	3352		1646	3409	
Flt Permitted	0.55	1.00	1.00	0.57	1.00		0.35	1.00		0.51	1.00	
Satd. Flow (perm)	963	1773	1513	1006	1717		615	3352		892	3409	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	51	150	277	78	95	61	125	368	35	79	700	75
RTOR Reduction (vph)	0	0	191	0	28	0	0	5	0	0	5	0
Lane Group Flow (vph)	51	150	86	78	128	0	125	398	0	79	770	0
Confl. Peds. (#/hr)							11		8	8		11
Heavy Vehicles (%)	4%	6%	2%	3%	3%	3%	3%	4%	14%	4%	3%	0%
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)	14.0	14.0	14.0	14.0	14.0		73.4	73.4		73.4	73.4	
Effective Green, g (s)	14.0	14.0	14.0	14.0	14.0		73.4	73.4		73.4	73.4	
Actuated g/C Ratio	0.14	0.14	0.14	0.14	0.14		0.73	0.73		0.73	0.73	
Clearance Time (s)	5.9	5.9	5.9	5.9	5.9		6.7	6.7		6.7	6.7	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	134	248	211	140	240		451	2460		654	2502	
v/s Ratio Prot		c0.08			0.07			0.12			c0.23	
v/s Ratio Perm	0.05		0.06	0.08			0.20			0.09		
v/c Ratio	0.38	0.60	0.41	0.56	0.54		0.28	0.16		0.12	0.31	
Uniform Delay, d1	39.1	40.4	39.2	40.1	40.0		4.4	4.0		3.9	4.6	
Progression Factor	1.00	1.00	1.00	1.28	1.35		0.72	0.69		1.00	1.00	
Incremental Delay, d2	1.8	4.1	1.3	4.7	2.3		1.5	0.1		0.4	0.3	
Delay (s)	40.9	44.5	40.5	55.9	56.4		4.7	2.9		4.3	4.9	
Level of Service	D	D	D	E	E		A	A		A	A	
Approach Delay (s)		41.8			56.2			3.3			4.8	
Approach LOS		D			E			A			A	

Intersection Summary				
HCM 2000 Control Delay	18.6	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.36			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.6	
Intersection Capacity Utilization	62.1%	ICU Level of Service	B	
Analysis Period (min)	15			
c Critical Lane Group				

P.M. Peak Hour

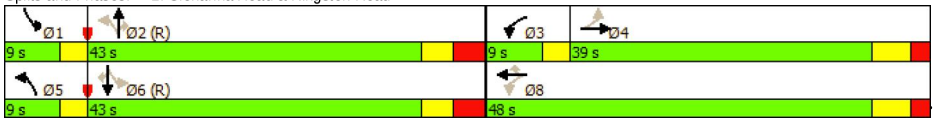
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	24	1187	143	156	596	132	120	177	194	178	199	36
Future Volume (vph)	24	1187	143	156	596	132	120	177	194	178	199	36
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2
Total Lost time (s)	6.4	6.4		3.0	6.4	6.4	3.0	7.0	7.0	3.0	7.0	7.0
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.98		1.00	1.00	0.90	1.00	1.00	0.91	1.00	1.00	0.73
Flpb, ped/bikes	0.97	1.00		1.00	1.00	1.00	0.93	1.00	1.00	0.97	1.00	1.00
Frt	1.00	0.98		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1666	3370		1658	3500	1373	1599	1879	1385	1673	1824	1130
Flt Permitted	0.41	1.00		0.08	1.00	1.00	0.47	1.00	1.00	0.53	1.00	1.00
Satd. Flow (perm)	711	3370		147	3500	1373	790	1879	1385	935	1824	1130
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	26	1290	155	170	648	143	130	192	211	193	216	39
RTOR Reduction (vph)	0	8	0	0	0	40	0	0	171	0	0	32
Lane Group Flow (vph)	26	1437	0	170	648	103	130	192	40	193	216	7
Confl. Peds. (#/hr)	30		55	55		30	91		50	50		91
Heavy Vehicles (%)	0%	2%	5%	4%	2%	1%	0%	0%	1%	0%	3%	0%
Turn Type	Perm	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4		3	8		5	2		1	6	
Permitted Phases	4			8		8	2		2	6		6
Actuated Green, G (s)	44.5	44.5		60.3	60.3	60.3	23.3	17.3	17.3	23.3	17.3	17.3
Effective Green, g (s)	44.5	44.5		60.3	60.3	60.3	23.3	17.3	17.3	23.3	17.3	17.3
Actuated g/C Ratio	0.44	0.44		0.60	0.60	0.60	0.23	0.17	0.17	0.23	0.17	0.17
Clearance Time (s)	6.4	6.4		3.0	6.4	6.4	3.0	7.0	7.0	3.0	7.0	7.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	316	1499		282	2110	827	232	325	239	262	315	195
v/s Ratio Prot		c0.43		c0.08	0.19		0.03	0.10		c0.04	0.12	
v/s Ratio Perm	0.04			0.29		0.07	0.10		0.03	c0.13		0.01
v/c Ratio	0.08	0.96		0.60	0.31	0.12	0.56	0.59	0.17	0.74	0.69	0.03
Uniform Delay, d1	16.0	26.9		20.8	9.7	8.5	32.6	38.1	35.2	34.7	38.8	34.4
Progression Factor	0.48	0.56		1.00	1.00	1.00	1.00	1.00	1.00	1.06	1.07	1.00
Incremental Delay, d2	0.1	8.4		3.6	0.1	0.1	3.1	7.7	1.5	10.3	11.5	0.3
Delay (s)	7.8	23.4		24.4	9.8	8.6	35.7	45.8	36.7	47.0	53.1	34.7
Level of Service	A	C		C	A	A	D	D	D	D	D	C
Approach Delay (s)		23.1			12.2			39.7			48.9	
Approach LOS		C			B			D			D	

Intersection Summary				
HCM 2000 Control Delay	26.0	HCM 2000 Level of Service	C	
HCM 2000 Volume to Capacity ratio	0.84			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	19.4	
Intersection Capacity Utilization	89.2%	ICU Level of Service	E	
Analysis Period (min)	15			
c Critical Lane Group				

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations											
Traffic Volume (vph)	24	1187	156	596	132	120	177	194	178	199	36
Future Volume (vph)	24	1187	156	596	132	120	177	194	178	199	36
Lane Group Flow (vph)	26	1445	170	648	143	130	192	211	193	216	39
Turn Type	Perm	NA	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4	3	8		5	2		1	6	
Permitted Phases	4		8		8	2		2	6		6
Detector Phase	4	4	3	8	8	5	2	2	1	6	6
Switch Phase											
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	24.4	24.4	8.0	24.4	24.4	8.0	25.0	25.0	8.0	25.0	25.0
Total Split (s)	39.0	39.0	9.0	48.0	48.0	9.0	43.0	43.0	9.0	43.0	43.0
Total Split (%)	39.0%	39.0%	9.0%	48.0%	48.0%	9.0%	43.0%	43.0%	9.0%	43.0%	43.0%
Yellow Time (s)	4.2	4.2	3.0	4.2	4.2	3.0	3.3	3.3	3.0	3.3	3.3
All-Red Time (s)	2.2	2.2	0.0	2.2	2.2	0.0	3.7	3.7	0.0	3.7	3.7
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.4	6.4	3.0	6.4	6.4	3.0	7.0	7.0	3.0	7.0	7.0
Lead/Lag	Lag	Lag	Lead			Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?											
Recall Mode	None	None	None	None	None	None	C-Min	C-Min	None	C-Min	C-Min
v/c Ratio	0.08	0.96	0.59	0.31	0.16	0.52	0.59	0.51	0.65	0.69	0.14
Control Delay	9.6	27.4	25.0	10.8	4.2	33.4	44.9	9.8	40.8	52.3	1.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	9.6	27.4	25.0	10.8	4.2	33.4	44.9	9.8	40.8	52.3	1.9
Queue Length 50th (m)	0.9	158.1	15.7	31.4	3.2	19.9	36.5	0.7	34.2	44.0	0.0
Queue Length 95th (m)	m2.8	m#217.9	39.7	49.2	13.2	32.0	55.0	19.2	42.0	65.4	1.0
Internal Link Dist (m)		393.2		523.9			174.6			416.6	
Turn Bay Length (m)	42.6		33.0		23.2	25.4		25.0	27.3		16.5
Base Capacity (vph)	316	1507	287	2110	868	252	676	631	296	656	472
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.08	0.96	0.59	0.31	0.16	0.52	0.28	0.33	0.65	0.33	0.08

Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Glenanna Road & Kingston Road



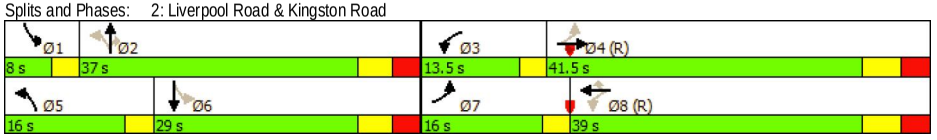
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	218	1048	330	226	515	79	302	914	278	114	365	85
Future Volume (vph)	218	1048	330	226	515	79	302	914	278	114	365	85
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2
Total Lost time (s)	3.0	7.4	7.4	3.0	7.4	7.4	3.0	6.9	6.9	3.0	6.9	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.91	
Frpb, ped/bikes	1.00	1.00	0.94	1.00	1.00	0.95	1.00	1.00	0.85	1.00	0.99	
Flpb, ped/bikes	0.99	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1699	3500	1416	1708	3500	1431	1677	3535	1273	1670	4894	
Flt Permitted	0.35	1.00	1.00	0.12	1.00	1.00	0.38	1.00	1.00	0.18	1.00	
Satd. Flow (perm)	632	3500	1416	218	3500	1431	662	3535	1273	322	4894	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	237	1139	359	246	560	86	328	993	302	124	397	92
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	156	0	38	0
Lane Group Flow (vph)	237	1139	359	246	560	86	328	993	146	124	451	0
Confl. Peds. (#/hr)	26		32	32		26	34		48	48		34
Heavy Vehicles (%)	1%	2%	2%	1%	2%	2%	2%	1%	3%	3%	0%	3%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		
Actuated Green, G (s)	46.0	34.1	34.1	43.8	33.0	33.0	37.8	29.8	29.8	26.8	21.8	
Effective Green, g (s)	46.0	34.1	34.1	43.8	33.0	33.0	37.8	29.8	29.8	26.8	21.8	
Actuated g/C Ratio	0.46	0.34	0.34	0.44	0.33	0.33	0.38	0.30	0.30	0.27	0.22	
Clearance Time (s)	3.0	7.4	7.4	3.0	7.4	7.4	3.0	6.9	6.9	3.0	6.9	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	417	1193	482	256	1155	472	382	1053	379	153	1066	
v/s Ratio Prot	c0.07	c0.33		c0.10	0.16		c0.11	c0.28		0.04	0.09	
v/s Ratio Perm	0.19		0.25	0.32		0.06	0.21		0.11	0.18		
v/c Ratio	0.57	0.95	0.74	0.96	0.48	0.18	0.86	0.94	0.39	0.81	0.42	
Uniform Delay, d1	17.3	32.2	29.1	25.1	26.7	23.9	25.1	34.3	27.8	31.9	33.7	
Progression Factor	1.00	1.00	1.00	1.36	1.44	1.45	1.00	1.00	1.00	1.10	1.04	
Incremental Delay, d2	1.8	17.2	10.0	44.4	1.4	0.8	17.1	15.8	0.7	26.6	0.3	
Delay (s)	19.1	49.4	39.1	78.5	39.8	35.4	42.2	50.1	28.5	61.7	35.2	
Level of Service	B	D	D	E	D	D	D	D	C	E	D	
Approach Delay (s)		43.2			50.1			44.5			40.5	
Approach LOS		D			D			D			D	

Intersection Summary				
HCM 2000 Control Delay	44.5	HCM 2000 Level of Service	D	
HCM 2000 Volume to Capacity ratio	0.97			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	20.3	
Intersection Capacity Utilization	91.7%	ICU Level of Service	F	
Analysis Period (min)	15			
c Critical Lane Group				

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations											
Traffic Volume (vph)	218	1048	330	226	515	79	302	914	278	114	365
Future Volume (vph)	218	1048	330	226	515	79	302	914	278	114	365
Lane Group Flow (vph)	237	1139	359	246	560	86	328	993	302	124	489
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA
Protected Phases	7	4		3	8		5	2		1	6
Permitted Phases	4		4	8		8	2		2	6	
Detector Phase	7	4	4	3	8	8	5	2	2	1	6
Switch Phase											
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	8.0	25.4	25.4	8.5	25.4	25.4	8.0	24.9	24.9	8.0	24.9
Total Split (s)	16.0	41.5	41.5	13.5	39.0	39.0	16.0	37.0	37.0	8.0	29.0
Total Split (%)	16.0%	41.5%	41.5%	13.5%	39.0%	39.0%	16.0%	37.0%	37.0%	8.0%	29.0%
Yellow Time (s)	3.0	4.2	4.2	3.0	4.2	4.2	3.0	3.7	3.7	3.0	3.7
All-Red Time (s)	0.0	3.2	3.2	0.0	3.2	3.2	0.0	3.2	3.2	0.0	3.2
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	3.0	7.4	7.4	3.0	7.4	7.4	3.0	6.9	6.9	3.0	6.9
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag
Lead-Lag Optimize?											
Recall Mode	None	C-Min	C-Min	None	C-Min	C-Min	None	Min	Min	None	Min
v/c Ratio	0.53	0.95	0.74	0.93	0.48	0.18	0.81	0.94	0.56	0.76	0.44
Control Delay	18.2	50.2	40.2	69.8	40.8	37.2	39.0	51.7	12.9	53.1	32.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.2	50.2	40.2	69.8	40.8	37.2	39.0	51.7	12.9	53.1	32.8
Queue Length 50th (m)	25.7	118.2	64.0	40.5	61.6	15.6	47.1	103.3	12.1	14.2	25.9
Queue Length 95th (m)	41.1	#163.6	#102.7	#83.1	76.6	29.4	#85.1	#144.2	39.4	#37.2	40.9
Internal Link Dist (m)		667.5			393.2			242.2			116.1
Turn Bay Length (m)	33.5		49.1	103.2		61.6	46.2		51.8	47.9	
Base Capacity (vph)	463	1193	482	265	1155	472	406	1064	538	164	1119
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.51	0.95	0.74	0.93	0.48	0.18	0.81	0.93	0.56	0.76	0.44

Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 13 (13%), Referenced to phase 4:EBTL and 8:WBTL, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 2: Liverpool Road & Kingston Road



Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations									
Traffic Volume (vph)	45	72	115	55	145	351	604	67	328
Future Volume (vph)	45	72	115	55	145	351	604	67	328
Lane Group Flow (vph)	49	78	125	60	206	382	736	73	390
Turn Type	Perm	NA	Perm	Perm	NA	Perm	NA	Perm	NA
Protected Phases		4			8		2		6
Permitted Phases	4		4	8		2		6	
Detector Phase	4	4	4	8	8	2	2	6	6
Switch Phase									
Minimum Initial (s)	8.0	8.0	8.0	8.0	8.0	5.0	5.0	5.0	5.0
Minimum Split (s)	23.9	23.9	23.9	23.9	23.9	24.7	24.7	24.7	24.7
Total Split (s)	36.0	36.0	36.0	36.0	36.0	64.0	64.0	64.0	64.0
Total Split (%)	36.0%	36.0%	36.0%	36.0%	36.0%	64.0%	64.0%	64.0%	64.0%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	4.6	4.6	4.6	4.6
All-Red Time (s)	2.2	2.2	2.2	2.2	2.2	2.1	2.1	2.1	2.1
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.9	5.9	5.9	5.9	5.9	6.7	6.7	6.7	6.7
Lead/Lag									
Lead-Lag Optimize?									
Recall Mode	None	None	None	None	None	C-Min	C-Min	C-Min	C-Min
v/c Ratio	0.39	0.27	0.36	0.29	0.69	0.57	0.30	0.15	0.15
Control Delay	45.0	37.4	9.1	27.9	39.0	8.5	3.0	6.6	5.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	45.0	37.4	9.1	27.9	39.0	8.5	3.0	6.6	5.1
Queue Length 50th (m)	9.1	14.1	0.0	5.6	20.3	14.0	12.6	4.1	11.1
Queue Length 95th (m)	19.6	25.9	14.7	22.4	61.4	m76.9	m7.6	11.5	20.1
Internal Link Dist (m)		107.2			416.6		192.1		478.0
Turn Bay Length (m)	22.0			24.3		24.4		46.2	
Base Capacity (vph)	237	549	551	385	550	668	2469	471	2518
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.21	0.14	0.23	0.16	0.37	0.57	0.30	0.15	0.15

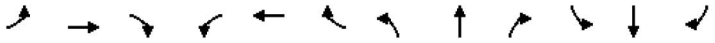
Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 6: Liverpool Road & Glenanna Road

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	18	1	45	123	3	98	41	923	247	76	396	26
Future Volume (Veh/h)	18	1	45	123	3	98	41	923	247	76	396	26
Sign Control		Stop			Stop			Free			Free	
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	1	49	134	3	107	45	1003	268	83	430	28
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			TWLTL	
Median storage veh)											2	
Upstream signal (m)								140			216	
pX, platoon unblocked	0.73	0.73		0.73	0.73	0.73				0.73		
vC, conflicting volume	1310	1971	229	1658	1851	636	458			1271		
vC1, stage 1 conf vol	610	610		1227	1227							
vC2, stage 2 conf vol	700	1361		430	624							
vCu, unblocked vol	678	1586	229	1155	1421	0	458			624		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)	6.5	5.5		6.5	5.5							
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	94	99	94	51	99	86	96			88		
cM capacity (veh/h)	351	193	780	274	267	792	1114			704		

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	70	134	110	45	669	602	83	287	171
Volume Left	20	134	0	45	0	0	83	0	0
Volume Right	49	0	107	0	0	268	0	0	28
cSH	560	274	751	1114	1700	1700	704	1700	1700
Volume to Capacity	0.12	0.49	0.15	0.04	0.39	0.35	0.12	0.17	0.10
Queue Length 95th (m)	3.4	20.1	4.1	1.0	0.0	0.0	3.2	0.0	0.0
Control Delay (s)	12.3	30.1	10.6	8.4	0.0	0.0	10.8	0.0	0.0
Lane LOS	B	D	B	A			B		
Approach Delay (s)	12.3	21.3		0.3			1.7		
Approach LOS	B	C							

Intersection Summary				
Average Delay	3.4			
Intersection Capacity Utilization	61.1%	ICU Level of Service		B
Analysis Period (min)	15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	45	72	115	55	145	44	351	604	73	67	328	30
Future Volume (vph)	45	72	115	55	145	44	351	604	73	67	328	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2
Total Lost time (s)	5.9	5.9	5.9	5.9	5.9		6.7	6.7		6.7	6.7	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00		0.99	1.00	
Frt	1.00	1.00	0.85	1.00	0.97		1.00	0.98		1.00	0.99	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1725	1824	1543	1725	1791		1708	3452		1714	3525	
Flt Permitted	0.43	1.00	1.00	0.71	1.00		0.52	1.00		0.37	1.00	
Satd. Flow (perm)	788	1824	1543	1282	1791		937	3452		660	3525	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	49	78	125	60	158	48	382	657	79	73	357	33
RTOR Reduction (vph)	0	0	105	0	13	0	0	6	0	0	5	0
Lane Group Flow (vph)	49	78	20	60	193	0	382	730	0	73	385	0
Confl. Peds. (#/hr)									11	11		
Heavy Vehicles (%)	0%	3%	0%	0%	1%	2%	1%	1%	5%	0%	0%	0%
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)	16.0	16.0	16.0	16.0	16.0		71.4	71.4		71.4	71.4	
Effective Green, g (s)	16.0	16.0	16.0	16.0	16.0		71.4	71.4		71.4	71.4	
Actuated g/C Ratio	0.16	0.16	0.16	0.16	0.16		0.71	0.71		0.71	0.71	
Clearance Time (s)	5.9	5.9	5.9	5.9	5.9		6.7	6.7		6.7	6.7	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	126	291	246	205	286		669	2464		471	2516	
v/s Ratio Prot		0.04			c0.11			0.21			0.11	
v/s Ratio Perm	0.06		0.01	0.05			c0.41			0.11		
v/c Ratio	0.39	0.27	0.08	0.29	0.67		0.57	0.30		0.15	0.15	
Uniform Delay, d1	37.6	36.9	35.7	37.0	39.5		6.9	5.2		4.6	4.6	
Progression Factor	1.00	1.00	1.00	0.69	0.76		0.70	0.49		1.00	1.00	
Incremental Delay, d2	2.0	0.5	0.1	0.8	6.0		2.4	0.2		0.7	0.1	
Delay (s)	39.6	37.4	35.9	26.3	36.1		7.2	2.8		5.3	4.7	
Level of Service	D	D	D	C	D		A	A		A	A	
Approach Delay (s)		37.1			33.9			4.3			4.8	
Approach LOS		D			C			A			A	

Intersection Summary				
HCM 2000 Control Delay	12.1	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.59			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.6	
Intersection Capacity Utilization	67.4%	ICU Level of Service	C	
Analysis Period (min)	15			
c Critical Lane Group				

Year 2029

A.M. Peak Hour

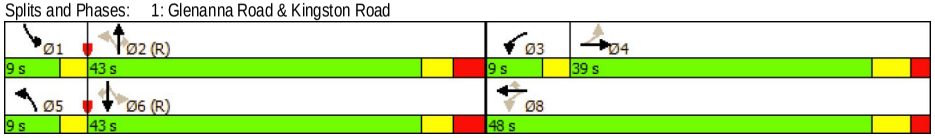
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	408	93	96	591	122	52	73	64	190	102	26
Future Volume (vph)	10	408	93	96	591	122	52	73	64	190	102	26
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2
Total Lost time (s)	6.4	6.4		3.0	6.4	6.4	3.0	7.0	7.0	3.0	7.0	7.0
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.98		1.00	1.00	0.96	1.00	1.00	0.93	1.00	1.00	0.88
Flpb, ped/bikes	0.99	1.00		1.00	1.00	1.00	0.94	1.00	1.00	0.97	1.00	1.00
Frt	1.00	0.97		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1568	3161		1651	3400	1464	1629	1860	1397	1641	1773	1365
Flt Permitted	0.41	1.00		0.25	1.00	1.00	0.69	1.00	1.00	0.65	1.00	1.00
Satd. Flow (perm)	673	3161		436	3400	1464	1175	1860	1397	1129	1773	1365
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	11	443	101	104	642	133	57	79	70	207	111	28
RTOR Reduction (vph)	0	22	0	0	0	0	0	0	44	0	0	16
Lane Group Flow (vph)	11	522	0	104	642	133	57	79	26	207	111	12
Confl. Peds. (#/hr)	8		25	25		8	35		34	34		35
Heavy Vehicles (%)	9%	8%	8%	4%	5%	1%	0%	1%	3%	2%	6%	0%
Turn Type	Perm	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4		3	8		5	2		1	6	
Permitted Phases	4			8		8	2		2	6		6
Actuated Green, G (s)	22.5	22.5		33.9	33.9	33.9	43.7	37.7	37.7	52.7	43.7	43.7
Effective Green, g (s)	22.5	22.5		33.9	33.9	33.9	43.7	37.7	37.7	52.7	43.7	43.7
Actuated g/C Ratio	0.22	0.22		0.34	0.34	0.34	0.44	0.38	0.38	0.53	0.44	0.44
Clearance Time (s)	6.4	6.4		3.0	6.4	6.4	3.0	7.0	7.0	3.0	7.0	7.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	151	711		249	1152	496	540	701	526	656	774	596
v/s Ratio Prot		c0.16		0.03	c0.19		0.01	0.04		c0.04	0.06	
v/s Ratio Perm	0.02			0.11		0.09	0.04		0.02	c0.13		0.01
v/c Ratio	0.07	0.73		0.42	0.56	0.27	0.11	0.11	0.05	0.32	0.14	0.02
Uniform Delay, d1	30.5	36.0		24.0	26.9	24.0	16.4	20.3	19.8	12.9	16.9	16.0
Progression Factor	0.58	0.72		1.00	1.00	1.00	1.00	1.00	1.00	0.81	0.86	1.00
Incremental Delay, d2	0.2	3.7		1.1	0.6	0.3	0.1	0.3	0.2	0.3	0.4	0.1
Delay (s)	17.8	29.7		25.2	27.5	24.3	16.5	20.6	20.0	10.7	15.0	16.1
Level of Service	B	C		C	C	C	B	C	B	B	B	B
Approach Delay (s)		29.5			26.8			19.2			12.5	
Approach LOS		C			C			B			B	

Intersection Summary				
HCM 2000 Control Delay	24.3	HCM 2000 Level of Service	C	
HCM 2000 Volume to Capacity ratio	0.47			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	19.4	
Intersection Capacity Utilization	54.9%	ICU Level of Service	A	
Analysis Period (min)	15			
c Critical Lane Group				

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations											
Traffic Volume (vph)	10	408	96	591	122	52	73	64	190	102	26
Future Volume (vph)	10	408	96	591	122	52	73	64	190	102	26
Lane Group Flow (vph)	11	544	104	642	133	57	79	70	207	111	28
Turn Type	Perm	NA	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4	3	8		5	2		1	6	
Permitted Phases	4		8		8	2		2	6		6
Detector Phase	4	4	3	8	8	5	2	2	1	6	6
Switch Phase											
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	8.0	8.0	5.0	8.0	8.0
Minimum Split (s)	24.4	24.4	8.0	24.4	24.4	8.0	25.4	25.4	8.0	25.4	25.4
Total Split (s)	39.0	39.0	9.0	48.0	48.0	9.0	43.0	43.0	9.0	43.0	43.0
Total Split (%)	39.0%	39.0%	9.0%	48.0%	48.0%	9.0%	43.0%	43.0%	9.0%	43.0%	43.0%
Yellow Time (s)	4.2	4.2	3.0	4.2	4.2	3.0	3.3	3.3	3.0	3.3	3.3
All-Red Time (s)	2.2	2.2	0.0	2.2	2.2	0.0	3.7	3.7	0.0	3.7	3.7
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.4	6.4	3.0	6.4	6.4	3.0	7.0	7.0	3.0	7.0	7.0
Lead/Lag	Lag	Lag	Lead			Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?											
Recall Mode	None	None	None	None	None	None	C-Min	C-Min	None	C-Min	C-Min
v/c Ratio	0.07	0.74	0.38	0.57	0.27	0.09	0.11	0.12	0.29	0.14	0.04
Control Delay	17.4	30.8	22.9	28.5	23.7	13.2	25.8	3.1	11.3	18.4	2.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	17.4	30.8	22.9	28.5	23.7	13.2	25.8	3.1	11.3	18.4	2.0
Queue Length 50th (m)	0.8	21.0	13.8	54.9	19.3	5.0	10.4	0.0	20.2	17.8	0.2
Queue Length 95th (m)	m2.1	24.0	21.7	61.9	29.2	13.4	26.1	5.7	45.1	33.8	2.3
Internal Link Dist (m)		393.2		523.9			174.6			416.6	
Turn Bay Length (m)	42.6		33.0		23.2	25.4		25.0	27.3		16.5
Base Capacity (vph)	219	1049	277	1428	615	607	780	645	703	813	682
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.05	0.52	0.38	0.45	0.22	0.09	0.10	0.11	0.29	0.14	0.04

Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 70
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Glenanna Road & Kingston Road



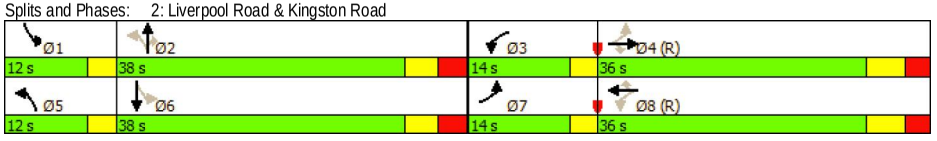
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	92	396	254	178	495	47	215	465	122	79	843	101
Future Volume (vph)	92	396	254	178	495	47	215	465	122	79	843	101
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2
Total Lost time (s)	3.0	7.0	7.0	3.0	7.0	7.0	3.0	6.9	6.9	3.0	6.9	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.91	
Frpb, ped/bikes	1.00	1.00	0.96	1.00	1.00	0.96	1.00	1.00	0.91	1.00	0.99	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.98	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1652	3368	1462	1639	3400	1487	1690	3500	1279	1665	4912	
Flt Permitted	0.38	1.00	1.00	0.37	1.00	1.00	0.17	1.00	1.00	0.47	1.00	
Satd. Flow (perm)	655	3368	1462	636	3400	1487	305	3500	1279	818	4912	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	100	430	276	193	538	51	234	505	133	86	916	110
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	80	0	14	0
Lane Group Flow (vph)	100	430	276	193	538	51	234	505	53	86	1012	0
Confl. Peds. (#/hr)	15		19	9		15	22		25	25		22
Heavy Vehicles (%)	4%	6%	1%	5%	5%	0%	2%	2%	10%	2%	2%	4%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		
Actuated Green, G (s)	31.0	23.3	23.3	36.8	26.2	26.2	49.2	39.5	39.5	41.1	34.4	
Effective Green, g (s)	31.0	23.3	23.3	36.8	26.2	26.2	49.2	39.5	39.5	41.1	34.4	
Actuated g/C Ratio	0.31	0.23	0.23	0.37	0.26	0.26	0.49	0.40	0.40	0.41	0.34	
Clearance Time (s)	3.0	7.0	7.0	3.0	7.0	7.0	3.0	6.9	6.9	3.0	6.9	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	279	784	340	340	890	389	313	1382	505	392	1689	
v/s Ratio Prot	0.03	0.13		c0.06	0.16		c0.09	0.14		0.01	0.21	
v/s Ratio Perm	0.08		c0.19	0.15		0.03	c0.28		0.04	0.08		
v/c Ratio	0.36	0.55	0.81	0.57	0.60	0.13	0.75	0.37	0.10	0.22	0.60	
Uniform Delay, d1	25.4	33.7	36.3	22.9	32.4	28.2	16.7	21.4	19.1	18.3	27.1	
Progression Factor	1.00	1.00	1.00	2.36	1.84	1.92	1.00	1.00	1.00	0.95	0.94	
Incremental Delay, d2	0.8	2.8	18.7	2.0	2.9	0.7	9.4	0.7	0.4	0.3	1.5	
Delay (s)	26.2	36.5	55.0	56.3	62.4	54.8	26.1	22.1	19.5	17.6	27.0	
Level of Service	C	D	D	E	E	D	C	C	B	B	C	
Approach Delay (s)		41.5			60.4			22.8			26.3	
Approach LOS		D			E			C			C	

Intersection Summary				
HCM 2000 Control Delay	36.3	HCM 2000 Level of Service	D	
HCM 2000 Volume to Capacity ratio	0.77			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	19.9	
Intersection Capacity Utilization	73.8%	ICU Level of Service	D	
Analysis Period (min)	15			
c Critical Lane Group				

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations											
Traffic Volume (vph)	92	396	254	178	495	47	215	465	122	79	843
Future Volume (vph)	92	396	254	178	495	47	215	465	122	79	843
Lane Group Flow (vph)	100	430	276	193	538	51	234	505	133	86	1026
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA
Protected Phases	7	4		3	8		5	2		1	6
Permitted Phases	4		4	8		8	2		2	6	
Detector Phase	7	4	4	3	8	8	5	2	2	1	6
Switch Phase											
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	11.9	25.0	25.0	9.5	25.0	25.0	9.5	24.9	24.9	8.0	24.9
Total Split (s)	14.0	36.0	36.0	14.0	36.0	36.0	12.0	38.0	38.0	12.0	38.0
Total Split (%)	14.0%	36.0%	36.0%	14.0%	36.0%	36.0%	12.0%	38.0%	38.0%	12.0%	38.0%
Yellow Time (s)	3.0	4.2	4.2	3.0	4.2	4.2	3.0	3.7	3.7	3.0	3.7
All-Red Time (s)	0.0	2.8	2.8	0.0	2.8	2.8	0.0	3.2	3.2	0.0	3.2
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	3.0	7.0	7.0	3.0	7.0	7.0	3.0	6.9	6.9	3.0	6.9
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag
Lead-Lag Optimize?											
Recall Mode	None	C-Min	C-Min	None	C-Min	C-Min	None	Max	Max	None	Max
v/c Ratio	0.30	0.53	0.79	0.53	0.58	0.12	0.73	0.37	0.23	0.20	0.61
Control Delay	19.4	35.1	51.8	49.3	60.3	53.1	32.3	24.5	5.6	14.1	27.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	19.4	35.1	51.8	49.3	60.3	53.1	32.3	24.5	5.6	14.1	27.9
Queue Length 50th (m)	12.1	39.8	52.4	39.6	61.4	10.9	25.9	39.8	0.0	7.5	57.9
Queue Length 95th (m)	21.0	52.4	78.5	61.4	78.8	23.0	#70.2	59.1	13.4	17.6	81.6
Internal Link Dist (m)		667.5			393.2			242.2			116.1
Turn Bay Length (m)	33.5		49.1	103.2		61.6	46.2		51.8	47.9	
Base Capacity (vph)	363	976	423	365	987	431	319	1382	585	456	1673
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.28	0.44	0.65	0.53	0.55	0.12	0.73	0.37	0.23	0.19	0.61

Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 13 (13%), Referenced to phase 4:EBTL and 8:WBTL, Start of Green
Natural Cycle: 75
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 2: Liverpool Road & Kingston Road



Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations									
Traffic Volume (vph)	47	138	255	72	87	115	350	73	664
Future Volume (vph)	47	138	255	72	87	115	350	73	664
Lane Group Flow (vph)	51	150	277	78	156	125	415	79	797
Turn Type	Perm	NA	Perm	Perm	NA	Perm	NA	Perm	NA
Protected Phases		4			8		2		6
Permitted Phases	4		4	8		2		6	
Detector Phase	4	4	4	8	8	2	2	6	6
Switch Phase									
Minimum Initial (s)	8.0	8.0	8.0	5.0	5.0	5.0	5.0	8.0	8.0
Minimum Split (s)	23.9	23.9	23.9	23.9	23.9	24.7	24.7	24.7	24.7
Total Split (s)	34.0	34.0	34.0	34.0	34.0	66.0	66.0	66.0	66.0
Total Split (%)	34.0%	34.0%	34.0%	34.0%	34.0%	66.0%	66.0%	66.0%	66.0%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	4.6	4.6	4.6	4.6
All-Red Time (s)	2.2	2.2	2.2	2.2	2.2	2.1	2.1	2.1	2.1
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.9	5.9	5.9	5.9	5.9	6.7	6.7	6.7	6.7
Lead/Lag									
Lead-Lag Optimize?									
Recall Mode	None	None	None	None	None	C-Min	C-Min	C-Min	C-Min
v/c Ratio	0.37	0.60	0.70	0.55	0.58	0.29	0.17	0.12	0.32
Control Delay	44.9	49.3	20.6	61.7	48.6	5.7	3.0	5.4	5.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	44.9	49.3	20.6	61.7	48.6	5.7	3.0	5.4	5.4
Queue Length 50th (m)	9.6	29.2	12.3	16.8	27.1	5.3	6.3	3.9	24.0
Queue Length 95th (m)	19.9	46.0	37.1	28.5	42.3	9.5	11.5	11.1	42.6
Internal Link Dist (m)		107.2			416.6		192.1		478.0
Turn Bay Length (m)	22.0			24.3		24.4		46.2	
Base Capacity (vph)	271	498	576	283	505	438	2460	645	2502
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.19	0.30	0.48	0.28	0.31	0.29	0.17	0.12	0.32

Intersection Summary

Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 55
Control Type: Actuated-Coordinated

Splits and Phases: 6: Liverpool Road & Glenanna Road

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	8	0	25	106	1	59	18	423	163	94	892	22
Future Volume (Veh/h)	8	0	25	106	1	59	18	423	163	94	892	22
Sign Control		Stop			Stop			Free			Free	
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	0	27	115	1	64	20	460	177	102	970	24
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			TWLTL	
Median storage veh)											2	
Upstream signal (m)								140			216	
pX, platoon unblocked	0.92	0.92	0.96	0.92	0.92	0.91	0.96			0.91		
vC, conflicting volume	1520	1863	497	1304	1786	318	994			637		
vC1, stage 1 conf vol	1186	1186		588	588							
vC2, stage 2 conf vol	334	677		716	1198							
vCu, unblocked vol	1227	1598	405	994	1515	42	920			394		
tC, single (s)	7.5	6.5	7.3	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)	6.5	5.5		6.5	5.5							
tF (s)	3.5	4.0	3.5	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	95	100	95	63	100	93	97			90		
cM capacity (veh/h)	188	220	525	312	212	930	723			1053		

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	36	115	65	20	307	330	102	647	347
Volume Left	9	115	0	20	0	0	102	0	0
Volume Right	27	0	64	0	0	177	0	0	24
cSH	363	312	884	723	1700	1700	1053	1700	1700
Volume to Capacity	0.10	0.37	0.07	0.03	0.18	0.19	0.10	0.38	0.20
Queue Length 95th (m)	2.6	13.1	1.9	0.7	0.0	0.0	2.6	0.0	0.0
Control Delay (s)	16.0	23.1	9.4	10.1	0.0	0.0	8.8	0.0	0.0
Lane LOS	C	C	A	B			A		
Approach Delay (s)	16.0	18.1		0.3			0.8		
Approach LOS	C	C							

Intersection Summary

Average Delay	2.5				
Intersection Capacity Utilization	51.2%	ICU Level of Service		A	
Analysis Period (min)	15				

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	47	138	255	72	87	56	115	350	32	73	664	69
Future Volume (vph)	47	138	255	72	87	56	115	350	32	73	664	69
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2
Total Lost time (s)	5.9	5.9	5.9	5.9	5.9		6.7	6.7		6.7	6.7	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		0.99	1.00		0.99	1.00	
Frt	1.00	1.00	0.85	1.00	0.94		1.00	0.99		1.00	0.99	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1658	1773	1513	1675	1717		1658	3355		1646	3410	
Flt Permitted	0.55	1.00	1.00	0.57	1.00		0.34	1.00		0.51	1.00	
Satd. Flow (perm)	967	1773	1513	1010	1717		600	3355		882	3410	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	51	150	277	78	95	61	125	380	35	79	722	75
RTOR Reduction (vph)	0	0	181	0	27	0	0	5	0	0	5	0
Lane Group Flow (vph)	51	150	96	78	129	0	125	410	0	79	792	0
Confl. Peds. (#/hr)							11		8	8		11
Heavy Vehicles (%)	4%	6%	2%	3%	3%	3%	3%	4%	14%	4%	3%	0%
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)	14.2	14.2	14.2	14.2	14.2		73.2	73.2		73.2	73.2	
Effective Green, g (s)	14.2	14.2	14.2	14.2	14.2		73.2	73.2		73.2	73.2	
Actuated g/C Ratio	0.14	0.14	0.14	0.14	0.14		0.73	0.73		0.73	0.73	
Clearance Time (s)	5.9	5.9	5.9	5.9	5.9		6.7	6.7		6.7	6.7	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	137	251	214	143	243		439	2455		645	2496	
v/s Ratio Prot		c0.08			0.07			0.12			c0.23	
v/s Ratio Perm	0.05		0.06	0.08			0.21			0.09		
v/c Ratio	0.37	0.60	0.45	0.55	0.53		0.28	0.17		0.12	0.32	
Uniform Delay, d1	38.9	40.2	39.3	39.9	39.8		4.5	4.1		3.9	4.7	
Progression Factor	1.00	1.00	1.00	1.23	1.30		0.69	0.66		1.00	1.00	
Incremental Delay, d2	1.7	3.8	1.5	4.2	2.1		1.6	0.1		0.4	0.3	
Delay (s)	40.6	44.0	40.8	53.2	54.0		4.7	2.8		4.3	5.0	
Level of Service	D	D	D	D	D		A	A		A	A	
Approach Delay (s)		41.8			53.7			3.3			5.0	
Approach LOS		D			D			A			A	

Intersection Summary				
HCM 2000 Control Delay	18.2	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.36			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.6	
Intersection Capacity Utilization	62.7%	ICU Level of Service	B	
Analysis Period (min)	15			
c Critical Lane Group				

P.M. Peak Hour

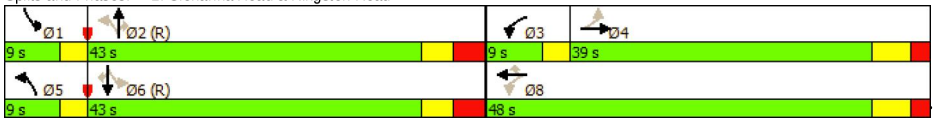
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	24	1217	143	156	611	132	120	177	194	178	199	36
Future Volume (vph)	24	1217	143	156	611	132	120	177	194	178	199	36
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2
Total Lost time (s)	6.4	6.4		3.0	6.4	6.4	3.0	7.0	7.0	3.0	7.0	7.0
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.98		1.00	1.00	0.90	1.00	1.00	0.91	1.00	1.00	0.73
Flpb, ped/bikes	0.97	1.00		1.00	1.00	1.00	0.93	1.00	1.00	0.97	1.00	1.00
Frt	1.00	0.98		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1668	3373		1658	3500	1373	1599	1879	1385	1673	1824	1130
Flt Permitted	0.40	1.00		0.08	1.00	1.00	0.47	1.00	1.00	0.53	1.00	1.00
Satd. Flow (perm)	701	3373		147	3500	1373	790	1879	1385	935	1824	1130
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	26	1323	155	170	664	143	130	192	211	193	216	39
RTOR Reduction (vph)	0	7	0	0	0	39	0	0	171	0	0	32
Lane Group Flow (vph)	26	1471	0	170	664	104	130	192	40	193	216	7
Confl. Peds. (#/hr)	30		55	55		30	91		50	50		91
Heavy Vehicles (%)	0%	2%	5%	4%	2%	1%	0%	0%	1%	0%	3%	0%
Turn Type	Perm	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4		3	8		5	2		1	6	
Permitted Phases	4			8		8	2		2	6		6
Actuated Green, G (s)	44.5	44.5		60.3	60.3	60.3	23.3	17.3	17.3	23.3	17.3	17.3
Effective Green, g (s)	44.5	44.5		60.3	60.3	60.3	23.3	17.3	17.3	23.3	17.3	17.3
Actuated g/C Ratio	0.44	0.44		0.60	0.60	0.60	0.23	0.17	0.17	0.23	0.17	0.17
Clearance Time (s)	6.4	6.4		3.0	6.4	6.4	3.0	7.0	7.0	3.0	7.0	7.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	311	1500		282	2110	827	232	325	239	262	315	195
v/s Ratio Prot		c0.44		c0.08	0.19		0.03	0.10		c0.04	0.12	
v/s Ratio Perm	0.04			0.29		0.08	0.10		0.03	c0.13		0.01
v/c Ratio	0.08	0.98		0.60	0.31	0.13	0.56	0.59	0.17	0.74	0.69	0.03
Uniform Delay, d1	16.0	27.3		21.1	9.7	8.5	32.6	38.1	35.2	34.7	38.8	34.4
Progression Factor	0.48	0.55		1.00	1.00	1.00	1.00	1.00	1.00	1.07	1.08	1.00
Incremental Delay, d2	0.1	11.4		3.6	0.1	0.1	3.1	7.7	1.5	10.3	11.5	0.3
Delay (s)	7.7	26.5		24.8	9.8	8.6	35.7	45.8	36.7	47.4	53.3	34.7
Level of Service	A	C		C	A	A	D	D	D	D	D	C
Approach Delay (s)		26.2			12.2			39.7			49.2	
Approach LOS		C			B			D			D	

Intersection Summary				
HCM 2000 Control Delay	27.3	HCM 2000 Level of Service	C	
HCM 2000 Volume to Capacity ratio	0.85			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	19.4	
Intersection Capacity Utilization	90.0%	ICU Level of Service	E	
Analysis Period (min)	15			
c Critical Lane Group				

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations											
Traffic Volume (vph)	24	1217	156	611	132	120	177	194	178	199	36
Future Volume (vph)	24	1217	156	611	132	120	177	194	178	199	36
Lane Group Flow (vph)	26	1478	170	664	143	130	192	211	193	216	39
Turn Type	Perm	NA	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4	3	8		5	2		1	6	
Permitted Phases	4		8		8	2		2	6		6
Detector Phase	4	4	3	8	8	5	2	2	1	6	6
Switch Phase											
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	24.4	24.4	8.0	24.4	24.4	8.0	25.0	25.0	8.0	25.0	25.0
Total Split (s)	39.0	39.0	9.0	48.0	48.0	9.0	43.0	43.0	9.0	43.0	43.0
Total Split (%)	39.0%	39.0%	9.0%	48.0%	48.0%	9.0%	43.0%	43.0%	9.0%	43.0%	43.0%
Yellow Time (s)	4.2	4.2	3.0	4.2	4.2	3.0	3.3	3.3	3.0	3.3	3.3
All-Red Time (s)	2.2	2.2	0.0	2.2	2.2	0.0	3.7	3.7	0.0	3.7	3.7
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.4	6.4	3.0	6.4	6.4	3.0	7.0	7.0	3.0	7.0	7.0
Lead/Lag	Lag	Lag	Lead			Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?											
Recall Mode	None	None	None	None	None	None	C-Min	C-Min	None	C-Min	C-Min
v/c Ratio	0.08	0.98	0.59	0.31	0.16	0.52	0.59	0.51	0.65	0.69	0.14
Control Delay	9.5	30.4	25.0	10.9	4.3	33.4	44.9	9.8	41.1	52.4	2.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	9.5	30.4	25.0	10.9	4.3	33.4	44.9	9.8	41.1	52.4	2.1
Queue Length 50th (m)	0.9	162.0	15.7	32.2	3.4	19.9	36.5	0.7	34.3	44.0	0.0
Queue Length 95th (m)	m2.7	m#219.3	39.7	50.6	13.4	32.0	55.0	19.2	41.0	66.7	1.5
Internal Link Dist (m)		393.2		523.9			174.6			416.6	
Turn Bay Length (m)	42.6		33.0		23.2	25.4		25.0	27.3		16.5
Base Capacity (vph)	311	1507	287	2110	867	252	676	631	296	656	472
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.08	0.98	0.59	0.31	0.16	0.52	0.28	0.33	0.65	0.33	0.08

Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Glenanna Road & Kingston Road



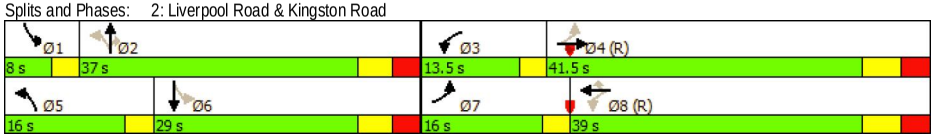
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	218	1074	330	226	528	79	302	937	278	114	374	85
Future Volume (vph)	218	1074	330	226	528	79	302	937	278	114	374	85
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2
Total Lost time (s)	3.0	7.4	7.4	3.0	7.4	7.4	3.0	6.9	6.9	3.0	6.9	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.91	
Frpb, ped/bikes	1.00	1.00	0.94	1.00	1.00	0.95	1.00	1.00	0.85	1.00	0.99	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1700	3500	1416	1708	3500	1431	1677	3535	1273	1670	4898	
Flt Permitted	0.34	1.00	1.00	0.12	1.00	1.00	0.37	1.00	1.00	0.18	1.00	
Satd. Flow (perm)	607	3500	1416	220	3500	1431	652	3535	1273	318	4898	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	237	1167	359	246	574	86	328	1018	302	124	407	92
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	152	0	37	0
Lane Group Flow (vph)	237	1167	359	246	574	86	328	1018	150	124	462	0
Confl. Peds. (#/hr)	26		32	32		26	34		48	48		34
Heavy Vehicles (%)	1%	2%	2%	1%	2%	2%	2%	1%	3%	3%	0%	3%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		
Actuated Green, G (s)	46.0	34.1	34.1	43.2	32.7	32.7	38.1	30.1	30.1	27.1	22.1	
Effective Green, g (s)	46.0	34.1	34.1	43.2	32.7	32.7	38.1	30.1	30.1	27.1	22.1	
Actuated g/C Ratio	0.46	0.34	0.34	0.43	0.33	0.33	0.38	0.30	0.30	0.27	0.22	
Clearance Time (s)	3.0	7.4	7.4	3.0	7.4	7.4	3.0	6.9	6.9	3.0	6.9	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	409	1193	482	251	1144	467	381	1064	383	153	1082	
v/s Ratio Prot	c0.07	c0.33		c0.10	0.16		c0.11	c0.29		0.04	0.09	
v/s Ratio Perm	0.20		0.25	0.32		0.06	0.22		0.12	0.18		
v/c Ratio	0.58	0.98	0.74	0.98	0.50	0.18	0.86	0.96	0.39	0.81	0.43	
Uniform Delay, d1	17.4	32.6	29.1	25.4	27.1	24.1	24.9	34.3	27.7	31.8	33.5	
Progression Factor	1.00	1.00	1.00	1.37	1.44	1.45	1.00	1.00	1.00	1.11	1.04	
Incremental Delay, d2	2.0	21.3	10.0	50.1	1.5	0.8	17.7	17.9	0.7	26.6	0.3	
Delay (s)	19.3	53.9	39.1	84.9	40.6	35.8	42.6	52.2	28.4	61.9	35.2	
Level of Service	B	D	D	F	D	D	D	D	C	E	D	
Approach Delay (s)		46.3			52.2			45.9			40.5	
Approach LOS		D			D			D			D	

Intersection Summary				
HCM 2000 Control Delay	46.5	HCM 2000 Level of Service	D	
HCM 2000 Volume to Capacity ratio	0.99			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	20.3	
Intersection Capacity Utilization	93.0%	ICU Level of Service	F	
Analysis Period (min)	15			
c Critical Lane Group				

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations											
Traffic Volume (vph)	218	1074	330	226	528	79	302	937	278	114	374
Future Volume (vph)	218	1074	330	226	528	79	302	937	278	114	374
Lane Group Flow (vph)	237	1167	359	246	574	86	328	1018	302	124	499
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA
Protected Phases	7	4		3	8		5	2		1	6
Permitted Phases	4		4	8		8	2		2	6	
Detector Phase	7	4	4	3	8	8	5	2	2	1	6
Switch Phase											
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	8.0	25.4	25.4	8.5	25.4	25.4	8.0	24.9	24.9	8.0	24.9
Total Split (s)	16.0	41.5	41.5	13.5	39.0	39.0	16.0	37.0	37.0	8.0	29.0
Total Split (%)	16.0%	41.5%	41.5%	13.5%	39.0%	39.0%	16.0%	37.0%	37.0%	8.0%	29.0%
Yellow Time (s)	3.0	4.2	4.2	3.0	4.2	4.2	3.0	3.7	3.7	3.0	3.7
All-Red Time (s)	0.0	3.2	3.2	0.0	3.2	3.2	0.0	3.2	3.2	0.0	3.2
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	3.0	7.4	7.4	3.0	7.4	7.4	3.0	6.9	6.9	3.0	6.9
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag
Lead-Lag Optimize?											
Recall Mode	None	C-Min	C-Min	None	C-Min	C-Min	None	Min	Min	None	Min
v/c Ratio	0.55	0.98	0.74	0.95	0.50	0.18	0.81	0.96	0.57	0.75	0.45
Control Delay	18.6	54.8	40.2	73.5	41.4	37.4	39.2	54.1	13.4	52.8	33.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.6	54.8	40.2	73.5	41.4	37.4	39.2	54.1	13.4	52.8	33.1
Queue Length 50th (m)	25.7	122.6	64.0	40.7	63.3	15.7	47.1	106.8	13.0	14.2	27.2
Queue Length 95th (m)	41.1	#170.1	#102.7	#83.4	78.6	29.8	#85.9	#150.1	40.5	#37.7	43.3
Internal Link Dist (m)		667.5			393.2			242.2			116.1
Turn Bay Length (m)	33.5		49.1	103.2		61.6	46.2		51.8	47.9	
Base Capacity (vph)	453	1193	482	260	1145	468	405	1064	534	165	1118
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.52	0.98	0.74	0.95	0.50	0.18	0.81	0.96	0.57	0.75	0.45

Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 13 (13%), Referenced to phase 4:EBTL and 8:WBTL, Start of Green
Natural Cycle: 100
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 2: Liverpool Road & Kingston Road



Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations									
Traffic Volume (vph)	45	72	115	55	145	351	627	67	337
Future Volume (vph)	45	72	115	55	145	351	627	67	337
Lane Group Flow (vph)	49	78	125	60	206	382	761	73	399
Turn Type	Perm	NA	Perm	Perm	NA	Perm	NA	Perm	NA
Protected Phases		4			8		2		6
Permitted Phases	4		4	8		2		6	
Detector Phase	4	4	4	8	8	2	2	6	6
Switch Phase									
Minimum Initial (s)	8.0	8.0	8.0	8.0	8.0	5.0	5.0	5.0	5.0
Minimum Split (s)	23.9	23.9	23.9	23.9	23.9	24.7	24.7	24.7	24.7
Total Split (s)	36.0	36.0	36.0	36.0	36.0	64.0	64.0	64.0	64.0
Total Split (%)	36.0%	36.0%	36.0%	36.0%	36.0%	64.0%	64.0%	64.0%	64.0%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	4.6	4.6	4.6	4.6
All-Red Time (s)	2.2	2.2	2.2	2.2	2.2	2.1	2.1	2.1	2.1
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.9	5.9	5.9	5.9	5.9	6.7	6.7	6.7	6.7
Lead/Lag									
Lead-Lag Optimize?									
Recall Mode	None	None	None	None	None	C-Min	C-Min	C-Min	C-Min
v/c Ratio	0.39	0.27	0.36	0.29	0.69	0.58	0.31	0.16	0.16
Control Delay	45.0	37.4	9.1	28.4	39.6	8.8	3.1	6.7	5.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	45.0	37.4	9.1	28.4	39.6	8.8	3.1	6.7	5.1
Queue Length 50th (m)	9.1	14.1	0.0	6.5	36.8	11.4	10.6	4.1	11.4
Queue Length 95th (m)	19.6	25.9	14.7	23.1	60.4	m75.8	m14.5	11.6	20.5
Internal Link Dist (m)		107.2			416.6		192.1		478.0
Turn Bay Length (m)	22.0			24.3		24.4		46.2	
Base Capacity (vph)	237	549	551	385	550	662	2470	457	2521
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.21	0.14	0.23	0.16	0.37	0.58	0.31	0.16	0.16

Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 6: Liverpool Road & Glenanna Road

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	18	1	45	123	3	98	41	946	247	76	405	26
Future Volume (Veh/h)	18	1	45	123	3	98	41	946	247	76	405	26
Sign Control		Stop			Stop			Free			Free	
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	1	49	134	3	107	45	1028	268	83	440	28
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			TWLTL	
Median storage veh)											2	
Upstream signal (m)								140			216	
pX, platoon unblocked	0.72	0.72		0.72	0.72	0.72				0.72		
vC, conflicting volume	1332	2006	234	1688	1886	648	468			1296		
vC1, stage 1 conf vol	620	620		1252	1252							
vC2, stage 2 conf vol	712	1386		436	634							
vCu, unblocked vol	689	1622	234	1181	1456	0	468			638		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)	6.5	5.5		6.5	5.5							
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	94	99	94	50	99	86	96			88		
cM capacity (veh/h)	345	186	774	267	261	785	1104			689		

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	70	134	110	45	685	611	83	293	175
Volume Left	20	134	0	45	0	0	83	0	0
Volume Right	49	0	107	0	0	268	0	0	28
cSH	553	267	744	1104	1700	1700	689	1700	1700
Volume to Capacity	0.13	0.50	0.15	0.04	0.40	0.36	0.12	0.17	0.10
Queue Length 95th (m)	3.5	20.9	4.1	1.0	0.0	0.0	3.3	0.0	0.0
Control Delay (s)	12.5	31.3	10.7	8.4	0.0	0.0	10.9	0.0	0.0
Lane LOS	B	D	B	A			B		
Approach Delay (s)	12.5	22.0		0.3			1.6		
Approach LOS	B	C							

Intersection Summary				
Average Delay	3.4			
Intersection Capacity Utilization	61.7%	ICU Level of Service		B
Analysis Period (min)	15			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	45	72	115	55	145	44	351	627	73	67	337	30
Future Volume (vph)	45	72	115	55	145	44	351	627	73	67	337	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2
Total Lost time (s)	5.9	5.9	5.9	5.9	5.9		6.7	6.7		6.7	6.7	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00		0.99	1.00	
Frt	1.00	1.00	0.85	1.00	0.97		1.00	0.98		1.00	0.99	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1725	1824	1543	1725	1791		1708	3454		1714	3526	
Flt Permitted	0.43	1.00	1.00	0.71	1.00		0.52	1.00		0.36	1.00	
Satd. Flow (perm)	788	1824	1543	1282	1791		929	3454		641	3526	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	49	78	125	60	158	48	382	682	79	73	366	33
RTOR Reduction (vph)	0	0	105	0	13	0	0	6	0	0	5	0
Lane Group Flow (vph)	49	78	20	60	193	0	382	755	0	73	394	0
Confl. Peds. (#/hr)									11	11		
Heavy Vehicles (%)	0%	3%	0%	0%	1%	2%	1%	1%	5%	0%	0%	0%
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)	16.0	16.0	16.0	16.0	16.0		71.4	71.4		71.4	71.4	
Effective Green, g (s)	16.0	16.0	16.0	16.0	16.0		71.4	71.4		71.4	71.4	
Actuated g/C Ratio	0.16	0.16	0.16	0.16	0.16		0.71	0.71		0.71	0.71	
Clearance Time (s)	5.9	5.9	5.9	5.9	5.9		6.7	6.7		6.7	6.7	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	126	291	246	205	286		663	2466		457	2517	
v/s Ratio Prot		0.04			c0.11			0.22			0.11	
v/s Ratio Perm	0.06		0.01	0.05			c0.41			0.11		
v/c Ratio	0.39	0.27	0.08	0.29	0.67		0.58	0.31		0.16	0.16	
Uniform Delay, d1	37.6	36.9	35.7	37.0	39.5		6.9	5.2		4.6	4.6	
Progression Factor	1.00	1.00	1.00	0.70	0.78		0.73	0.50		1.00	1.00	
Incremental Delay, d2	2.0	0.5	0.1	0.8	6.0		2.4	0.2		0.7	0.1	
Delay (s)	39.6	37.4	35.9	26.8	36.8		7.4	2.9		5.4	4.7	
Level of Service	D	D	D	C	D		A	A		A	A	
Approach Delay (s)		37.1			34.5			4.4			4.8	
Approach LOS		D			C			A			A	

Intersection Summary				
HCM 2000 Control Delay	12.1	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.59			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.6	
Intersection Capacity Utilization	67.7%	ICU Level of Service	C	
Analysis Period (min)	15			
c Critical Lane Group				

APPENDIX E

10th Edition ITE LUC 222 Multifamily Housing (High Rise) and LUC 820 Shopping Center Trip Generation Information

Land Use: 222
Multifamily Housing (High-Rise)

Description

High-rise multifamily housing includes apartments, townhouses, and condominiums that have more than 10 levels (floors). They are likely to have one or more elevators. Multifamily housing (low-rise) (Land Use 220), multifamily housing (mid-rise) (Land Use 221), off-campus student apartment (Land Use 225), and high-rise residential with 1st-floor commercial (Land Use 232) are related land uses.

Additional Data

In prior editions of *Trip Generation Manual*, the high-rise multifamily housing sites were further divided into rental and condominium categories. An investigation of vehicle trip data found no clear differences in trip making patterns between the rental and condominium sites within the ITE database. As more data are compiled for future editions, this land use classification can be reinvestigated.

For the 12 sites for which both the number of residents and the number of occupied dwelling units were available, there were an average of 1.57 residents per occupied dwelling unit.

For the 26 sites for which the numbers of both total dwelling units and occupied dwelling units were available, an average of 98.4 percent of the total dwelling units were occupied.

Time-of-day distribution data for this land use are presented in Appendix A. For the eight dense multi-use sites for which 24-hour time-of-day person trip data were collected, the overall highest vehicle volumes during the AM and PM on a weekday were between 7:30 and 8:30 a.m. and 5:30 and 6:30 p.m., respectively. The Saturday and Sunday peak hours for person trips were between 5:00 and 6:00 p.m. and 4:45 and 5:45 p.m., respectively.

For the six center city core sites for which 24-hour time-of-day person trip data were collected, the overall highest vehicle volumes during the AM and PM on a weekday were between 8:00 and 9:00 a.m. and 6:00 and 7:00 p.m., respectively. The Saturday and Sunday peak hours for person trips were between 11:30 a.m. and 12:30 p.m. and 11:00 a.m. and 12:00 p.m., respectively.

For the 12 sites for which data were provided for both occupied dwelling units and residents, there was an average of 1.57 residents per occupied dwelling unit.

For the 26 sites for which data were provided for both occupied dwelling units and total dwelling units, an average of 98.4 percent of the units were occupied.

The average numbers of person trips per vehicle trip at the three center city core sites at which both person trip and vehicle trip data were collected were as follows:

- 2.52 during Weekday, Peak Hour of Adjacent Street Traffic, one hour between 7 and 9 a.m.
- 2.70 during Weekday, AM Peak Hour of Generator
- 1.88 during Weekday, Peak Hour of Adjacent Street Traffic, one hour between 4 and 6 p.m.
- 2.22 during Weekday, PM Peak Hour of Generator

The average numbers of person trips per vehicle trip at the six dense multi-use urban sites at which both person trip and vehicle trip data were collected were as follows:

- 2.81 during Weekday, Peak Hour of Adjacent Street Traffic, one hour between 7 and 9 a.m.
- 2.49 during Weekday, AM Peak Hour of Generator
- 2.17 during Weekday, Peak Hour of Adjacent Street Traffic, one hour between 4 and 6 p.m.
- 2.85 during Weekday, PM Peak Hour of Generator

The sites were surveyed in the 1980s, the 2000s, and the 2010s in California, District of Columbia, Maryland, New Jersey, New York, Ontario (CAN), Oregon, Pennsylvania, Virginia, and Washington.

Source Numbers

105, 168, 169, 187, 305, 321, 356, 818, 862, 901, 910, 949, 963, 964, 966, 967

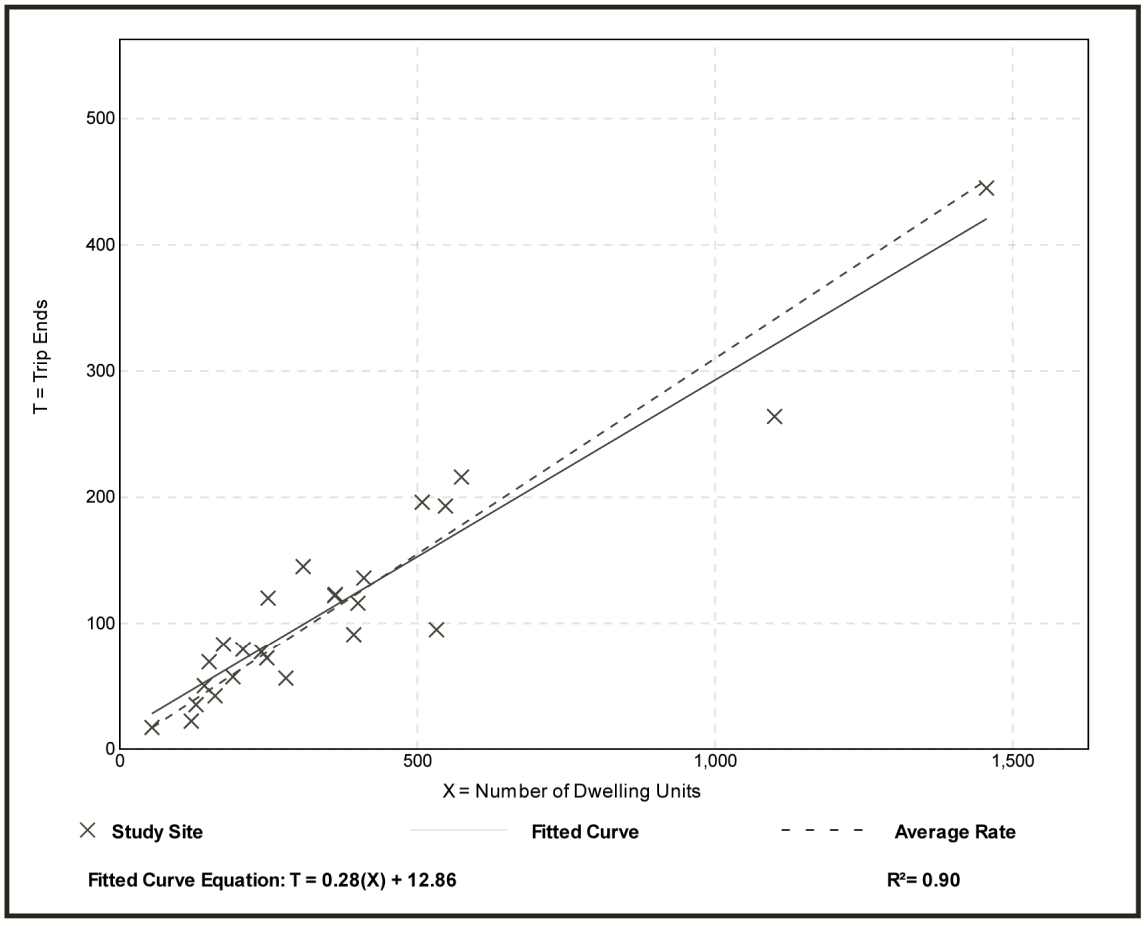
Multifamily Housing (High-Rise)
(222)

Vehicle Trip Ends vs: **Dwelling Units**
On a: **Weekday,**
Peak Hour of Adjacent Street Traffic,
One Hour Between 7 and 9 a.m.
Setting/Location: **General Urban/Suburban**
Number of Studies: 25
Avg. Num. of Dwelling Units: 372
Directional Distribution: 24% entering, 76% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.31	0.18 - 0.48	0.08

Data Plot and Equation



Multifamily Housing (High-Rise)
(222)

Vehicle Trip Ends vs: **Dwelling Units**
On a: **Weekday,**
Peak Hour of Adjacent Street Traffic,
One Hour Between 4 and 6 p.m.
Setting/Location: **General Urban/Suburban**
Number of Studies: 25
Avg. Num. of Dwelling Units: 372
Directional Distribution: 61% entering, 39% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.36	0.23 - 0.53	0.06

Data Plot and Equation

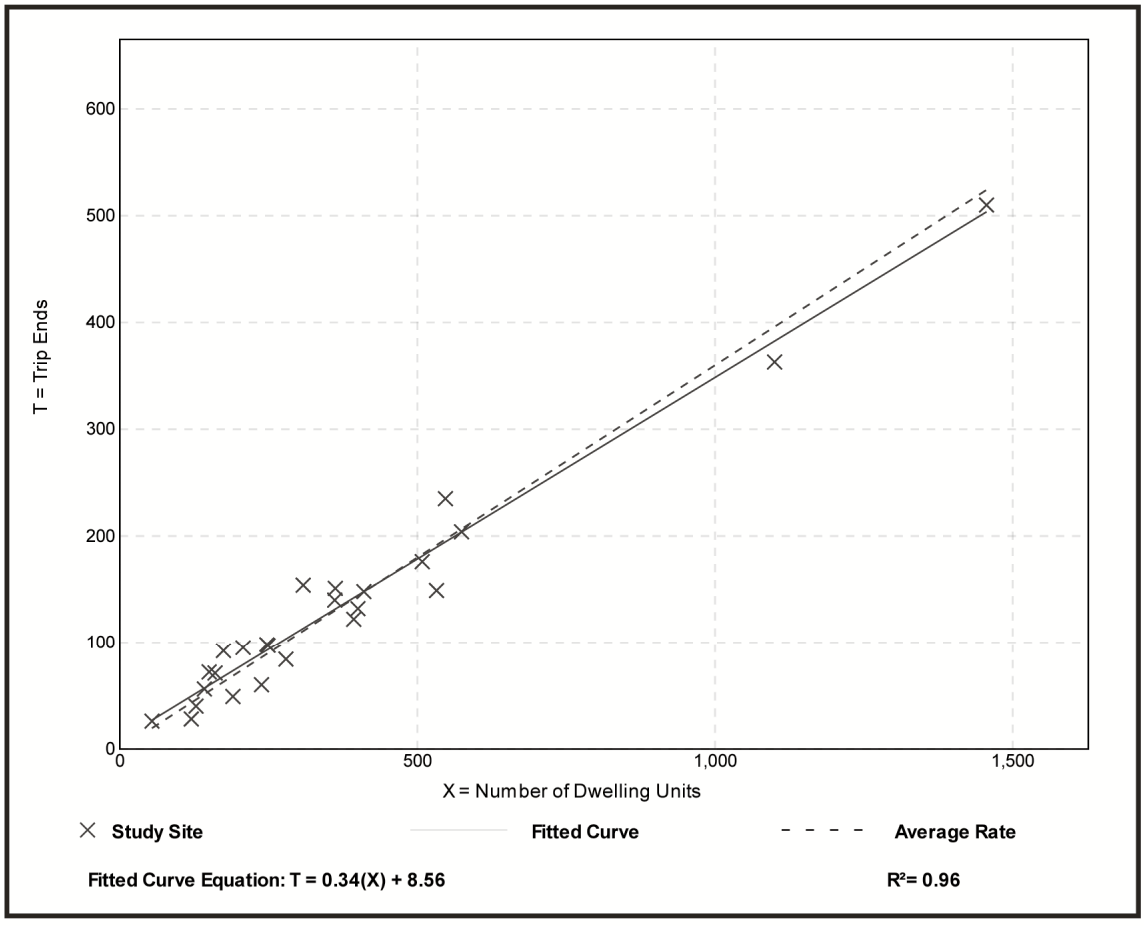


EXHIBIT 3

Calculation of Residential Site Distribution using Transportsation Tomorrow Survey Data

Thu Nov 01 2018 17:05:02 GMT-0400 (Eastern Daylight Time) - Run Time: 2206ms

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: 2006 GTA zone of origin - gta06_orig
Column: 2006 GTA zone of destination - gta06_dest

(Start time of trip - start_time In 700-900
and
Primary travel mode of trip - mode_prime In D,M,T,P
and
Trip purpose - trip_purp In 1, 2
and
2006 GTA zone of origin - gta06_orig In 1040
and
2006 GTA zone of destination - gta06_dest In 1-9999)

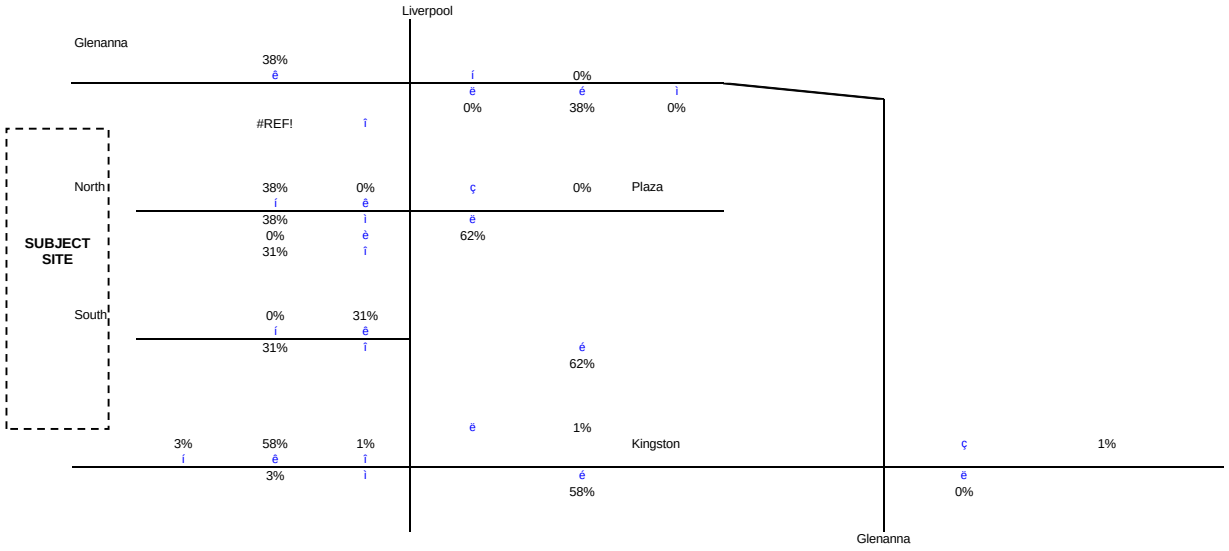
Trip 2016
ROW : gta06_orig
COLUMN : gta06_dest

gta06_orig	gta06_dest	total
1040	47	31
1040	491	40
1040	560	9
1040	623	10
1040	1051	21
1040	1053	8
1040	1088	62
1040	1152	13
1040	1199	19
1040	2072	71
1040	2371	54
1040	2387	44
1040	2401	17
1040	2715	33
1040	9998	30

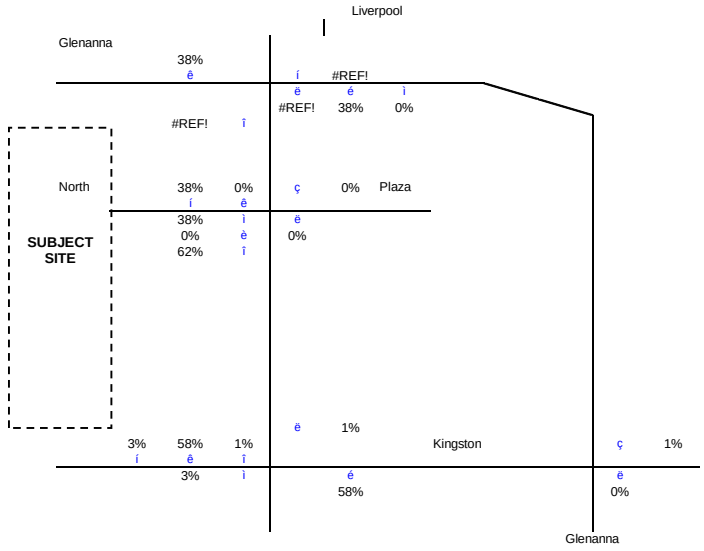
Zone of Destination	Number of Trips	Destination Municipality	General Direction 1	General Direction 2	Path
47	31	Toronto	West	NW Bay/Welles	SB Liverpool, WB Hwy 401 / SB DVP
491	40	Toronto	West	SE McCowan/H	SB Liverpool, WB Hwy 401
560	9	Toronto	West	N Morningside/K	SB Liverpool, WB On Kingston
623	10	Toronto	West	NE Morningside	SB Liverpool, WB Hwy 401
1051	21	Durham	South	SE Liverpool/Hw	SB Liverpool, EB Bayly
1053	8	Durham	South	SE Sandy Beac	SB Liverpool, EB Bayly
1088	62	Durham	Southeast	SE Church/Bayl	SB Liverpool, EB Bayly
1152	13	Durham	East	NW Brock St/Ba	SB Liverpool, EB Hwy 401
1199	19	Durham	East	NE Simcoe/King	SB Liverpool, EB Hwy 401
2072	71	York	Northwest	NW Hwy 400/Ru	NB Liverpool, WB Hwy 407, WB Rutherford
2371	54	York	Northwest	NE Hwy 404/Ste	SB Liverpool, WB Hwy 401, NB Hwy 404
2387	44	York	Northwest	NE Rodick/Appl	NB Liverpool, WB Hwy 407, NB Warden
2401	17	York	Northwest	NE Birchmount/	NB Liverpool, WB Hwy 407, SB Kennedy
2715	33	York	Northwest	NE Hwy 48/Beth	NB Liverpool, WB Hwy 407, NB Markham
9998	30	External, Undefined	North, East Wes	33% N, 33% W,	33% NB, 17% WB Hwy 401, 16% WB Kingston, 17% EB Hwy 401, 16% EB
	462				

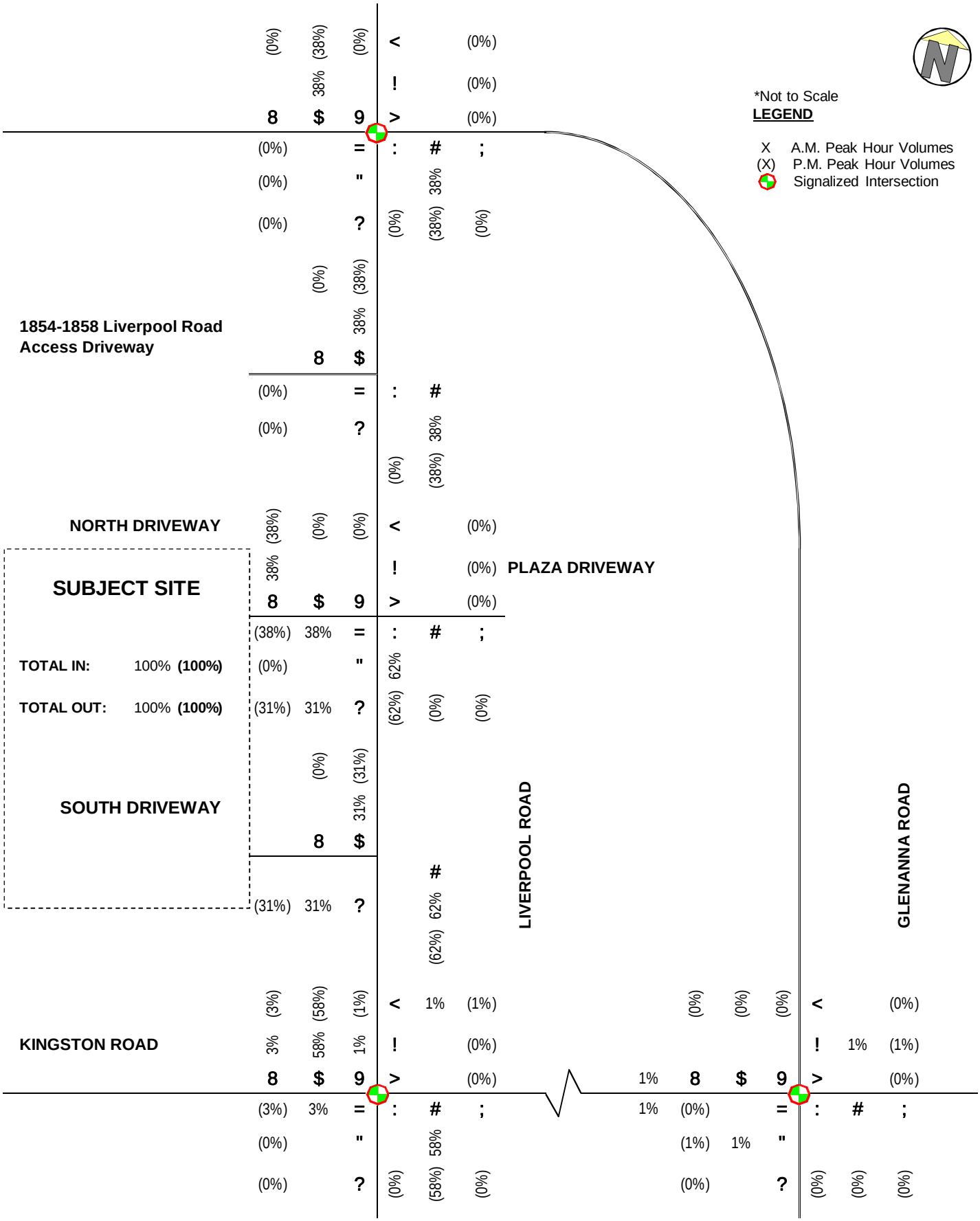
Percentage Splits						Percentage Splits					
Kingston/Liverpool			Liverpool/Glenanna			Kingston/Liverpool			Liverpool/Glenanna		
SBL	SBT	SBR	NBL	NBT	NBR	SBL	SBT	SBR	NBL	NBT	NBR
	100%					0	31	0	0	0	0
	100%					0	40	0	0	0	0
		100%				0	0	9	0	0	0
	100%					0	10	0	0	0	0
	100%					0	21	0	0	0	0
	100%					0	8	0	0	0	0
	100%					0	62	0	0	0	0
	100%					0	13	0	0	0	0
	100%					0	19	0	0	0	0
				100%		0	0	0	0	71	0
	100%					0	54	0	0	0	0
				100%		0	0	0	0	44	0
				100%		0	0	0	0	17	0
				100%		0	0	0	0	33	0
12%	43%	12%		33%		4	***12***	4	0	10	0
						4	270	13	0	175	0
											462
11	22					1%	58%	3%	0%	38%	0%
										100%	

North Access Full, South as Right-In/Right-Out



North Access Only

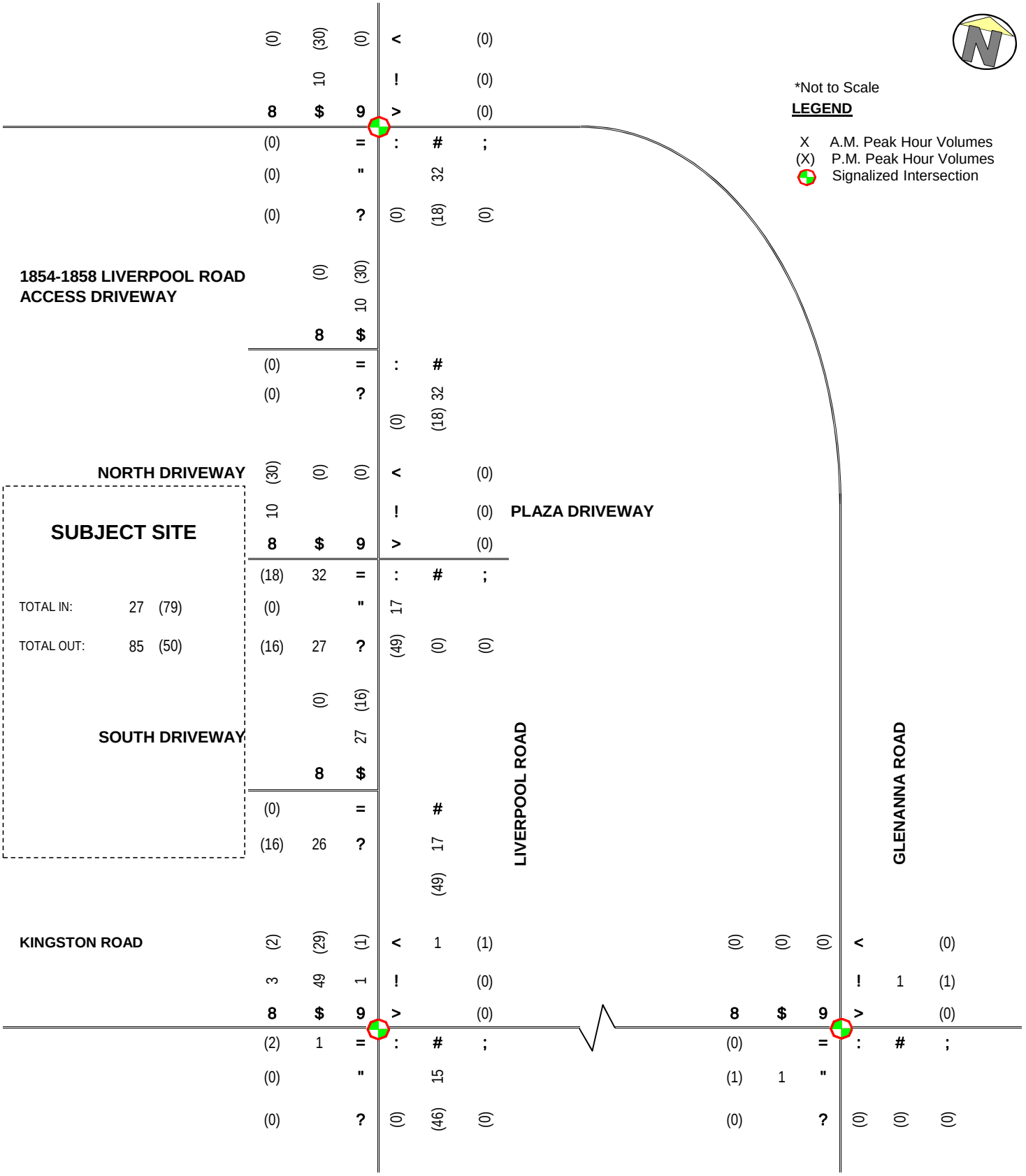




PROPOSED REDEVELOPMENT (1294 Kingston Rd., 1848 Liverpool Rd., and 1852 Liverpool Rd.)

FIGURE **E1**

SUBJECT SITE RESIDENTIAL SITE DISTRIBUTION

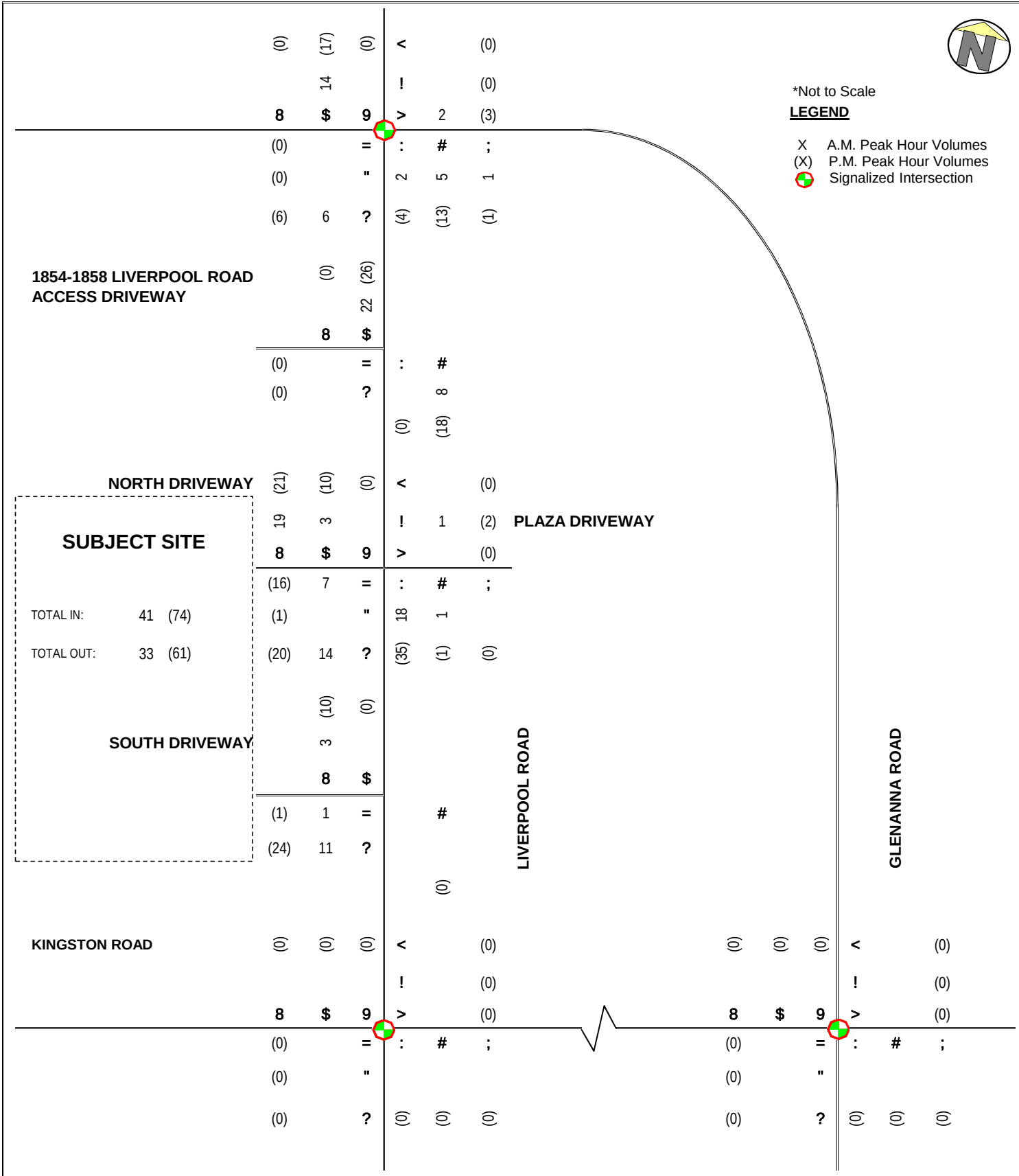


PROPOSED REDEVELOPMENT (1294 Kingston Rd., 1848 Liverpool Rd., and 1852 Liverpool Rd.)

FIGURE **E2**

SUBJECT SITE RESIDENTIAL SITE TRAFFIC

Column 60

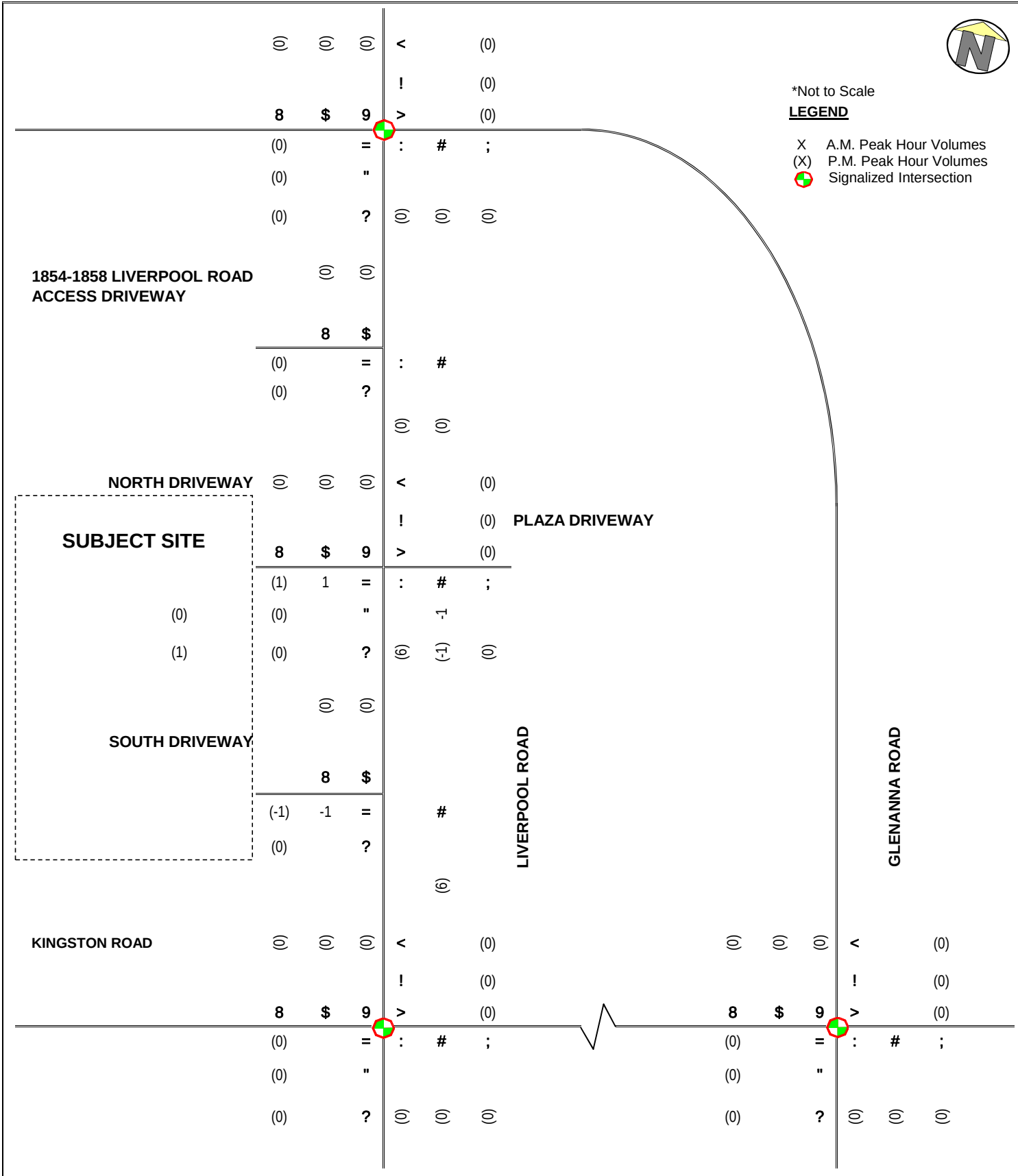


PROPOSED REDEVELOPMENT (1294 Kingston Rd., 1848 Liverpool Rd., and 1852 Liverpool Rd.)

FIGURE **E3**

SUBJECT SITE EXISTING SITE PEAK TRAFFIC

Column 62

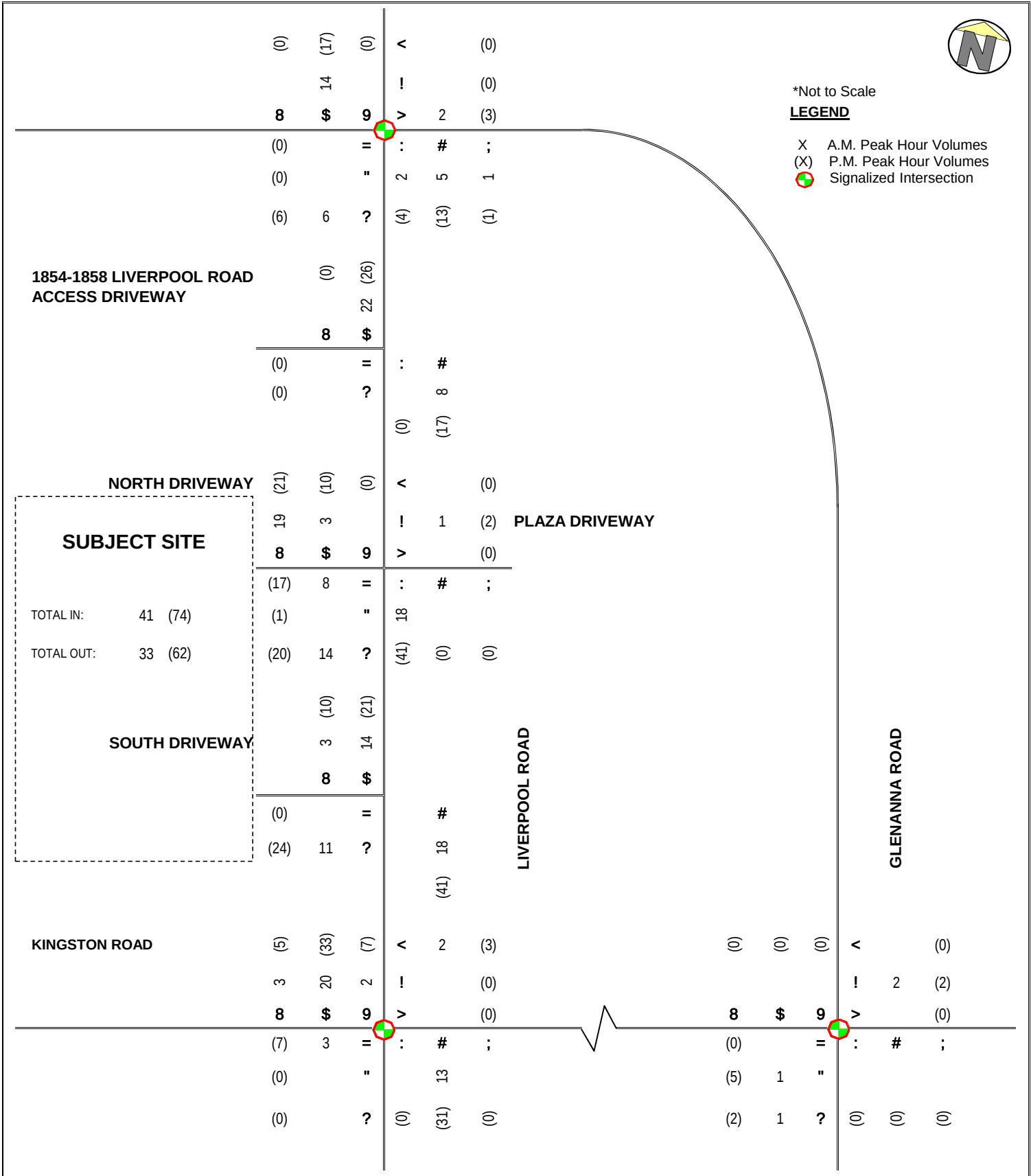


PROPOSED REDEVELOPMENT (1294 Kingston Rd., 1848 Liverpool Rd., and 1852 Liverpool Rd.)

FIGURE **E4**

SUBJECT SITE EXISTING SITE TRAFFIC REASSIGNMENTS

Column 64

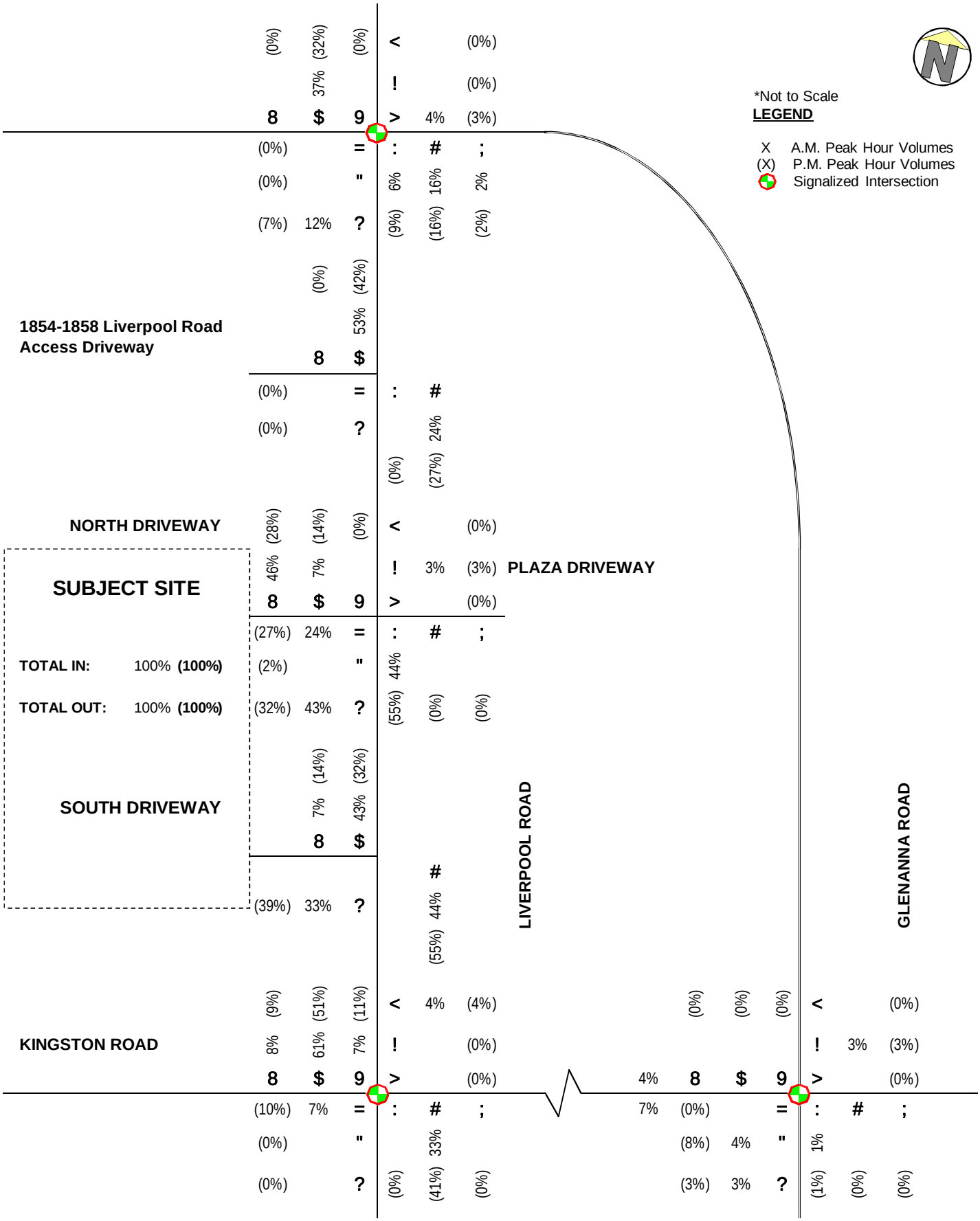


PROPOSED REDEVELOPMENT (1294 Kingston Rd., 1848 Liverpool Rd., and 1852 Liverpool Rd.)

FIGURE **E5**

SUBJECT SITE REVISED EXISTING SITE PEAK TRAFFIC

Column 66

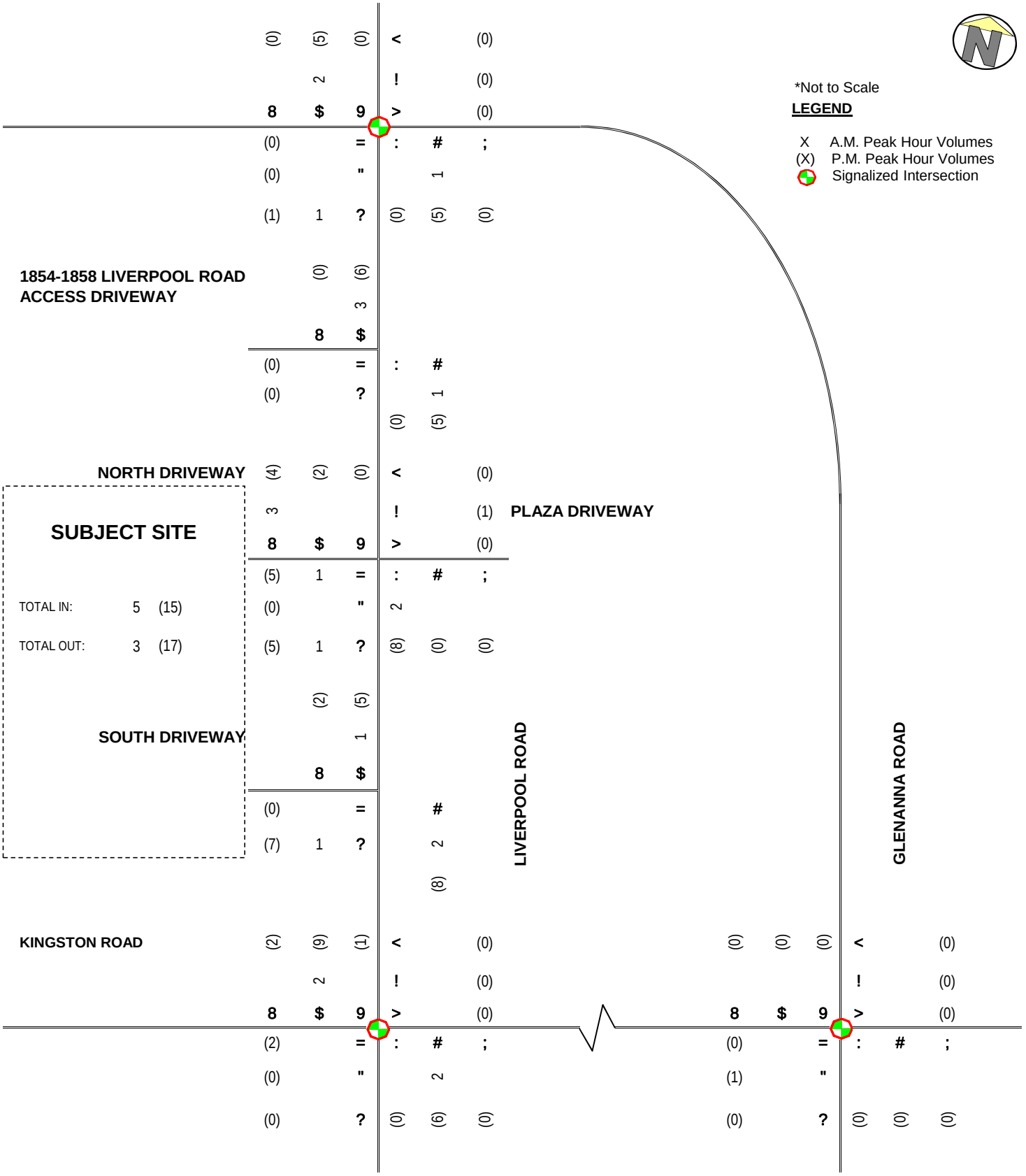


PROPOSED REDEVELOPMENT (1294 Kingston Rd., 1848 Liverpool Rd., and 1852 Liverpool Rd.)

FIGURE **E6**

SUBJECT SITE RETAIL SITE DISTRIBUTION

Column 68

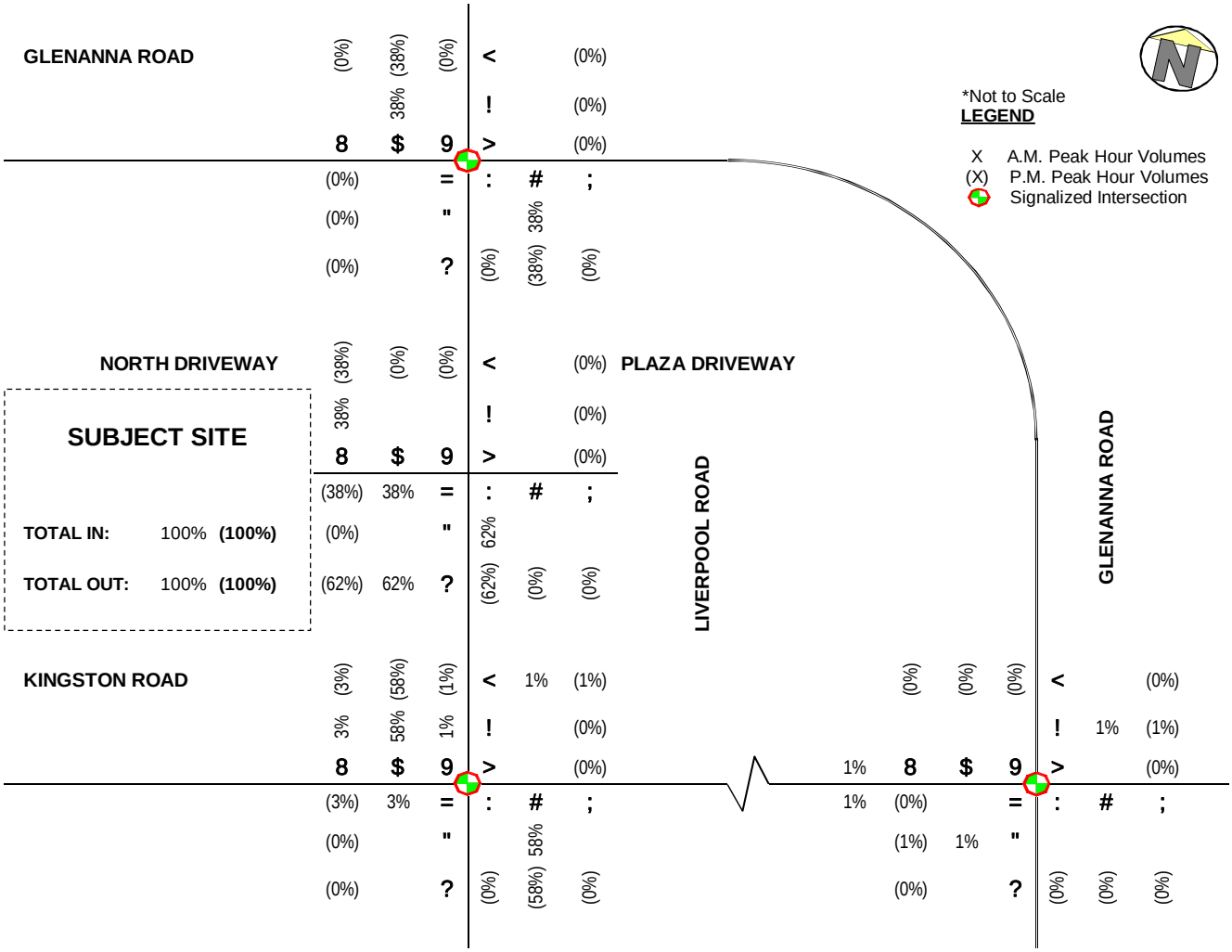


PROPOSED REDEVELOPMENT (1294 Kingston Rd., 1848 Liverpool Rd., and 1852 Liverpool Rd.)

FIGURE **E7**

SUBJECT SITE RETAIL SITE TRAFFIC

Column 70



PROPOSED REDEVELOPMENT (1294 Kingston Rd., 1848 Liverpool Rd., and 1852 Liverpool Rd.)

FIGURE **E8**

SUBJECT SITE RESIDENTIAL TRAFFIC DISTRIBUTION (One-Access)

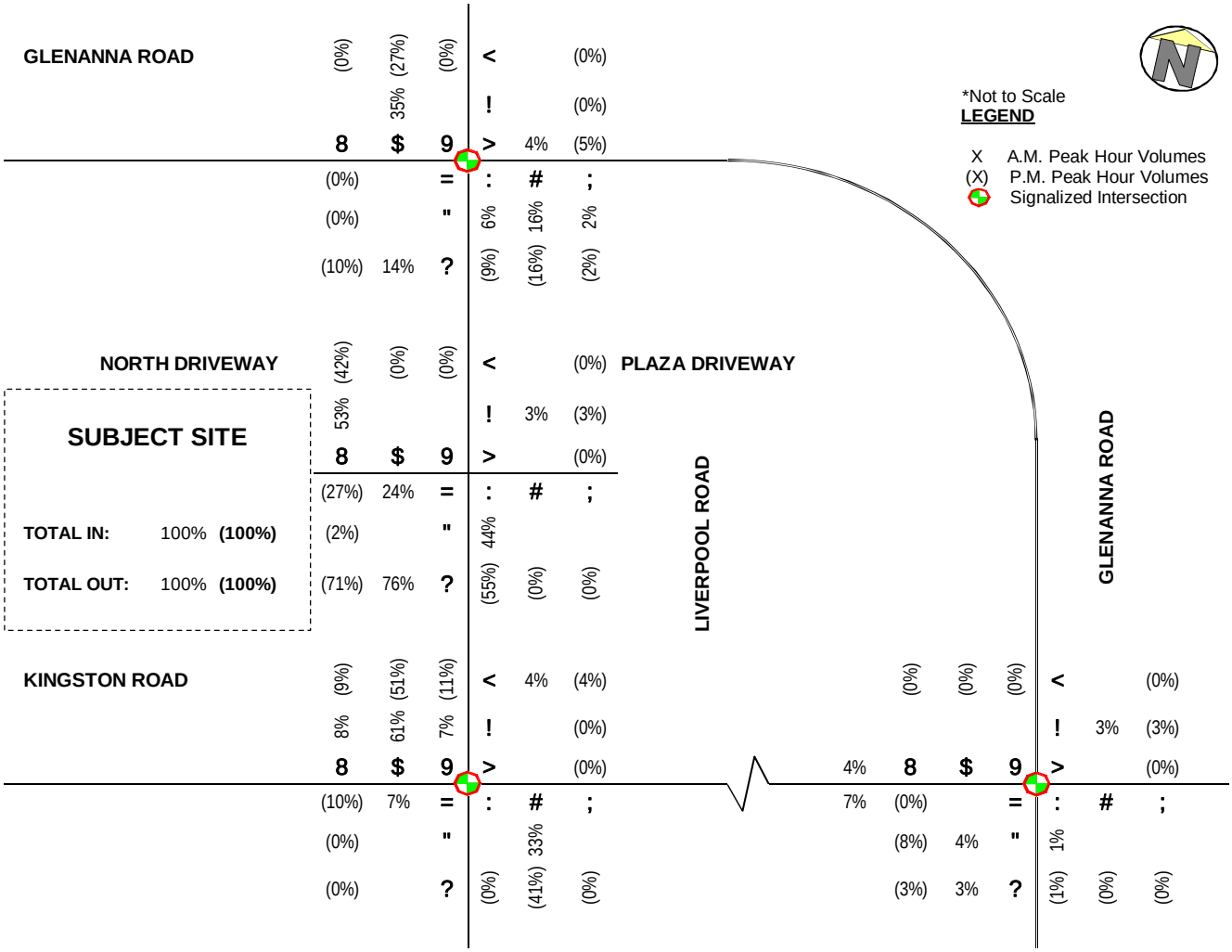
Column 82

PROPOSED REDEVELOPMENT (1294 Kingston Rd., 1848 Liverpool Rd., and 1852 Liverpool Rd.)

FIGURE **E9**

SUBJECT SITE NEW RESIDENTIAL TRAFFIC (One-Access)

Column 84



PROPOSED REDEVELOPMENT (1294 Kingston Rd., 1848 Liverpool Rd., and 1852 Liverpool Rd.)

FIGURE **E10**

SUBJECT SITE RETAIL TRAFFIC DISTRIBUTION (One-Access)

Column 86

PROPOSED REDEVELOPMENT (1294 Kingston Rd., 1848 Liverpool Rd., and 1852 Liverpool Rd.)

FIGURE **E11**

SUBJECT SITE RETAIL TRAFFIC (One-Access)

Column 88

APPENDIX F

Future Total Intersection Capacity Analysis

Two-Access

Year 2024

A.M. Peak Hour

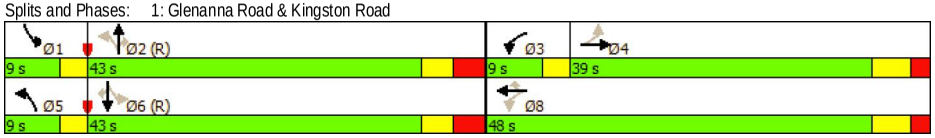
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	407	92	96	590	122	52	73	64	190	102	26
Future Volume (vph)	10	407	92	96	590	122	52	73	64	190	102	26
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2
Total Lost time (s)	6.4	6.4		3.0	6.4	6.4	3.0	7.0	7.0	3.0	7.0	7.0
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.98		1.00	1.00	0.96	1.00	1.00	0.93	1.00	1.00	0.88
Flpb, ped/bikes	0.99	1.00		1.00	1.00	1.00	0.94	1.00	1.00	0.97	1.00	1.00
Frt	1.00	0.97		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1568	3162		1651	3400	1464	1629	1860	1397	1641	1773	1365
Flt Permitted	0.41	1.00		0.25	1.00	1.00	0.69	1.00	1.00	0.65	1.00	1.00
Satd. Flow (perm)	674	3162		437	3400	1464	1175	1860	1397	1129	1773	1365
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	11	442	100	104	641	133	57	79	70	207	111	28
RTOR Reduction (vph)	0	23	0	0	0	0	0	0	44	0	0	16
Lane Group Flow (vph)	11	519	0	104	641	133	57	79	26	207	111	12
Confl. Peds. (#/hr)	8		25	25		8	35		34	34		35
Heavy Vehicles (%)	9%	8%	8%	4%	5%	1%	0%	1%	3%	2%	6%	0%
Turn Type	Perm	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4		3	8		5	2		1	6	
Permitted Phases	4			8		8	2		2	6		6
Actuated Green, G (s)	22.4	22.4		33.8	33.8	33.8	43.8	37.8	37.8	52.8	43.8	43.8
Effective Green, g (s)	22.4	22.4		33.8	33.8	33.8	43.8	37.8	37.8	52.8	43.8	43.8
Actuated g/C Ratio	0.22	0.22		0.34	0.34	0.34	0.44	0.38	0.38	0.53	0.44	0.44
Clearance Time (s)	6.4	6.4		3.0	6.4	6.4	3.0	7.0	7.0	3.0	7.0	7.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	150	708		249	1149	494	541	703	528	657	776	597
v/s Ratio Prot		c0.16		0.03	c0.19		0.01	0.04		c0.04	0.06	
v/s Ratio Perm	0.02			0.11		0.09	0.04		0.02	c0.13		0.01
v/c Ratio	0.07	0.73		0.42	0.56	0.27	0.11	0.11	0.05	0.32	0.14	0.02
Uniform Delay, d1	30.6	36.0		24.1	27.0	24.1	16.4	20.2	19.7	12.8	16.8	15.9
Progression Factor	0.57	0.72		1.00	1.00	1.00	1.00	1.00	1.00	0.81	0.86	1.00
Incremental Delay, d2	0.2	3.8		1.1	0.6	0.3	0.1	0.3	0.2	0.3	0.4	0.1
Delay (s)	17.7	29.8		25.2	27.6	24.4	16.5	20.5	19.9	10.6	14.9	16.0
Level of Service	B	C		C	C	C	B	C	B	B	B	B
Approach Delay (s)		29.5			26.8			19.2			12.4	
Approach LOS		C			C			B			B	

Intersection Summary				
HCM 2000 Control Delay	24.3	HCM 2000 Level of Service	C	
HCM 2000 Volume to Capacity ratio	0.47			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	19.4	
Intersection Capacity Utilization	54.9%	ICU Level of Service	A	
Analysis Period (min)	15			
c Critical Lane Group				

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations											
Traffic Volume (vph)	10	407	96	590	122	52	73	64	190	102	26
Future Volume (vph)	10	407	96	590	122	52	73	64	190	102	26
Lane Group Flow (vph)	11	542	104	641	133	57	79	70	207	111	28
Turn Type	Perm	NA	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4	3	8		5	2		1	6	
Permitted Phases	4		8		8	2		2	6		6
Detector Phase	4	4	3	8	8	5	2	2	1	6	6
Switch Phase											
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	8.0	8.0	5.0	8.0	8.0
Minimum Split (s)	24.4	24.4	8.0	24.4	24.4	8.0	25.4	25.4	8.0	25.4	25.4
Total Split (s)	39.0	39.0	9.0	48.0	48.0	9.0	43.0	43.0	9.0	43.0	43.0
Total Split (%)	39.0%	39.0%	9.0%	48.0%	48.0%	9.0%	43.0%	43.0%	9.0%	43.0%	43.0%
Yellow Time (s)	4.2	4.2	3.0	4.2	4.2	3.0	3.3	3.3	3.0	3.3	3.3
All-Red Time (s)	2.2	2.2	0.0	2.2	2.2	0.0	3.7	3.7	0.0	3.7	3.7
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.4	6.4	3.0	6.4	6.4	3.0	7.0	7.0	3.0	7.0	7.0
Lead/Lag	Lag	Lag	Lead			Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?											
Recall Mode	None	None	None	None	None	None	C-Min	C-Min	None	C-Min	C-Min
v/c Ratio	0.07	0.74	0.38	0.57	0.27	0.09	0.11	0.12	0.29	0.14	0.04
Control Delay	17.3	30.7	22.9	28.5	23.8	13.2	25.8	3.1	11.2	18.3	2.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	17.3	30.7	22.9	28.5	23.8	13.2	25.8	3.1	11.2	18.3	2.1
Queue Length 50th (m)	0.8	20.7	13.8	54.7	19.3	5.0	10.4	0.0	20.2	17.8	0.2
Queue Length 95th (m)	m2.1	23.8	21.7	61.7	29.2	13.4	26.1	5.7	48.6	33.8	2.3
Internal Link Dist (m)		393.2		523.9			174.6			416.6	
Turn Bay Length (m)	42.6		33.0		23.2	25.4		25.0	27.3		16.5
Base Capacity (vph)	219	1050	277	1428	615	607	781	646	703	814	682
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.05	0.52	0.38	0.45	0.22	0.09	0.10	0.11	0.29	0.14	0.04

Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 70
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Glenanna Road & Kingston Road



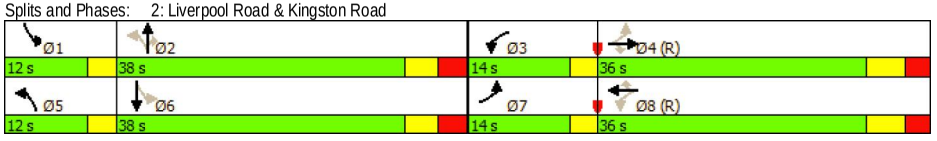
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	90	396	254	178	495	46	215	469	122	77	875	101
Future Volume (vph)	90	396	254	178	495	46	215	469	122	77	875	101
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2
Total Lost time (s)	3.0	7.0	7.0	3.0	7.0	7.0	3.0	6.9	6.9	3.0	6.9	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.91	
Frpb, ped/bikes	1.00	1.00	0.96	1.00	1.00	0.96	1.00	1.00	0.91	1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1652	3368	1462	1639	3400	1487	1690	3500	1279	1666	4916	
Flt Permitted	0.38	1.00	1.00	0.37	1.00	1.00	0.16	1.00	1.00	0.46	1.00	
Satd. Flow (perm)	659	3368	1462	634	3400	1487	285	3500	1279	814	4916	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	98	430	276	193	538	50	234	510	133	84	951	110
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	80	0	14	0
Lane Group Flow (vph)	98	430	276	193	538	50	234	510	53	84	1047	0
Confl. Peds. (#/hr)	15		19	9		15	22		25	25		22
Heavy Vehicles (%)	4%	6%	1%	5%	5%	0%	2%	2%	10%	2%	2%	4%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		
Actuated Green, G (s)	30.9	23.3	23.3	36.9	26.3	26.3	49.2	39.6	39.6	41.0	34.4	
Effective Green, g (s)	30.9	23.3	23.3	36.9	26.3	26.3	49.2	39.6	39.6	41.0	34.4	
Actuated g/C Ratio	0.31	0.23	0.23	0.37	0.26	0.26	0.49	0.40	0.40	0.41	0.34	
Clearance Time (s)	3.0	7.0	7.0	3.0	7.0	7.0	3.0	6.9	6.9	3.0	6.9	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	279	784	340	340	894	391	306	1386	506	389	1691	
v/s Ratio Prot	0.03	0.13		c0.06	0.16		c0.09	0.15		0.01	0.21	
v/s Ratio Perm	0.08		c0.19	0.15		0.03	c0.29		0.04	0.07		
v/c Ratio	0.35	0.55	0.81	0.57	0.60	0.13	0.76	0.37	0.10	0.22	0.62	
Uniform Delay, d1	25.5	33.7	36.3	22.9	32.3	28.1	17.0	21.4	19.0	18.3	27.3	
Progression Factor	1.00	1.00	1.00	2.36	1.84	1.92	1.00	1.00	1.00	0.93	0.93	
Incremental Delay, d2	0.8	2.8	18.7	2.1	2.8	0.6	10.8	0.8	0.4	0.3	1.7	
Delay (s)	26.2	36.5	55.0	56.1	62.3	54.5	27.9	22.1	19.4	17.3	27.1	
Level of Service	C	D	D	E	E	D	C	C	B	B	C	
Approach Delay (s)		41.6			60.3			23.2			26.4	
Approach LOS		D			E			C			C	

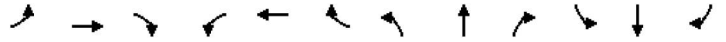
Intersection Summary				
HCM 2000 Control Delay	36.3	HCM 2000 Level of Service	D	
HCM 2000 Volume to Capacity ratio	0.78			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	19.9	
Intersection Capacity Utilization	74.4%	ICU Level of Service	D	
Analysis Period (min)	15			
c Critical Lane Group				

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations											
Traffic Volume (vph)	90	396	254	178	495	46	215	469	122	77	875
Future Volume (vph)	90	396	254	178	495	46	215	469	122	77	875
Lane Group Flow (vph)	98	430	276	193	538	50	234	510	133	84	1061
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA
Protected Phases	7	4		3	8		5	2		1	6
Permitted Phases	4		4	8		8	2		2	6	
Detector Phase	7	4	4	3	8	8	5	2	2	1	6
Switch Phase											
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	11.9	25.0	25.0	9.5	25.0	25.0	9.5	24.9	24.9	8.0	24.9
Total Split (s)	14.0	36.0	36.0	14.0	36.0	36.0	12.0	38.0	38.0	12.0	38.0
Total Split (%)	14.0%	36.0%	36.0%	14.0%	36.0%	36.0%	12.0%	38.0%	38.0%	12.0%	38.0%
Yellow Time (s)	3.0	4.2	4.2	3.0	4.2	4.2	3.0	3.7	3.7	3.0	3.7
All-Red Time (s)	0.0	2.8	2.8	0.0	2.8	2.8	0.0	3.2	3.2	0.0	3.2
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	3.0	7.0	7.0	3.0	7.0	7.0	3.0	6.9	6.9	3.0	6.9
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag
Lead-Lag Optimize?											
Recall Mode	None	C-Min	C-Min	None	C-Min	C-Min	None	Max	Max	None	Max
v/c Ratio	0.30	0.53	0.79	0.53	0.58	0.12	0.75	0.37	0.23	0.19	0.63
Control Delay	19.3	35.1	51.8	49.3	60.3	52.9	34.2	24.5	5.6	13.9	28.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	19.3	35.1	51.8	49.3	60.3	52.9	34.2	24.5	5.6	13.9	28.1
Queue Length 50th (m)	11.8	39.8	52.4	39.5	61.3	10.7	25.9	40.3	0.0	7.4	62.4
Queue Length 95th (m)	20.6	52.4	78.5	61.2	78.8	23.0	#73.3	59.8	13.4	16.6	82.0
Internal Link Dist (m)		667.5			393.2			242.2			35.5
Turn Bay Length (m)	33.5		49.1	103.2		61.6	46.2		51.8	47.9	
Base Capacity (vph)	365	976	423	366	987	431	311	1384	586	454	1672
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.27	0.44	0.65	0.53	0.55	0.12	0.75	0.37	0.23	0.19	0.63

Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 13 (13%), Referenced to phase 4:EBTL and 8:WBTL, Start of Green
Natural Cycle: 75
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 2: Liverpool Road & Kingston Road





Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	34	0	28	106	0	59	19	423	163	94	892	13
Future Volume (Veh/h)	34	0	28	106	0	59	19	423	163	94	892	13
Sign Control		Stop			Stop			Free			Free	
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)	37	0	30	115	0	64	21	460	177	102	970	14
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								TWLTL			TWLTL	
Median storage veh)								2			2	
Upstream signal (m)								140			216	
pX, platoon unblocked	0.92	0.92	0.97	0.92	0.92	0.91	0.97			0.91		
vC, conflicting volume	1517	1860	492	1310	1778	318	984			637		
vC1, stage 1 conf vol	1181	1181		590	590							
vC2, stage 2 conf vol	336	679		719	1188							
vCu, unblocked vol	1225	1597	403	1001	1509	39	912			391		
tC, single (s)	7.5	6.5	7.2	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)	6.5	5.5		6.5	5.5							
tF (s)	3.5	4.0	3.4	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	80	100	94	63	100	93	97			90		
cM capacity (veh/h)	189	220	545	308	214	933	729			1054		

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	67	115	64	21	307	330	102	647	337
Volume Left	37	115	0	21	0	0	102	0	0
Volume Right	30	0	64	0	0	177	0	0	14
cSH	268	308	933	729	1700	1700	1054	1700	1700
Volume to Capacity	0.25	0.37	0.07	0.03	0.18	0.19	0.10	0.38	0.20
Queue Length 95th (m)	7.7	13.3	1.8	0.7	0.0	0.0	2.6	0.0	0.0
Control Delay (s)	22.9	23.4	9.1	10.1	0.0	0.0	8.8	0.0	0.0
Lane LOS	C	C	A	B			A		
Approach Delay (s)	22.9	18.3		0.3			0.8		
Approach LOS	C	C							

Intersection Summary					
Average Delay	3.0				
Intersection Capacity Utilization	48.7%	ICU Level of Service		A	
Analysis Period (min)	15				

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	27	0	605	1026	0
Future Volume (Veh/h)	0	27	0	605	1026	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	29	0	658	1115	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	TWLTL	
Median storage veh)					2	
Upstream signal (m)				59	297	
pX, platoon unblocked	0.90					
vC, conflicting volume	1444	279	1115			
vC1, stage 1 conf vol	1115					
vC2, stage 2 conf vol	329					
vCu, unblocked vol	1270	279	1115			
tC, single (s)	6.8	7.1	4.1			
tC, 2 stage (s)	5.8					
tF (s)	3.5	3.4	2.2			
p0 queue free %	100	96	100			
cM capacity (veh/h)	269	698	634			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2	SB 3	SB 4
Volume Total	29	329	329	319	319	319	159
Volume Left	0	0	0	0	0	0	0
Volume Right	29	0	0	0	0	0	0
cSH	698	1700	1700	1700	1700	1700	1700
Volume to Capacity	0.04	0.19	0.19	0.19	0.19	0.19	0.09
Queue Length 95th (m)	1.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	10.4	0.0	0.0	0.0	0.0	0.0	0.0
Lane LOS	B						
Approach Delay (s)	10.4	0.0		0.0			
Approach LOS	B						

Intersection Summary				
Average Delay	0.2			
Intersection Capacity Utilization	24.9%	ICU Level of Service		A
Analysis Period (min)	15			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	47	138	250	70	87	56	113	379	31	73	662	69
Future Volume (vph)	47	138	250	70	87	56	113	379	31	73	662	69
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2
Total Lost time (s)	5.9	5.9	5.9	5.9	5.9		6.7	6.7		6.7	6.7	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		0.99	1.00		0.99	1.00	
Frt	1.00	1.00	0.85	1.00	0.94		1.00	0.99		1.00	0.99	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1658	1773	1513	1675	1717		1658	3362		1647	3410	
Flt Permitted	0.55	1.00	1.00	0.57	1.00		0.34	1.00		0.49	1.00	
Satd. Flow (perm)	965	1773	1513	1008	1717		601	3362		856	3410	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	51	150	272	76	95	61	123	412	34	79	720	75
RTOR Reduction (vph)	0	0	182	0	27	0	0	4	0	0	5	0
Lane Group Flow (vph)	51	150	90	76	129	0	123	442	0	79	790	0
Confl. Peds. (#/hr)							11		8	8		11
Heavy Vehicles (%)	4%	6%	2%	3%	3%	3%	3%	4%	14%	4%	3%	0%
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)	14.1	14.1	14.1	14.1	14.1		73.3	73.3		73.3	73.3	
Effective Green, g (s)	14.1	14.1	14.1	14.1	14.1		73.3	73.3		73.3	73.3	
Actuated g/C Ratio	0.14	0.14	0.14	0.14	0.14		0.73	0.73		0.73	0.73	
Clearance Time (s)	5.9	5.9	5.9	5.9	5.9		6.7	6.7		6.7	6.7	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	136	249	213	142	242		440	2464		627	2499	
v/s Ratio Prot		c0.08			0.07			0.13			c0.23	
v/s Ratio Perm	0.05		0.06	0.08			0.20			0.09		
v/c Ratio	0.38	0.60	0.42	0.54	0.53		0.28	0.18		0.13	0.32	
Uniform Delay, d1	39.0	40.3	39.2	39.9	39.9		4.5	4.1		3.9	4.6	
Progression Factor	1.00	1.00	1.00	1.26	1.34		0.68	0.68		1.00	1.00	
Incremental Delay, d2	1.7	4.1	1.4	3.8	2.2		1.5	0.2		0.4	0.3	
Delay (s)	40.7	44.4	40.6	53.9	55.6		4.6	2.9		4.3	5.0	
Level of Service	D	D	D	D	E		A	A		A	A	
Approach Delay (s)		41.8			55.0			3.3			4.9	
Approach LOS		D			E			A			A	

Intersection Summary				
HCM 2000 Control Delay	18.0	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.36			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.6	
Intersection Capacity Utilization	62.5%	ICU Level of Service	B	
Analysis Period (min)	15			
c Critical Lane Group				

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations									
Traffic Volume (vph)	47	138	250	70	87	113	379	73	662
Future Volume (vph)	47	138	250	70	87	113	379	73	662
Lane Group Flow (vph)	51	150	272	76	156	123	446	79	795
Turn Type	Perm	NA	Perm	Perm	NA	Perm	NA	Perm	NA
Protected Phases		4			8		2		6
Permitted Phases	4		4	8		2		6	
Detector Phase	4	4	4	8	8	2	2	6	6
Switch Phase									
Minimum Initial (s)	8.0	8.0	8.0	5.0	5.0	5.0	5.0	8.0	8.0
Minimum Split (s)	23.9	23.9	23.9	23.9	23.9	24.7	24.7	24.7	24.7
Total Split (s)	34.0	34.0	34.0	34.0	34.0	66.0	66.0	66.0	66.0
Total Split (%)	34.0%	34.0%	34.0%	34.0%	34.0%	66.0%	66.0%	66.0%	66.0%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	4.6	4.6	4.6	4.6
All-Red Time (s)	2.2	2.2	2.2	2.2	2.2	2.1	2.1	2.1	2.1
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.9	5.9	5.9	5.9	5.9	6.7	6.7	6.7	6.7
Lead/Lag									
Lead-Lag Optimize?									
Recall Mode	None	None	None	None	None	C-Min	C-Min	C-Min	C-Min
v/c Ratio	0.38	0.60	0.69	0.54	0.58	0.28	0.18	0.13	0.32
Control Delay	45.3	49.7	19.7	62.5	50.0	5.5	3.2	5.4	5.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	45.3	49.7	19.7	62.5	50.0	5.5	3.2	5.4	5.3
Queue Length 50th (m)	9.6	29.2	11.1	16.3	27.2	5.2	7.1	4.0	24.0
Queue Length 95th (m)	20.1	46.2	35.9	29.7	44.7	9.8	13.1	11.0	41.7
Internal Link Dist (m)		107.2			416.6		192.1		478.0
Turn Bay Length (m)	22.0			24.3		24.4		46.2	
Base Capacity (vph)	271	498	577	283	505	440	2470	627	2506
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.19	0.30	0.47	0.27	0.31	0.28	0.18	0.13	0.32

Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 55
Control Type: Actuated-Coordinated

Splits and Phases: 6: Liverpool Road & Glenanna Road

P.M. Peak Hour

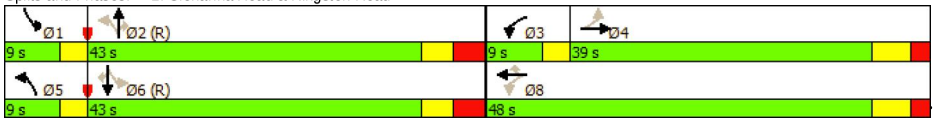
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	24	1184	141	156	595	132	119	177	194	178	199	36
Future Volume (vph)	24	1184	141	156	595	132	119	177	194	178	199	36
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2
Total Lost time (s)	6.4	6.4		3.0	6.4	6.4	3.0	7.0	7.0	3.0	7.0	7.0
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.98		1.00	1.00	0.90	1.00	1.00	0.91	1.00	1.00	0.73
Flpb, ped/bikes	0.97	1.00		1.00	1.00	1.00	0.93	1.00	1.00	0.97	1.00	1.00
Frt	1.00	0.98		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1666	3371		1658	3500	1373	1599	1879	1385	1673	1824	1130
Flt Permitted	0.41	1.00		0.08	1.00	1.00	0.47	1.00	1.00	0.53	1.00	1.00
Satd. Flow (perm)	712	3371		147	3500	1373	790	1879	1385	935	1824	1130
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	26	1287	153	170	647	143	129	192	211	193	216	39
RTOR Reduction (vph)	0	8	0	0	0	40	0	0	171	0	0	32
Lane Group Flow (vph)	26	1432	0	170	647	103	129	192	40	193	216	7
Confl. Peds. (#/hr)	30		55	55		30	91		50	50		91
Heavy Vehicles (%)	0%	2%	5%	4%	2%	1%	0%	0%	1%	0%	3%	0%
Turn Type	Perm	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4		3	8		5	2		1	6	
Permitted Phases	4			8		8	2		2	6		6
Actuated Green, G (s)	44.5	44.5		60.3	60.3	60.3	23.3	17.3	17.3	23.3	17.3	17.3
Effective Green, g (s)	44.5	44.5		60.3	60.3	60.3	23.3	17.3	17.3	23.3	17.3	17.3
Actuated g/C Ratio	0.44	0.44		0.60	0.60	0.60	0.23	0.17	0.17	0.23	0.17	0.17
Clearance Time (s)	6.4	6.4		3.0	6.4	6.4	3.0	7.0	7.0	3.0	7.0	7.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	316	1500		282	2110	827	232	325	239	262	315	195
v/s Ratio Prot		c0.42		c0.08	0.18		0.03	0.10		c0.04	0.12	
v/s Ratio Perm	0.04			0.29		0.07	0.10		0.03	c0.13		0.01
v/c Ratio	0.08	0.95		0.60	0.31	0.12	0.56	0.59	0.17	0.74	0.69	0.03
Uniform Delay, d1	16.0	26.8		20.8	9.7	8.5	32.5	38.1	35.2	34.7	38.8	34.4
Progression Factor	0.48	0.56		1.00	1.00	1.00	1.00	1.00	1.00	1.07	1.08	1.00
Incremental Delay, d2	0.1	8.0		3.6	0.1	0.1	2.9	7.7	1.5	10.3	11.5	0.3
Delay (s)	7.8	23.0		24.4	9.8	8.6	35.4	45.8	36.7	47.6	53.4	34.7
Level of Service	A	C		C	A	A	D	D	D	D	D	C
Approach Delay (s)		22.7			12.2			39.7			49.3	
Approach LOS		C			B			D			D	

Intersection Summary				
HCM 2000 Control Delay	25.9	HCM 2000 Level of Service	C	
HCM 2000 Volume to Capacity ratio	0.84			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	19.4	
Intersection Capacity Utilization	89.0%	ICU Level of Service	E	
Analysis Period (min)	15			
c Critical Lane Group				

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations											
Traffic Volume (vph)	24	1184	156	595	132	119	177	194	178	199	36
Future Volume (vph)	24	1184	156	595	132	119	177	194	178	199	36
Lane Group Flow (vph)	26	1440	170	647	143	129	192	211	193	216	39
Turn Type	Perm	NA	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4	3	8		5	2		1	6	
Permitted Phases	4		8		8	2		2	6		6
Detector Phase	4	4	3	8	8	5	2	2	1	6	6
Switch Phase											
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	24.4	24.4	8.0	24.4	24.4	8.0	25.0	25.0	8.0	25.0	25.0
Total Split (s)	39.0	39.0	9.0	48.0	48.0	9.0	43.0	43.0	9.0	43.0	43.0
Total Split (%)	39.0%	39.0%	9.0%	48.0%	48.0%	9.0%	43.0%	43.0%	9.0%	43.0%	43.0%
Yellow Time (s)	4.2	4.2	3.0	4.2	4.2	3.0	3.3	3.3	3.0	3.3	3.3
All-Red Time (s)	2.2	2.2	0.0	2.2	2.2	0.0	3.7	3.7	0.0	3.7	3.7
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.4	6.4	3.0	6.4	6.4	3.0	7.0	7.0	3.0	7.0	7.0
Lead/Lag	Lag	Lag	Lead			Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?											
Recall Mode	None	None	None	None	None	None	C-Min	C-Min	None	C-Min	C-Min
v/c Ratio	0.08	0.96	0.59	0.31	0.16	0.51	0.59	0.51	0.65	0.69	0.14
Control Delay	9.6	27.0	25.0	10.8	4.2	33.2	44.9	9.8	41.3	52.5	2.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	9.6	27.0	25.0	10.8	4.2	33.2	44.9	9.8	41.3	52.5	2.1
Queue Length 50th (m)	0.9	157.8	15.7	31.3	3.2	19.7	36.5	0.7	34.1	44.1	0.0
Queue Length 95th (m)	m2.8	m#216.6	39.7	49.2	13.2	31.7	55.0	19.2	40.7	66.9	1.5
Internal Link Dist (m)		393.2		523.9			174.6			416.6	
Turn Bay Length (m)	42.6		33.0		23.2	25.4		25.0	27.3		16.5
Base Capacity (vph)	316	1507	287	2110	868	252	676	631	296	656	472
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.08	0.96	0.59	0.31	0.16	0.51	0.28	0.33	0.65	0.33	0.08

Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Glenanna Road & Kingston Road



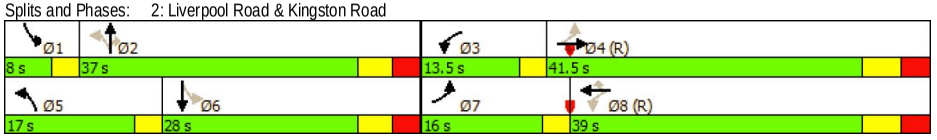
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	215	1048	330	226	515	77	302	935	278	109	370	84
Future Volume (vph)	215	1048	330	226	515	77	302	935	278	109	370	84
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2
Total Lost time (s)	3.0	7.4	7.4	3.0	7.4	7.4	3.0	6.9	6.9	3.0	6.9	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.91	
Frpb, ped/bikes	1.00	1.00	0.94	1.00	1.00	0.95	1.00	1.00	0.85	1.00	0.99	
Flpb, ped/bikes	0.99	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1699	3500	1416	1708	3500	1431	1677	3535	1273	1670	4898	
Flt Permitted	0.35	1.00	1.00	0.12	1.00	1.00	0.37	1.00	1.00	0.19	1.00	
Satd. Flow (perm)	627	3500	1416	219	3500	1431	651	3535	1273	332	4898	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	234	1139	359	246	560	84	328	1016	302	118	402	91
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	152	0	36	0
Lane Group Flow (vph)	234	1139	359	246	560	84	328	1016	150	118	457	0
Confl. Peds. (#/hr)	26		32	32		26	34		48	48		34
Heavy Vehicles (%)	1%	2%	2%	1%	2%	2%	2%	1%	3%	3%	0%	3%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		
Actuated Green, G (s)	45.9	34.1	34.1	43.3	32.8	32.8	38.1	30.1	30.1	26.2	21.2	
Effective Green, g (s)	45.9	34.1	34.1	43.3	32.8	32.8	38.1	30.1	30.1	26.2	21.2	
Actuated g/C Ratio	0.46	0.34	0.34	0.43	0.33	0.33	0.38	0.30	0.30	0.26	0.21	
Clearance Time (s)	3.0	7.4	7.4	3.0	7.4	7.4	3.0	6.9	6.9	3.0	6.9	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	414	1193	482	251	1148	469	390	1064	383	153	1038	
v/s Ratio Prot	c0.07	c0.33		c0.10	0.16		c0.12	c0.29		0.04	0.09	
v/s Ratio Perm	0.19		0.25	0.32		0.06	0.20		0.12	0.16		
v/c Ratio	0.57	0.95	0.74	0.98	0.49	0.18	0.84	0.95	0.39	0.77	0.44	
Uniform Delay, d1	17.3	32.2	29.1	25.3	26.9	24.0	24.5	34.3	27.7	31.7	34.2	
Progression Factor	1.00	1.00	1.00	1.36	1.44	1.45	1.00	1.00	1.00	1.12	1.05	
Incremental Delay, d2	1.8	17.2	10.0	50.2	1.4	0.8	15.0	17.6	0.7	21.0	0.3	
Delay (s)	19.1	49.4	39.1	84.6	40.1	35.5	39.5	51.9	28.4	56.3	36.2	
Level of Service	B	D	D	F	D	D	D	D	C	E	D	
Approach Delay (s)		43.2			51.9			45.1			40.1	
Approach LOS		D			D			D			D	

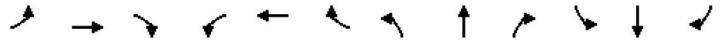
Intersection Summary				
HCM 2000 Control Delay	45.1	HCM 2000 Level of Service	D	
HCM 2000 Volume to Capacity ratio	0.98			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	20.3	
Intersection Capacity Utilization	92.0%	ICU Level of Service	F	
Analysis Period (min)	15			
c Critical Lane Group				

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations											
Traffic Volume (vph)	215	1048	330	226	515	77	302	935	278	109	370
Future Volume (vph)	215	1048	330	226	515	77	302	935	278	109	370
Lane Group Flow (vph)	234	1139	359	246	560	84	328	1016	302	118	493
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA
Protected Phases	7	4		3	8		5	2		1	6
Permitted Phases	4		4	8		8	2		2	6	
Detector Phase	7	4	4	3	8	8	5	2	2	1	6
Switch Phase											
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	8.0	25.4	25.4	8.5	25.4	25.4	8.0	24.9	24.9	8.0	24.9
Total Split (s)	16.0	41.5	41.5	13.5	39.0	39.0	17.0	37.0	37.0	8.0	28.0
Total Split (%)	16.0%	41.5%	41.5%	13.5%	39.0%	39.0%	17.0%	37.0%	37.0%	8.0%	28.0%
Yellow Time (s)	3.0	4.2	4.2	3.0	4.2	4.2	3.0	3.7	3.7	3.0	3.7
All-Red Time (s)	0.0	3.2	3.2	0.0	3.2	3.2	0.0	3.2	3.2	0.0	3.2
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	3.0	7.4	7.4	3.0	7.4	7.4	3.0	6.9	6.9	3.0	6.9
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag
Lead-Lag Optimize?											
Recall Mode	None	C-Min	C-Min	None	C-Min	C-Min	None	Min	Min	None	Min
v/c Ratio	0.53	0.95	0.74	0.95	0.49	0.18	0.79	0.95	0.57	0.72	0.46
Control Delay	18.2	50.2	40.2	73.2	41.0	37.1	37.1	53.8	13.4	48.9	34.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.2	50.2	40.2	73.2	41.0	37.1	37.1	53.8	13.4	48.9	34.2
Queue Length 50th (m)	25.4	118.2	64.0	40.6	61.7	15.3	47.1	106.5	13.0	13.6	26.5
Queue Length 95th (m)	40.7	#163.6	#102.7	#82.4	76.7	29.1	#83.1	#149.6	40.5	#33.9	43.2
Internal Link Dist (m)		667.5			393.2			242.2			35.5
Turn Bay Length (m)	33.5		49.1	103.2		61.6	46.2		51.8	47.9	
Base Capacity (vph)	461	1193	482	260	1146	468	416	1064	534	165	1073
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.51	0.95	0.74	0.95	0.49	0.18	0.79	0.95	0.57	0.72	0.46

Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 13 (13%), Referenced to phase 4:EBTL and 8:WBTL, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 2: Liverpool Road & Kingston Road





Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	23	0	21	123	1	98	57	923	247	76	398	34
Future Volume (Veh/h)	23	0	21	123	1	98	57	923	247	76	398	34
Sign Control		Stop			Stop			Free			Free	
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)	25	0	23	134	1	107	62	1003	268	83	433	37
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								TWLTL			TWLTL	
Median storage veh)								2			2	
Upstream signal (m)								140			216	
pX, platoon unblocked	0.72	0.72		0.72	0.72	0.72				0.72		
vC, conflicting volume	1350	2012	235	1666	1897	636	470			1271		
vC1, stage 1 conf vol	618	618		1261	1261							
vC2, stage 2 conf vol	733	1395		406	636							
vCu, unblocked vol	719	1634	235	1156	1474	0	470			609		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)	6.5	5.5		6.5	5.5							
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	93	100	97	50	100	86	94			88		
cM capacity (veh/h)	343	179	773	267	251	786	1102			708		

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	48	134	108	62	669	602	83	289	181
Volume Left	25	134	0	62	0	0	83	0	0
Volume Right	23	0	107	0	0	268	0	0	37
cSH	468	267	771	1102	1700	1700	708	1700	1700
Volume to Capacity	0.10	0.50	0.14	0.06	0.39	0.35	0.12	0.17	0.11
Queue Length 95th (m)	2.7	20.9	3.9	1.4	0.0	0.0	3.2	0.0	0.0
Control Delay (s)	13.6	31.4	10.4	8.5	0.0	0.0	10.8	0.0	0.0
Lane LOS	B	D	B	A			B		
Approach Delay (s)	13.6	22.0		0.4			1.6		
Approach LOS	B	C							

Intersection Summary				
Average Delay	3.4			
Intersection Capacity Utilization	59.2%	ICU Level of Service	B	
Analysis Period (min)	15			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	23	0	1227	540	2
Future Volume (Veh/h)	0	23	0	1227	540	2
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	25	0	1334	587	2
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	TWLTL	
Median storage veh)					2	
Upstream signal (m)				59	297	
pX, platoon unblocked	0.72					
vC, conflicting volume	1255	148	589			
vC1, stage 1 conf vol	588					
vC2, stage 2 conf vol	667					
vCu, unblocked vol	564	148	589			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)	5.8					
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	97	100			
cM capacity (veh/h)	486	879	996			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2	SB 3	SB 4
Volume Total	25	445	889	168	168	168	86
Volume Left	0	0	0	0	0	0	0
Volume Right	25	0	0	0	0	0	2
cSH	879	996	1700	1700	1700	1700	1700
Volume to Capacity	0.03	0.00	0.52	0.10	0.10	0.10	0.05
Queue Length 95th (m)	0.7	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	9.2	0.0	0.0	0.0	0.0	0.0	0.0
Lane LOS	A						
Approach Delay (s)	9.2	0.0		0.0			
Approach LOS	A						

Intersection Summary				
Average Delay	0.1			
Intersection Capacity Utilization	37.3%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	45	72	110	52	145	44	347	614	72	67	346	30
Future Volume (vph)	45	72	110	52	145	44	347	614	72	67	346	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2
Total Lost time (s)	5.9	5.9	5.9	5.9	5.9		6.7	6.7		6.7	6.7	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00		0.99	1.00	
Frt	1.00	1.00	0.85	1.00	0.97		1.00	0.98		1.00	0.99	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1725	1824	1543	1725	1791		1708	3454		1714	3527	
Flt Permitted	0.43	1.00	1.00	0.71	1.00		0.51	1.00		0.36	1.00	
Satd. Flow (perm)	788	1824	1543	1282	1791		920	3454		654	3527	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	49	78	120	57	158	48	377	667	78	73	376	33
RTOR Reduction (vph)	0	0	101	0	13	0	0	6	0	0	4	0
Lane Group Flow (vph)	49	78	19	57	193	0	377	739	0	73	405	0
Confl. Peds. (#/hr)									11	11		
Heavy Vehicles (%)	0%	3%	0%	0%	1%	2%	1%	1%	5%	0%	0%	0%
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)	16.0	16.0	16.0	16.0	16.0		71.4	71.4		71.4	71.4	
Effective Green, g (s)	16.0	16.0	16.0	16.0	16.0		71.4	71.4		71.4	71.4	
Actuated g/C Ratio	0.16	0.16	0.16	0.16	0.16		0.71	0.71		0.71	0.71	
Clearance Time (s)	5.9	5.9	5.9	5.9	5.9		6.7	6.7		6.7	6.7	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	126	291	246	205	286		656	2466		466	2518	
v/s Ratio Prot		0.04			c0.11			0.21			0.11	
v/s Ratio Perm	0.06		0.01	0.04			c0.41			0.11		
v/c Ratio	0.39	0.27	0.08	0.28	0.67		0.57	0.30		0.16	0.16	
Uniform Delay, d1	37.6	36.9	35.7	36.9	39.5		6.9	5.2		4.6	4.6	
Progression Factor	1.00	1.00	1.00	0.69	0.76		0.74	0.52		1.00	1.00	
Incremental Delay, d2	2.0	0.5	0.1	0.7	6.0		2.4	0.2		0.7	0.1	
Delay (s)	39.6	37.4	35.9	26.2	36.1		7.5	2.9		5.3	4.8	
Level of Service	D	D	D	C	D		A	A		A	A	
Approach Delay (s)		37.1			34.0			4.5			4.8	
Approach LOS		D			C			A			A	

Intersection Summary				
HCM 2000 Control Delay	12.0	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.59			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.6	
Intersection Capacity Utilization	67.7%	ICU Level of Service	C	
Analysis Period (min)	15			
c Critical Lane Group				

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations									
Traffic Volume (vph)	45	72	110	52	145	347	614	67	346
Future Volume (vph)	45	72	110	52	145	347	614	67	346
Lane Group Flow (vph)	49	78	120	57	206	377	745	73	409
Turn Type	Perm	NA	Perm	Perm	NA	Perm	NA	Perm	NA
Protected Phases		4			8		2		6
Permitted Phases	4		4	8		2		6	
Detector Phase	4	4	4	8	8	2	2	6	6
Switch Phase									
Minimum Initial (s)	8.0	8.0	8.0	8.0	8.0	5.0	5.0	5.0	5.0
Minimum Split (s)	23.9	23.9	23.9	23.9	23.9	24.7	24.7	24.7	24.7
Total Split (s)	36.0	36.0	36.0	36.0	36.0	64.0	64.0	64.0	64.0
Total Split (%)	36.0%	36.0%	36.0%	36.0%	36.0%	64.0%	64.0%	64.0%	64.0%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	4.6	4.6	4.6	4.6
All-Red Time (s)	2.2	2.2	2.2	2.2	2.2	2.1	2.1	2.1	2.1
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.9	5.9	5.9	5.9	5.9	6.7	6.7	6.7	6.7
Lead/Lag									
Lead-Lag Optimize?									
Recall Mode	None	None	None	None	None	C-Min	C-Min	C-Min	C-Min
v/c Ratio	0.39	0.27	0.34	0.28	0.69	0.57	0.30	0.16	0.16
Control Delay	45.0	37.4	9.2	27.6	39.0	8.9	3.1	6.6	5.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	45.0	37.4	9.2	27.6	39.0	8.9	3.1	6.6	5.1
Queue Length 50th (m)	9.1	14.1	0.0	5.2	21.5	13.4	12.3	4.1	11.7
Queue Length 95th (m)	19.6	25.9	14.4	22.1	60.4	m75.0	m14.2	11.5	21.1
Internal Link Dist (m)		107.2			416.6		192.1		478.0
Turn Bay Length (m)	22.0			24.3		24.4		46.2	
Base Capacity (vph)	237	549	548	385	550	656	2470	466	2521
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.21	0.14	0.22	0.15	0.37	0.57	0.30	0.16	0.16

Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 6: Liverpool Road & Glenanna Road

Year 2029

A.M. Peak Hour

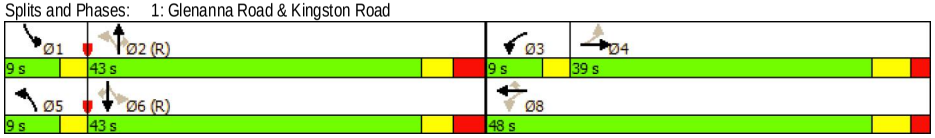
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	407	92	96	590	122	52	73	64	190	102	26
Future Volume (vph)	10	407	92	96	590	122	52	73	64	190	102	26
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2
Total Lost time (s)	6.4	6.4		3.0	6.4	6.4	3.0	7.0	7.0	3.0	7.0	7.0
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.98		1.00	1.00	0.96	1.00	1.00	0.93	1.00	1.00	0.88
Flpb, ped/bikes	0.99	1.00		1.00	1.00	1.00	0.94	1.00	1.00	0.97	1.00	1.00
Frt	1.00	0.97		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1568	3162		1651	3400	1464	1629	1860	1397	1641	1773	1365
Flt Permitted	0.41	1.00		0.25	1.00	1.00	0.69	1.00	1.00	0.65	1.00	1.00
Satd. Flow (perm)	674	3162		437	3400	1464	1175	1860	1397	1129	1773	1365
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	11	442	100	104	641	133	57	79	70	207	111	28
RTOR Reduction (vph)	0	23	0	0	0	0	0	0	44	0	0	16
Lane Group Flow (vph)	11	519	0	104	641	133	57	79	26	207	111	12
Confl. Peds. (#/hr)	8		25	25		8	35		34	34		35
Heavy Vehicles (%)	9%	8%	8%	4%	5%	1%	0%	1%	3%	2%	6%	0%
Turn Type	Perm	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4		3	8		5	2		1	6	
Permitted Phases	4			8		8	2		2	6		6
Actuated Green, G (s)	22.4	22.4		33.8	33.8	33.8	43.8	37.8	37.8	52.8	43.8	43.8
Effective Green, g (s)	22.4	22.4		33.8	33.8	33.8	43.8	37.8	37.8	52.8	43.8	43.8
Actuated g/C Ratio	0.22	0.22		0.34	0.34	0.34	0.44	0.38	0.38	0.53	0.44	0.44
Clearance Time (s)	6.4	6.4		3.0	6.4	6.4	3.0	7.0	7.0	3.0	7.0	7.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	150	708		249	1149	494	541	703	528	657	776	597
v/s Ratio Prot		c0.16		0.03	c0.19		0.01	0.04		c0.04	0.06	
v/s Ratio Perm	0.02			0.11		0.09	0.04		0.02	c0.13		0.01
v/c Ratio	0.07	0.73		0.42	0.56	0.27	0.11	0.11	0.05	0.32	0.14	0.02
Uniform Delay, d1	30.6	36.0		24.1	27.0	24.1	16.4	20.2	19.7	12.8	16.8	15.9
Progression Factor	0.57	0.72		1.00	1.00	1.00	1.00	1.00	1.00	0.81	0.86	1.00
Incremental Delay, d2	0.2	3.8		1.1	0.6	0.3	0.1	0.3	0.2	0.3	0.4	0.1
Delay (s)	17.7	29.8		25.2	27.6	24.4	16.5	20.5	19.9	10.6	14.9	16.0
Level of Service	B	C		C	C	C	B	C	B	B	B	B
Approach Delay (s)		29.5			26.8			19.2			12.4	
Approach LOS		C			C			B			B	

Intersection Summary				
HCM 2000 Control Delay	24.3	HCM 2000 Level of Service	C	
HCM 2000 Volume to Capacity ratio	0.47			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	19.4	
Intersection Capacity Utilization	54.9%	ICU Level of Service	A	
Analysis Period (min)	15			
c Critical Lane Group				

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations											
Traffic Volume (vph)	10	407	96	590	122	52	73	64	190	102	26
Future Volume (vph)	10	407	96	590	122	52	73	64	190	102	26
Lane Group Flow (vph)	11	542	104	641	133	57	79	70	207	111	28
Turn Type	Perm	NA	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4	3	8		5	2		1	6	
Permitted Phases	4		8		8	2		2	6		6
Detector Phase	4	4	3	8	8	5	2	2	1	6	6
Switch Phase											
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	8.0	8.0	5.0	8.0	8.0
Minimum Split (s)	24.4	24.4	8.0	24.4	24.4	8.0	25.4	25.4	8.0	25.4	25.4
Total Split (s)	39.0	39.0	9.0	48.0	48.0	9.0	43.0	43.0	9.0	43.0	43.0
Total Split (%)	39.0%	39.0%	9.0%	48.0%	48.0%	9.0%	43.0%	43.0%	9.0%	43.0%	43.0%
Yellow Time (s)	4.2	4.2	3.0	4.2	4.2	3.0	3.3	3.3	3.0	3.3	3.3
All-Red Time (s)	2.2	2.2	0.0	2.2	2.2	0.0	3.7	3.7	0.0	3.7	3.7
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.4	6.4	3.0	6.4	6.4	3.0	7.0	7.0	3.0	7.0	7.0
Lead/Lag	Lag	Lag	Lead			Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?											
Recall Mode	None	None	None	None	None	None	C-Min	C-Min	None	C-Min	C-Min
v/c Ratio	0.07	0.74	0.38	0.57	0.27	0.09	0.11	0.12	0.29	0.14	0.04
Control Delay	17.3	30.7	22.9	28.5	23.8	13.2	25.8	3.1	11.2	18.3	2.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	17.3	30.7	22.9	28.5	23.8	13.2	25.8	3.1	11.2	18.3	2.1
Queue Length 50th (m)	0.8	20.7	13.8	54.7	19.3	5.0	10.4	0.0	20.2	17.8	0.2
Queue Length 95th (m)	m2.1	23.8	21.7	61.7	29.2	13.4	26.1	5.7	48.6	33.8	2.3
Internal Link Dist (m)		393.2		523.9			174.6			416.6	
Turn Bay Length (m)	42.6		33.0		23.2	25.4		25.0	27.3		16.5
Base Capacity (vph)	219	1050	277	1428	615	607	781	646	703	814	682
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.05	0.52	0.38	0.45	0.22	0.09	0.10	0.11	0.29	0.14	0.04

Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 70
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Glenanna Road & Kingston Road



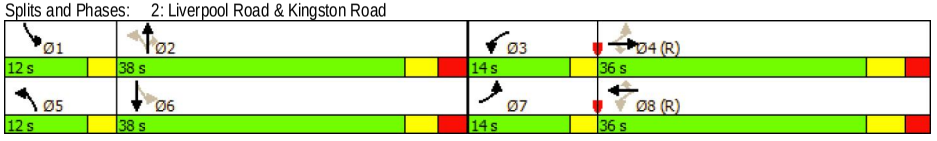
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	90	396	254	178	495	46	215	469	122	77	875	101
Future Volume (vph)	90	396	254	178	495	46	215	469	122	77	875	101
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2
Total Lost time (s)	3.0	7.0	7.0	3.0	7.0	7.0	3.0	6.9	6.9	3.0	6.9	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.91	
Frpb, ped/bikes	1.00	1.00	0.96	1.00	1.00	0.96	1.00	1.00	0.91	1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1652	3368	1462	1639	3400	1487	1690	3500	1279	1666	4916	
Flt Permitted	0.38	1.00	1.00	0.37	1.00	1.00	0.16	1.00	1.00	0.46	1.00	
Satd. Flow (perm)	659	3368	1462	634	3400	1487	285	3500	1279	814	4916	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	98	430	276	193	538	50	234	510	133	84	951	110
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	80	0	14	0
Lane Group Flow (vph)	98	430	276	193	538	50	234	510	53	84	1047	0
Confl. Peds. (#/hr)	15		19	9		15	22		25	25		22
Heavy Vehicles (%)	4%	6%	1%	5%	5%	0%	2%	2%	10%	2%	2%	4%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		
Actuated Green, G (s)	30.9	23.3	23.3	36.9	26.3	26.3	49.2	39.6	39.6	41.0	34.4	
Effective Green, g (s)	30.9	23.3	23.3	36.9	26.3	26.3	49.2	39.6	39.6	41.0	34.4	
Actuated g/C Ratio	0.31	0.23	0.23	0.37	0.26	0.26	0.49	0.40	0.40	0.41	0.34	
Clearance Time (s)	3.0	7.0	7.0	3.0	7.0	7.0	3.0	6.9	6.9	3.0	6.9	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	279	784	340	340	894	391	306	1386	506	389	1691	
v/s Ratio Prot	0.03	0.13		c0.06	0.16		c0.09	0.15		0.01	0.21	
v/s Ratio Perm	0.08		c0.19	0.15		0.03	c0.29		0.04	0.07		
v/c Ratio	0.35	0.55	0.81	0.57	0.60	0.13	0.76	0.37	0.10	0.22	0.62	
Uniform Delay, d1	25.5	33.7	36.3	22.9	32.3	28.1	17.0	21.4	19.0	18.3	27.3	
Progression Factor	1.00	1.00	1.00	2.36	1.84	1.92	1.00	1.00	1.00	0.93	0.93	
Incremental Delay, d2	0.8	2.8	18.7	2.1	2.8	0.6	10.8	0.8	0.4	0.3	1.7	
Delay (s)	26.2	36.5	55.0	56.1	62.3	54.5	27.9	22.1	19.4	17.3	27.1	
Level of Service	C	D	D	E	E	D	C	C	B	B	C	
Approach Delay (s)		41.6			60.3			23.2			26.4	
Approach LOS		D			E			C			C	

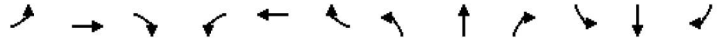
Intersection Summary				
HCM 2000 Control Delay	36.3	HCM 2000 Level of Service	D	
HCM 2000 Volume to Capacity ratio	0.78			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	19.9	
Intersection Capacity Utilization	74.4%	ICU Level of Service	D	
Analysis Period (min)	15			
c Critical Lane Group				

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations											
Traffic Volume (vph)	90	396	254	178	495	46	215	469	122	77	875
Future Volume (vph)	90	396	254	178	495	46	215	469	122	77	875
Lane Group Flow (vph)	98	430	276	193	538	50	234	510	133	84	1061
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA
Protected Phases	7	4		3	8		5	2		1	6
Permitted Phases	4		4	8		8	2		2	6	
Detector Phase	7	4	4	3	8	8	5	2	2	1	6
Switch Phase											
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	11.9	25.0	25.0	9.5	25.0	25.0	9.5	24.9	24.9	8.0	24.9
Total Split (s)	14.0	36.0	36.0	14.0	36.0	36.0	12.0	38.0	38.0	12.0	38.0
Total Split (%)	14.0%	36.0%	36.0%	14.0%	36.0%	36.0%	12.0%	38.0%	38.0%	12.0%	38.0%
Yellow Time (s)	3.0	4.2	4.2	3.0	4.2	4.2	3.0	3.7	3.7	3.0	3.7
All-Red Time (s)	0.0	2.8	2.8	0.0	2.8	2.8	0.0	3.2	3.2	0.0	3.2
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	3.0	7.0	7.0	3.0	7.0	7.0	3.0	6.9	6.9	3.0	6.9
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag
Lead-Lag Optimize?											
Recall Mode	None	C-Min	C-Min	None	C-Min	C-Min	None	Max	Max	None	Max
v/c Ratio	0.30	0.53	0.79	0.53	0.58	0.12	0.75	0.37	0.23	0.19	0.63
Control Delay	19.3	35.1	51.8	49.3	60.3	52.9	34.2	24.5	5.6	13.9	28.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	19.3	35.1	51.8	49.3	60.3	52.9	34.2	24.5	5.6	13.9	28.1
Queue Length 50th (m)	11.8	39.8	52.4	39.5	61.3	10.7	25.9	40.3	0.0	7.4	62.4
Queue Length 95th (m)	20.6	52.4	78.5	61.2	78.8	23.0	#73.3	59.8	13.4	16.6	82.0
Internal Link Dist (m)		667.5			393.2			242.2			35.5
Turn Bay Length (m)	33.5		49.1	103.2		61.6	46.2		51.8	47.9	
Base Capacity (vph)	365	976	423	366	987	431	311	1384	586	454	1672
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.27	0.44	0.65	0.53	0.55	0.12	0.75	0.37	0.23	0.19	0.63

Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 13 (13%), Referenced to phase 4:EBTL and 8:WBTL, Start of Green
Natural Cycle: 75
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 2: Liverpool Road & Kingston Road





Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	34	0	28	106	0	59	19	423	163	94	892	13
Future Volume (Veh/h)	34	0	28	106	0	59	19	423	163	94	892	13
Sign Control		Stop			Stop			Free			Free	
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)	37	0	30	115	0	64	21	460	177	102	970	14
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								TWLTL			TWLTL	
Median storage veh)								2			2	
Upstream signal (m)								140			216	
pX, platoon unblocked	0.92	0.92	0.97	0.92	0.92	0.91	0.97			0.91		
vC, conflicting volume	1517	1860	492	1310	1778	318	984			637		
vC1, stage 1 conf vol	1181	1181		590	590							
vC2, stage 2 conf vol	336	679		719	1188							
vCu, unblocked vol	1225	1597	403	1001	1509	39	912			391		
tC, single (s)	7.5	6.5	7.2	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)	6.5	5.5		6.5	5.5							
tF (s)	3.5	4.0	3.4	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	80	100	94	63	100	93	97			90		
cM capacity (veh/h)	189	220	545	308	214	933	729			1054		

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	67	115	64	21	307	330	102	647	337
Volume Left	37	115	0	21	0	0	102	0	0
Volume Right	30	0	64	0	0	177	0	0	14
cSH	268	308	933	729	1700	1700	1054	1700	1700
Volume to Capacity	0.25	0.37	0.07	0.03	0.18	0.19	0.10	0.38	0.20
Queue Length 95th (m)	7.7	13.3	1.8	0.7	0.0	0.0	2.6	0.0	0.0
Control Delay (s)	22.9	23.4	9.1	10.1	0.0	0.0	8.8	0.0	0.0
Lane LOS	C	C	A	B			A		
Approach Delay (s)	22.9	18.3		0.3			0.8		
Approach LOS	C	C							

Intersection Summary					
Average Delay	3.0				
Intersection Capacity Utilization	48.7%	ICU Level of Service		A	
Analysis Period (min)	15				

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	27	0	605	1026	0
Future Volume (Veh/h)	0	27	0	605	1026	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	29	0	658	1115	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	TWLTL	
Median storage veh)					2	
Upstream signal (m)				59	297	
pX, platoon unblocked	0.90					
vC, conflicting volume	1444	279	1115			
vC1, stage 1 conf vol	1115					
vC2, stage 2 conf vol	329					
vCu, unblocked vol	1270	279	1115			
tC, single (s)	6.8	7.1	4.1			
tC, 2 stage (s)	5.8					
tF (s)	3.5	3.4	2.2			
p0 queue free %	100	96	100			
cM capacity (veh/h)	269	698	634			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2	SB 3	SB 4
Volume Total	29	329	329	319	319	319	159
Volume Left	0	0	0	0	0	0	0
Volume Right	29	0	0	0	0	0	0
cSH	698	1700	1700	1700	1700	1700	1700
Volume to Capacity	0.04	0.19	0.19	0.19	0.19	0.19	0.09
Queue Length 95th (m)	1.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	10.4	0.0	0.0	0.0	0.0	0.0	0.0
Lane LOS	B						
Approach Delay (s)	10.4	0.0		0.0			
Approach LOS	B						

Intersection Summary				
Average Delay	0.2			
Intersection Capacity Utilization	24.9%	ICU Level of Service		A
Analysis Period (min)	15			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	47	138	250	70	87	56	113	379	31	73	662	69
Future Volume (vph)	47	138	250	70	87	56	113	379	31	73	662	69
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2
Total Lost time (s)	5.9	5.9	5.9	5.9	5.9		6.7	6.7		6.7	6.7	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		0.99	1.00		0.99	1.00	
Frt	1.00	1.00	0.85	1.00	0.94		1.00	0.99		1.00	0.99	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1658	1773	1513	1675	1717		1658	3362		1647	3410	
Flt Permitted	0.55	1.00	1.00	0.57	1.00		0.34	1.00		0.49	1.00	
Satd. Flow (perm)	965	1773	1513	1008	1717		601	3362		856	3410	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	51	150	272	76	95	61	123	412	34	79	720	75
RTOR Reduction (vph)	0	0	182	0	27	0	0	4	0	0	5	0
Lane Group Flow (vph)	51	150	90	76	129	0	123	442	0	79	790	0
Confl. Peds. (#/hr)							11		8	8		11
Heavy Vehicles (%)	4%	6%	2%	3%	3%	3%	3%	4%	14%	4%	3%	0%
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)	14.1	14.1	14.1	14.1	14.1		73.3	73.3		73.3	73.3	
Effective Green, g (s)	14.1	14.1	14.1	14.1	14.1		73.3	73.3		73.3	73.3	
Actuated g/C Ratio	0.14	0.14	0.14	0.14	0.14		0.73	0.73		0.73	0.73	
Clearance Time (s)	5.9	5.9	5.9	5.9	5.9		6.7	6.7		6.7	6.7	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	136	249	213	142	242		440	2464		627	2499	
v/s Ratio Prot		c0.08			0.07			0.13			c0.23	
v/s Ratio Perm	0.05		0.06	0.08			0.20			0.09		
v/c Ratio	0.38	0.60	0.42	0.54	0.53		0.28	0.18		0.13	0.32	
Uniform Delay, d1	39.0	40.3	39.2	39.9	39.9		4.5	4.1		3.9	4.6	
Progression Factor	1.00	1.00	1.00	1.26	1.34		0.68	0.68		1.00	1.00	
Incremental Delay, d2	1.7	4.1	1.4	3.8	2.2		1.5	0.2		0.4	0.3	
Delay (s)	40.7	44.4	40.6	53.9	55.6		4.6	2.9		4.3	5.0	
Level of Service	D	D	D	D	E		A	A		A	A	
Approach Delay (s)		41.8			55.0			3.3			4.9	
Approach LOS		D			E			A			A	

Intersection Summary				
HCM 2000 Control Delay	18.0	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.36			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.6	
Intersection Capacity Utilization	62.5%	ICU Level of Service	B	
Analysis Period (min)	15			
c Critical Lane Group				

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations									
Traffic Volume (vph)	47	138	250	70	87	113	379	73	662
Future Volume (vph)	47	138	250	70	87	113	379	73	662
Lane Group Flow (vph)	51	150	272	76	156	123	446	79	795
Turn Type	Perm	NA	Perm	Perm	NA	Perm	NA	Perm	NA
Protected Phases		4			8		2		6
Permitted Phases	4		4	8		2		6	
Detector Phase	4	4	4	8	8	2	2	6	6
Switch Phase									
Minimum Initial (s)	8.0	8.0	8.0	5.0	5.0	5.0	5.0	8.0	8.0
Minimum Split (s)	23.9	23.9	23.9	23.9	23.9	24.7	24.7	24.7	24.7
Total Split (s)	34.0	34.0	34.0	34.0	34.0	66.0	66.0	66.0	66.0
Total Split (%)	34.0%	34.0%	34.0%	34.0%	34.0%	66.0%	66.0%	66.0%	66.0%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	4.6	4.6	4.6	4.6
All-Red Time (s)	2.2	2.2	2.2	2.2	2.2	2.1	2.1	2.1	2.1
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.9	5.9	5.9	5.9	5.9	6.7	6.7	6.7	6.7
Lead/Lag									
Lead-Lag Optimize?									
Recall Mode	None	None	None	None	None	C-Min	C-Min	C-Min	C-Min
v/c Ratio	0.38	0.60	0.69	0.54	0.58	0.28	0.18	0.13	0.32
Control Delay	45.3	49.7	19.7	62.5	50.0	5.5	3.2	5.4	5.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	45.3	49.7	19.7	62.5	50.0	5.5	3.2	5.4	5.3
Queue Length 50th (m)	9.6	29.2	11.1	16.3	27.2	5.2	7.1	4.0	24.0
Queue Length 95th (m)	20.1	46.2	35.9	29.7	44.7	9.8	13.1	11.0	41.7
Internal Link Dist (m)		107.2			416.6		192.1		478.0
Turn Bay Length (m)	22.0			24.3		24.4		46.2	
Base Capacity (vph)	271	498	577	283	505	440	2470	627	2506
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.19	0.30	0.47	0.27	0.31	0.28	0.18	0.13	0.32

Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 55
Control Type: Actuated-Coordinated

Splits and Phases: 6: Liverpool Road & Glenanna Road

P.M. Peak Hour

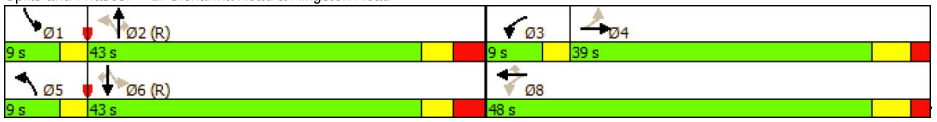
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	24	1214	141	156	610	132	119	177	194	178	199	36
Future Volume (vph)	24	1214	141	156	610	132	119	177	194	178	199	36
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2
Total Lost time (s)	6.4	6.4		3.0	6.4	6.4	3.0	7.0	7.0	3.0	7.0	7.0
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.98		1.00	1.00	0.90	1.00	1.00	0.91	1.00	1.00	0.73
Flpb, ped/bikes	0.97	1.00		1.00	1.00	1.00	0.93	1.00	1.00	0.97	1.00	1.00
Frt	1.00	0.98		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1668	3374		1658	3500	1373	1599	1879	1385	1673	1824	1130
Flt Permitted	0.40	1.00		0.08	1.00	1.00	0.47	1.00	1.00	0.53	1.00	1.00
Satd. Flow (perm)	702	3374		147	3500	1373	790	1879	1385	935	1824	1130
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	26	1320	153	170	663	143	129	192	211	193	216	39
RTOR Reduction (vph)	0	7	0	0	0	39	0	0	171	0	0	32
Lane Group Flow (vph)	26	1466	0	170	663	104	129	192	40	193	216	7
Confl. Peds. (#/hr)	30		55	55		30	91		50	50		91
Heavy Vehicles (%)	0%	2%	5%	4%	2%	1%	0%	0%	1%	0%	3%	0%
Turn Type	Perm	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4		3	8		5	2		1	6	
Permitted Phases	4			8		8	2		2	6		6
Actuated Green, G (s)	44.5	44.5		60.3	60.3	60.3	23.3	17.3	17.3	23.3	17.3	17.3
Effective Green, g (s)	44.5	44.5		60.3	60.3	60.3	23.3	17.3	17.3	23.3	17.3	17.3
Actuated g/C Ratio	0.44	0.44		0.60	0.60	0.60	0.23	0.17	0.17	0.23	0.17	0.17
Clearance Time (s)	6.4	6.4		3.0	6.4	6.4	3.0	7.0	7.0	3.0	7.0	7.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	312	1501		282	2110	827	232	325	239	262	315	195
v/s Ratio Prot		c0.43		c0.08	0.19		0.03	0.10		c0.04	0.12	
v/s Ratio Perm	0.04			0.29		0.08	0.10		0.03	c0.13		0.01
v/c Ratio	0.08	0.98		0.60	0.31	0.13	0.56	0.59	0.17	0.74	0.69	0.03
Uniform Delay, d1	16.0	27.2		21.1	9.7	8.5	32.5	38.1	35.2	34.7	38.8	34.4
Progression Factor	0.48	0.56		1.00	1.00	1.00	1.00	1.00	1.00	1.07	1.08	1.00
Incremental Delay, d2	0.1	10.6		3.6	0.1	0.1	2.9	7.7	1.5	10.3	11.5	0.3
Delay (s)	7.7	25.8		24.7	9.8	8.6	35.4	45.8	36.7	47.5	53.3	34.7
Level of Service	A	C		C	A	A	D	D	D	D	D	C
Approach Delay (s)		25.5			12.2			39.7			49.2	
Approach LOS		C			B			D			D	

Intersection Summary				
HCM 2000 Control Delay	27.0	HCM 2000 Level of Service	C	
HCM 2000 Volume to Capacity ratio	0.85			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	19.4	
Intersection Capacity Utilization	89.8%	ICU Level of Service	E	
Analysis Period (min)	15			
c Critical Lane Group				

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations											
Traffic Volume (vph)	24	1214	156	610	132	119	177	194	178	199	36
Future Volume (vph)	24	1214	156	610	132	119	177	194	178	199	36
Lane Group Flow (vph)	26	1473	170	663	143	129	192	211	193	216	39
Turn Type	Perm	NA	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4	3	8		5	2		1	6	
Permitted Phases	4		8		8	2		2	6		6
Detector Phase	4	4	3	8	8	5	2	2	1	6	6
Switch Phase											
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	24.4	24.4	8.0	24.4	24.4	8.0	25.0	25.0	8.0	25.0	25.0
Total Split (s)	39.0	39.0	9.0	48.0	48.0	9.0	43.0	43.0	9.0	43.0	43.0
Total Split (%)	39.0%	39.0%	9.0%	48.0%	48.0%	9.0%	43.0%	43.0%	9.0%	43.0%	43.0%
Yellow Time (s)	4.2	4.2	3.0	4.2	4.2	3.0	3.3	3.3	3.0	3.3	3.3
All-Red Time (s)	2.2	2.2	0.0	2.2	2.2	0.0	3.7	3.7	0.0	3.7	3.7
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.4	6.4	3.0	6.4	6.4	3.0	7.0	7.0	3.0	7.0	7.0
Lead/Lag	Lag	Lag	Lead			Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?											
Recall Mode	None	None	None	None	None	None	C-Min	C-Min	None	C-Min	C-Min
v/c Ratio	0.08	0.98	0.59	0.31	0.16	0.51	0.59	0.51	0.65	0.69	0.14
Control Delay	9.6	29.9	25.0	10.9	4.3	33.2	44.9	9.8	41.2	52.4	2.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	9.6	29.9	25.0	10.9	4.3	33.2	44.9	9.8	41.2	52.4	2.1
Queue Length 50th (m)	0.9	161.7	15.7	32.2	3.4	19.7	36.5	0.7	34.2	44.2	0.0
Queue Length 95th (m)	m2.9	m#218.2	39.7	50.5	13.4	31.7	55.0	19.2	40.8	67.0	1.5
Internal Link Dist (m)		393.2		523.9			174.6			416.6	
Turn Bay Length (m)	42.6		33.0		23.2	25.4		25.0	27.3		16.5
Base Capacity (vph)	312	1507	287	2110	867	252	676	631	296	656	472
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.08	0.98	0.59	0.31	0.16	0.51	0.28	0.33	0.65	0.33	0.08

Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Glenanna Road & Kingston Road



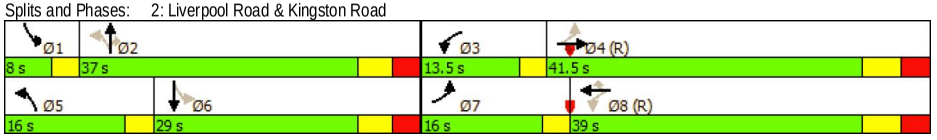
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	215	1074	330	226	528	77	302	958	278	109	379	84
Future Volume (vph)	215	1074	330	226	528	77	302	958	278	109	379	84
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2
Total Lost time (s)	3.0	7.4	7.4	3.0	7.4	7.4	3.0	6.9	6.9	3.0	6.9	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.91	
Frpb, ped/bikes	1.00	1.00	0.94	1.00	1.00	0.95	1.00	1.00	0.85	1.00	0.99	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1700	3500	1416	1708	3500	1431	1677	3535	1273	1670	4903	
Flt Permitted	0.34	1.00	1.00	0.12	1.00	1.00	0.37	1.00	1.00	0.18	1.00	
Satd. Flow (perm)	610	3500	1416	219	3500	1431	647	3535	1273	318	4903	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	234	1167	359	246	574	84	328	1041	302	118	412	91
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	148	0	35	0
Lane Group Flow (vph)	234	1167	359	246	574	84	328	1041	154	118	468	0
Confl. Peds. (#/hr)	26		32	32		26	34		48	48		34
Heavy Vehicles (%)	1%	2%	2%	1%	2%	2%	2%	1%	3%	3%	0%	3%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		
Actuated Green, G (s)	45.9	34.1	34.1	43.3	32.8	32.8	38.1	30.1	30.1	27.1	22.1	
Effective Green, g (s)	45.9	34.1	34.1	43.3	32.8	32.8	38.1	30.1	30.1	27.1	22.1	
Actuated g/C Ratio	0.46	0.34	0.34	0.43	0.33	0.33	0.38	0.30	0.30	0.27	0.22	
Clearance Time (s)	3.0	7.4	7.4	3.0	7.4	7.4	3.0	6.9	6.9	3.0	6.9	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	408	1193	482	251	1148	469	380	1064	383	153	1083	
v/s Ratio Prot	c0.07	c0.33		c0.10	0.16		c0.11	c0.29		0.04	0.10	
v/s Ratio Perm	0.20		0.25	0.32		0.06	0.22		0.12	0.17		
v/c Ratio	0.57	0.98	0.74	0.98	0.50	0.18	0.86	0.98	0.40	0.77	0.43	
Uniform Delay, d1	17.4	32.6	29.1	25.5	27.0	24.0	24.9	34.6	27.8	31.2	33.5	
Progression Factor	1.00	1.00	1.00	1.37	1.44	1.45	1.00	1.00	1.00	1.12	1.05	
Incremental Delay, d2	1.9	21.3	10.0	50.1	1.5	0.8	18.0	22.2	0.7	21.0	0.3	
Delay (s)	19.3	53.9	39.1	85.0	40.5	35.6	42.8	56.8	28.5	56.0	35.4	
Level of Service	B	D	D	F	D	D	D	E	C	E	D	
Approach Delay (s)		46.3			52.1			49.0			39.3	
Approach LOS		D			D			D			D	

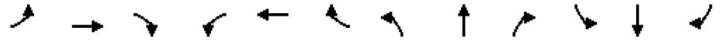
Intersection Summary				
HCM 2000 Control Delay	47.4	HCM 2000 Level of Service	D	
HCM 2000 Volume to Capacity ratio	1.00			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	20.3	
Intersection Capacity Utilization	93.3%	ICU Level of Service	F	
Analysis Period (min)	15			
c Critical Lane Group				

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations											
Traffic Volume (vph)	215	1074	330	226	528	77	302	958	278	109	379
Future Volume (vph)	215	1074	330	226	528	77	302	958	278	109	379
Lane Group Flow (vph)	234	1167	359	246	574	84	328	1041	302	118	503
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA
Protected Phases	7	4		3	8		5	2		1	6
Permitted Phases	4		4	8		8	2		2	6	
Detector Phase	7	4	4	3	8	8	5	2	2	1	6
Switch Phase											
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	8.0	25.4	25.4	8.5	25.4	25.4	8.0	24.9	24.9	8.0	24.9
Total Split (s)	16.0	41.5	41.5	13.5	39.0	39.0	16.0	37.0	37.0	8.0	29.0
Total Split (%)	16.0%	41.5%	41.5%	13.5%	39.0%	39.0%	16.0%	37.0%	37.0%	8.0%	29.0%
Yellow Time (s)	3.0	4.2	4.2	3.0	4.2	4.2	3.0	3.7	3.7	3.0	3.7
All-Red Time (s)	0.0	3.2	3.2	0.0	3.2	3.2	0.0	3.2	3.2	0.0	3.2
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	3.0	7.4	7.4	3.0	7.4	7.4	3.0	6.9	6.9	3.0	6.9
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag
Lead-Lag Optimize?											
Recall Mode	None	C-Min	C-Min	None	C-Min	C-Min	None	Min	Min	None	Min
v/c Ratio	0.54	0.98	0.74	0.95	0.50	0.18	0.81	0.98	0.57	0.72	0.45
Control Delay	18.4	54.8	40.2	73.3	41.4	37.3	39.4	58.4	13.9	48.9	33.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.4	54.8	40.2	73.3	41.4	37.3	39.4	58.4	13.9	48.9	33.5
Queue Length 50th (m)	25.4	122.6	64.0	40.7	63.3	15.4	47.1	110.2	13.8	13.5	27.3
Queue Length 95th (m)	40.7	#170.1	#102.7	#83.4	78.7	29.3	#86.2	#155.2	41.7	#34.6	43.6
Internal Link Dist (m)		667.5			393.2			242.2			35.5
Turn Bay Length (m)	33.5		49.1	103.2		61.6	46.2		51.8	47.9	
Base Capacity (vph)	454	1193	482	260	1146	468	404	1064	531	165	1118
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.52	0.98	0.74	0.95	0.50	0.18	0.81	0.98	0.57	0.72	0.45

Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 13 (13%), Referenced to phase 4:EBTL and 8:WBTL, Start of Green
Natural Cycle: 100
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 2: Liverpool Road & Kingston Road





Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	23	0	21	123	1	98	57	946	247	76	407	34
Future Volume (Veh/h)	23	0	21	123	1	98	57	946	247	76	407	34
Sign Control		Stop			Stop			Free			Free	
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)	25	0	23	134	1	107	62	1028	268	83	442	37
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								TWLTL			TWLTL	
Median storage veh)								2			2	
Upstream signal (m)								140			216	
pX, platoon unblocked	0.72	0.72		0.72	0.72	0.72				0.72		
vC, conflicting volume	1372	2046	240	1696	1931	648	479			1296		
vC1, stage 1 conf vol	626	626		1286	1286							
vC2, stage 2 conf vol	746	1420		410	645							
vCu, unblocked vol	729	1670	240	1181	1509	0	479			623		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)	6.5	5.5		6.5	5.5							
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	93	100	97	48	100	86	94			88		
cM capacity (veh/h)	338	173	768	260	245	780	1094			694		

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	48	134	108	62	685	611	83	295	184
Volume Left	25	134	0	62	0	0	83	0	0
Volume Right	23	0	107	0	0	268	0	0	37
cSH	462	260	764	1094	1700	1700	694	1700	1700
Volume to Capacity	0.10	0.52	0.14	0.06	0.40	0.36	0.12	0.17	0.11
Queue Length 95th (m)	2.8	21.8	3.9	1.4	0.0	0.0	3.2	0.0	0.0
Control Delay (s)	13.7	32.7	10.5	8.5	0.0	0.0	10.9	0.0	0.0
Lane LOS	B	D	B	A			B		
Approach Delay (s)	13.7	22.8		0.4			1.6		
Approach LOS	B	C							

Intersection Summary				
Average Delay	3.4			
Intersection Capacity Utilization	59.8%	ICU Level of Service	B	
Analysis Period (min)	15			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	23	0	1250	549	2
Future Volume (Veh/h)	0	23	0	1250	549	2
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	25	0	1359	597	2
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	TWLTL	
Median storage veh)					2	
Upstream signal (m)				59	297	
pX, platoon unblocked	0.71					
vC, conflicting volume	1278	150	599			
vC1, stage 1 conf vol	598					
vC2, stage 2 conf vol	680					
vCu, unblocked vol	571	150	599			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)	5.8					
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	97	100			
cM capacity (veh/h)	480	876	988			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2	SB 3	SB 4
Volume Total	25	453	906	171	171	171	87
Volume Left	0	0	0	0	0	0	0
Volume Right	25	0	0	0	0	0	2
cSH	876	988	1700	1700	1700	1700	1700
Volume to Capacity	0.03	0.00	0.53	0.10	0.10	0.10	0.05
Queue Length 95th (m)	0.7	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	9.2	0.0	0.0	0.0	0.0	0.0	0.0
Lane LOS	A						
Approach Delay (s)	9.2	0.0		0.0			
Approach LOS	A						

Intersection Summary				
Average Delay	0.1			
Intersection Capacity Utilization	37.9%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	45	72	110	52	145	44	347	637	72	67	355	30
Future Volume (vph)	45	72	110	52	145	44	347	637	72	67	355	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2
Total Lost time (s)	5.9	5.9	5.9	5.9	5.9		6.7	6.7		6.7	6.7	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00		0.99	1.00	
Frt	1.00	1.00	0.85	1.00	0.97		1.00	0.98		1.00	0.99	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1725	1824	1543	1725	1791		1708	3456		1714	3528	
Flt Permitted	0.43	1.00	1.00	0.71	1.00		0.51	1.00		0.35	1.00	
Satd. Flow (perm)	788	1824	1543	1282	1791		911	3456		635	3528	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	49	78	120	57	158	48	377	692	78	73	386	33
RTOR Reduction (vph)	0	0	101	0	13	0	0	6	0	0	4	0
Lane Group Flow (vph)	49	78	19	57	193	0	377	764	0	73	415	0
Confl. Peds. (#/hr)									11	11		
Heavy Vehicles (%)	0%	3%	0%	0%	1%	2%	1%	1%	5%	0%	0%	0%
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)	16.0	16.0	16.0	16.0	16.0		71.4	71.4		71.4	71.4	
Effective Green, g (s)	16.0	16.0	16.0	16.0	16.0		71.4	71.4		71.4	71.4	
Actuated g/C Ratio	0.16	0.16	0.16	0.16	0.16		0.71	0.71		0.71	0.71	
Clearance Time (s)	5.9	5.9	5.9	5.9	5.9		6.7	6.7		6.7	6.7	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	126	291	246	205	286		650	2467		453	2518	
v/s Ratio Prot		0.04			c0.11			0.22			0.12	
v/s Ratio Perm	0.06		0.01	0.04			c0.41			0.12		
v/c Ratio	0.39	0.27	0.08	0.28	0.67		0.58	0.31		0.16	0.16	
Uniform Delay, d1	37.6	36.9	35.7	36.9	39.5		7.0	5.3		4.6	4.6	
Progression Factor	1.00	1.00	1.00	0.70	0.77		0.73	0.50		1.00	1.00	
Incremental Delay, d2	2.0	0.5	0.1	0.7	6.0		2.4	0.2		0.8	0.1	
Delay (s)	39.6	37.4	35.9	26.5	36.5		7.5	2.9		5.4	4.8	
Level of Service	D	D	D	C	D		A	A		A	A	
Approach Delay (s)		37.1			34.3			4.4			4.9	
Approach LOS		D			C			A			A	

Intersection Summary				
HCM 2000 Control Delay	11.9	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.60			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.6	
Intersection Capacity Utilization	68.0%	ICU Level of Service	C	
Analysis Period (min)	15			
c Critical Lane Group				

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations									
Traffic Volume (vph)	45	72	110	52	145	347	637	67	355
Future Volume (vph)	45	72	110	52	145	347	637	67	355
Lane Group Flow (vph)	49	78	120	57	206	377	770	73	419
Turn Type	Perm	NA	Perm	Perm	NA	Perm	NA	Perm	NA
Protected Phases		4			8		2		6
Permitted Phases	4		4	8		2		6	
Detector Phase	4	4	4	8	8	2	2	6	6
Switch Phase									
Minimum Initial (s)	8.0	8.0	8.0	8.0	8.0	5.0	5.0	5.0	5.0
Minimum Split (s)	23.9	23.9	23.9	23.9	23.9	24.7	24.7	24.7	24.7
Total Split (s)	36.0	36.0	36.0	36.0	36.0	64.0	64.0	64.0	64.0
Total Split (%)	36.0%	36.0%	36.0%	36.0%	36.0%	64.0%	64.0%	64.0%	64.0%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	4.6	4.6	4.6	4.6
All-Red Time (s)	2.2	2.2	2.2	2.2	2.2	2.1	2.1	2.1	2.1
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.9	5.9	5.9	5.9	5.9	6.7	6.7	6.7	6.7
Lead/Lag									
Lead-Lag Optimize?									
Recall Mode	None	None	None	None	None	C-Min	C-Min	C-Min	C-Min
v/c Ratio	0.39	0.27	0.34	0.28	0.69	0.58	0.31	0.16	0.17
Control Delay	45.0	37.4	9.2	27.8	39.3	8.9	3.1	6.7	5.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	45.0	37.4	9.2	27.8	39.3	8.9	3.1	6.7	5.1
Queue Length 50th (m)	9.1	14.1	0.0	5.5	32.1	11.6	11.1	4.1	12.0
Queue Length 95th (m)	19.6	25.9	14.4	22.3	60.4	m74.0	m14.6	11.6	21.6
Internal Link Dist (m)		107.2			416.6		192.1		478.0
Turn Bay Length (m)	22.0			24.3		24.4		46.2	
Base Capacity (vph)	237	549	548	385	550	650	2472	453	2521
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.21	0.14	0.22	0.15	0.37	0.58	0.31	0.16	0.17

Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 6: Liverpool Road & Glenanna Road

One-Access

Year 2024

A.M. Peak Hour

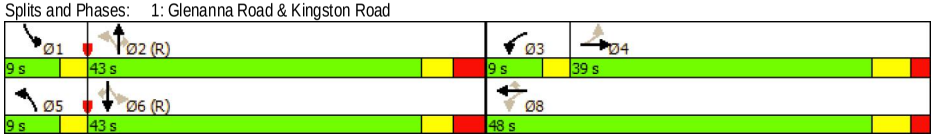
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	397	92	96	575	122	52	73	64	190	102	26
Future Volume (vph)	10	397	92	96	575	122	52	73	64	190	102	26
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2
Total Lost time (s)	6.4	6.4		3.0	6.4	6.4	3.0	7.0	7.0	3.0	7.0	7.0
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.98		1.00	1.00	0.96	1.00	1.00	0.93	1.00	1.00	0.88
Flpb, ped/bikes	0.99	1.00		1.00	1.00	1.00	0.94	1.00	1.00	0.97	1.00	1.00
Frt	1.00	0.97		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1568	3159		1650	3400	1464	1629	1860	1397	1641	1773	1365
Flt Permitted	0.41	1.00		0.25	1.00	1.00	0.69	1.00	1.00	0.65	1.00	1.00
Satd. Flow (perm)	685	3159		443	3400	1464	1175	1860	1397	1130	1773	1365
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	11	432	100	104	625	133	57	79	70	207	111	28
RTOR Reduction (vph)	0	23	0	0	0	0	0	0	43	0	0	16
Lane Group Flow (vph)	11	509	0	104	625	133	57	79	27	207	111	12
Confl. Peds. (#/hr)	8		25	25		8	35		34	34		35
Heavy Vehicles (%)	9%	8%	8%	4%	5%	1%	0%	1%	3%	2%	6%	0%
Turn Type	Perm	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4		3	8		5	2		1	6	
Permitted Phases	4			8		8	2		2	6		6
Actuated Green, G (s)	22.0	22.0		33.4	33.4	33.4	44.3	38.3	38.3	53.2	44.2	44.2
Effective Green, g (s)	22.0	22.0		33.4	33.4	33.4	44.3	38.3	38.3	53.2	44.2	44.2
Actuated g/C Ratio	0.22	0.22		0.33	0.33	0.33	0.44	0.38	0.38	0.53	0.44	0.44
Clearance Time (s)	6.4	6.4		3.0	6.4	6.4	3.0	7.0	7.0	3.0	7.0	7.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	150	694		249	1135	488	547	712	535	661	783	603
v/s Ratio Prot		c0.16		0.04	c0.18		0.01	0.04		c0.04	0.06	
v/s Ratio Perm	0.02			0.10		0.09	0.04		0.02	c0.13		0.01
v/c Ratio	0.07	0.73		0.42	0.55	0.27	0.10	0.11	0.05	0.31	0.14	0.02
Uniform Delay, d1	30.9	36.3		24.4	27.2	24.4	16.1	19.9	19.4	12.6	16.6	15.7
Progression Factor	0.58	0.73		1.00	1.00	1.00	1.00	1.00	1.00	0.81	0.87	1.00
Incremental Delay, d2	0.2	3.8		1.1	0.6	0.3	0.1	0.3	0.2	0.3	0.4	0.1
Delay (s)	18.0	30.1		25.5	27.8	24.7	16.2	20.2	19.6	10.5	14.8	15.8
Level of Service	B	C		C	C	C	B	C	B	B	B	B
Approach Delay (s)		29.9			27.0			18.9			12.3	
Approach LOS		C			C			B			B	

Intersection Summary				
HCM 2000 Control Delay	24.4	HCM 2000 Level of Service	C	
HCM 2000 Volume to Capacity ratio	0.47			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	19.4	
Intersection Capacity Utilization	54.7%	ICU Level of Service	A	
Analysis Period (min)	15			
c Critical Lane Group				

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations											
Traffic Volume (vph)	10	397	96	575	122	52	73	64	190	102	26
Future Volume (vph)	10	397	96	575	122	52	73	64	190	102	26
Lane Group Flow (vph)	11	532	104	625	133	57	79	70	207	111	28
Turn Type	Perm	NA	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4	3	8		5	2		1	6	
Permitted Phases	4		8		8	2		2	6		6
Detector Phase	4	4	3	8	8	5	2	2	1	6	6
Switch Phase											
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	8.0	8.0	5.0	8.0	8.0
Minimum Split (s)	24.4	24.4	8.0	24.4	24.4	8.0	25.4	25.4	8.0	25.4	25.4
Total Split (s)	39.0	39.0	9.0	48.0	48.0	9.0	43.0	43.0	9.0	43.0	43.0
Total Split (%)	39.0%	39.0%	9.0%	48.0%	48.0%	9.0%	43.0%	43.0%	9.0%	43.0%	43.0%
Yellow Time (s)	4.2	4.2	3.0	4.2	4.2	3.0	3.3	3.3	3.0	3.3	3.3
All-Red Time (s)	2.2	2.2	0.0	2.2	2.2	0.0	3.7	3.7	0.0	3.7	3.7
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.4	6.4	3.0	6.4	6.4	3.0	7.0	7.0	3.0	7.0	7.0
Lead/Lag	Lag	Lag	Lead			Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?											
Recall Mode	None	None	None	None	None	None	C-Min	C-Min	None	C-Min	C-Min
v/c Ratio	0.07	0.74	0.38	0.56	0.28	0.09	0.11	0.12	0.29	0.14	0.04
Control Delay	17.6	31.0	23.2	28.6	24.1	13.0	25.5	3.1	11.1	18.2	2.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	17.6	31.0	23.2	28.6	24.1	13.0	25.5	3.1	11.1	18.2	2.2
Queue Length 50th (m)	0.8	20.7	13.9	53.4	19.4	4.9	10.3	0.0	18.6	17.8	0.2
Queue Length 95th (m)	m2.2	23.8	21.9	60.5	29.5	13.3	25.9	5.7	49.6	33.8	2.3
Internal Link Dist (m)		393.2		523.9			174.6			416.6	
Turn Bay Length (m)	42.6		33.0		23.2	25.4		25.0	27.3		16.5
Base Capacity (vph)	223	1050	277	1426	614	612	785	649	707	820	687
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.05	0.51	0.38	0.44	0.22	0.09	0.10	0.11	0.29	0.14	0.04

Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 70
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Glenanna Road & Kingston Road



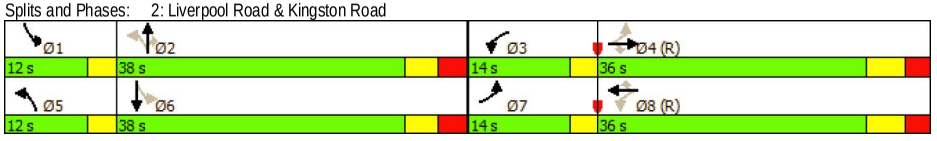
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	90	387	254	178	483	46	215	458	122	77	855	101
Future Volume (vph)	90	387	254	178	483	46	215	458	122	77	855	101
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2
Total Lost time (s)	3.0	7.0	7.0	3.0	7.0	7.0	3.0	6.9	6.9	3.0	6.9	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.91	
Frpb, ped/bikes	1.00	1.00	0.96	1.00	1.00	0.96	1.00	1.00	0.91	1.00	0.99	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.98	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1652	3368	1462	1639	3400	1487	1690	3500	1279	1665	4914	
Flt Permitted	0.39	1.00	1.00	0.38	1.00	1.00	0.17	1.00	1.00	0.47	1.00	
Satd. Flow (perm)	680	3368	1462	648	3400	1487	299	3500	1279	823	4914	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	98	421	276	193	525	50	234	498	133	84	929	110
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	80	0	14	0
Lane Group Flow (vph)	98	421	276	193	525	50	234	498	53	84	1025	0
Confl. Peds. (#/hr)	15		19	9		15	22		25	25		22
Heavy Vehicles (%)	4%	6%	1%	5%	5%	0%	2%	2%	10%	2%	2%	4%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		
Actuated Green, G (s)	30.9	23.3	23.3	36.9	26.3	26.3	49.2	39.6	39.6	41.2	34.6	
Effective Green, g (s)	30.9	23.3	23.3	36.9	26.3	26.3	49.2	39.6	39.6	41.2	34.6	
Actuated g/C Ratio	0.31	0.23	0.23	0.37	0.26	0.26	0.49	0.40	0.40	0.41	0.35	
Clearance Time (s)	3.0	7.0	7.0	3.0	7.0	7.0	3.0	6.9	6.9	3.0	6.9	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	283	784	340	344	894	391	308	1386	506	394	1700	
v/s Ratio Prot	0.03	0.13		c0.06	0.15		c0.09	0.14		0.01	0.21	
v/s Ratio Perm	0.08		c0.19	0.15		0.03	c0.29		0.04	0.07		
v/c Ratio	0.35	0.54	0.81	0.56	0.59	0.13	0.76	0.36	0.10	0.21	0.60	
Uniform Delay, d1	25.4	33.6	36.3	22.9	32.1	28.1	16.8	21.3	19.0	18.2	27.0	
Progression Factor	1.00	1.00	1.00	2.35	1.84	1.92	1.00	1.00	1.00	0.88	0.91	
Incremental Delay, d2	0.7	2.6	18.7	2.0	2.7	0.6	10.3	0.7	0.4	0.3	1.6	
Delay (s)	26.2	36.3	55.0	55.8	61.9	54.5	27.1	22.0	19.4	16.3	26.2	
Level of Service	C	D	D	E	E	D	C	C	B	B	C	
Approach Delay (s)		41.5			59.9			23.0			25.4	
Approach LOS		D			E			C			C	

Intersection Summary				
HCM 2000 Control Delay	35.9	HCM 2000 Level of Service	D	
HCM 2000 Volume to Capacity ratio	0.77			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	19.9	
Intersection Capacity Utilization	74.0%	ICU Level of Service	D	
Analysis Period (min)	15			
c Critical Lane Group				

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations											
Traffic Volume (vph)	90	387	254	178	483	46	215	458	122	77	855
Future Volume (vph)	90	387	254	178	483	46	215	458	122	77	855
Lane Group Flow (vph)	98	421	276	193	525	50	234	498	133	84	1039
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA
Protected Phases	7	4		3	8		5	2		1	6
Permitted Phases	4		4	8		8	2		2	6	
Detector Phase	7	4	4	3	8	8	5	2	2	1	6
Switch Phase											
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	11.9	25.0	25.0	9.5	25.0	25.0	9.5	24.9	24.9	8.0	24.9
Total Split (s)	14.0	36.0	36.0	14.0	36.0	36.0	12.0	38.0	38.0	12.0	38.0
Total Split (%)	14.0%	36.0%	36.0%	14.0%	36.0%	36.0%	12.0%	38.0%	38.0%	12.0%	38.0%
Yellow Time (s)	3.0	4.2	4.2	3.0	4.2	4.2	3.0	3.7	3.7	3.0	3.7
All-Red Time (s)	0.0	2.8	2.8	0.0	2.8	2.8	0.0	3.2	3.2	0.0	3.2
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	3.0	7.0	7.0	3.0	7.0	7.0	3.0	6.9	6.9	3.0	6.9
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag
Lead-Lag Optimize?											
Recall Mode	None	C-Min	C-Min	None	C-Min	C-Min	None	Max	Max	None	Max
v/c Ratio	0.29	0.52	0.79	0.53	0.56	0.12	0.75	0.36	0.23	0.19	0.62
Control Delay	19.2	34.9	51.8	48.9	60.0	52.9	33.3	24.4	5.6	13.2	27.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	19.2	34.9	51.8	48.9	60.0	52.9	33.3	24.4	5.6	13.2	27.1
Queue Length 50th (m)	11.8	39.0	52.4	39.4	59.5	10.6	25.9	39.1	0.0	7.5	61.0
Queue Length 95th (m)	20.6	51.3	78.5	60.7	77.0	22.6	#71.2	58.3	13.4	15.4	76.8
Internal Link Dist (m)		667.5			393.2			242.2			116.1
Turn Bay Length (m)	33.5		49.1	103.2		61.6	46.2		51.8	47.9	
Base Capacity (vph)	371	976	423	369	987	431	314	1384	586	460	1682
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.26	0.43	0.65	0.52	0.53	0.12	0.75	0.36	0.23	0.18	0.62

Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 13 (13%), Referenced to phase 4:EBTL and 8:WBTL, Start of Green
Natural Cycle: 75
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 2: Liverpool Road & Kingston Road



Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations									
Traffic Volume (vph)	47	138	250	70	87	113	368	73	642
Future Volume (vph)	47	138	250	70	87	113	368	73	642
Lane Group Flow (vph)	51	150	272	76	156	123	434	79	773
Turn Type	Perm	NA	Perm	Perm	NA	Perm	NA	Perm	NA
Protected Phases		4			8		2		6
Permitted Phases	4		4	8		2		6	
Detector Phase	4	4	4	8	8	2	2	6	6
Switch Phase									
Minimum Initial (s)	8.0	8.0	8.0	5.0	5.0	5.0	5.0	8.0	8.0
Minimum Split (s)	23.9	23.9	23.9	23.9	23.9	24.7	24.7	24.7	24.7
Total Split (s)	34.0	34.0	34.0	34.0	34.0	66.0	66.0	66.0	66.0
Total Split (%)	34.0%	34.0%	34.0%	34.0%	34.0%	66.0%	66.0%	66.0%	66.0%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	4.6	4.6	4.6	4.6
All-Red Time (s)	2.2	2.2	2.2	2.2	2.2	2.1	2.1	2.1	2.1
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.9	5.9	5.9	5.9	5.9	6.7	6.7	6.7	6.7
Lead/Lag									
Lead-Lag Optimize?									
Recall Mode	None	None	None	None	None	C-Min	C-Min	C-Min	C-Min
v/c Ratio	0.38	0.61	0.67	0.54	0.58	0.27	0.18	0.12	0.31
Control Delay	45.7	50.2	17.8	65.1	51.9	5.4	3.2	5.3	5.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	45.7	50.2	17.8	65.1	51.9	5.4	3.2	5.3	5.2
Queue Length 50th (m)	9.6	29.2	9.0	16.2	27.0	4.9	7.0	4.0	23.1
Queue Length 95th (m)	20.2	46.6	33.5	32.0	48.5	10.5	13.7	10.7	39.3
Internal Link Dist (m)		107.2			416.6		192.1		478.0
Turn Bay Length (m)	22.0			24.3		24.4		46.2	
Base Capacity (vph)	270	498	585	282	505	453	2470	636	2507
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.19	0.30	0.46	0.27	0.31	0.27	0.18	0.12	0.31

Intersection Summary

Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 55
Control Type: Actuated-Coordinated

Splits and Phases: 6: Liverpool Road & Glenanna Road

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	34	0	55	106	0	59	19	412	163	94	872	13
Future Volume (Veh/h)	34	0	55	106	0	59	19	412	163	94	872	13
Sign Control		Stop			Stop			Free			Free	
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)	37	0	60	115	0	64	21	448	177	102	948	14
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			TWLTL	
Median storage veh)											2	
Upstream signal (m)								140			216	
pX, platoon unblocked	0.92	0.92	0.97	0.92	0.92	0.91	0.97			0.91		
vC, conflicting volume	1489	1826	481	1316	1744	312	962			625		
vC1, stage 1 conf vol	1159	1159		578	578							
vC2, stage 2 conf vol	330	667		738	1166							
vCu, unblocked vol	1221	1586	405	1035	1498	43	901			387		
tC, single (s)	7.5	6.5	7.3	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)	6.5	5.5		6.5	5.5							
tF (s)	3.5	4.0	3.5	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	81	100	89	59	100	93	97			90		
cM capacity (veh/h)	194	224	529	280	218	931	741			1062		

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	97	115	64	21	299	326	102	632	330
Volume Left	37	115	0	21	0	0	102	0	0
Volume Right	60	0	64	0	0	177	0	0	14
cSH	319	280	931	741	1700	1700	1062	1700	1700
Volume to Capacity	0.30	0.41	0.07	0.03	0.18	0.19	0.10	0.37	0.19
Queue Length 95th (m)	10.0	15.3	1.8	0.7	0.0	0.0	2.5	0.0	0.0
Control Delay (s)	21.2	26.5	9.2	10.0	0.0	0.0	8.8	0.0	0.0
Lane LOS	C	D	A	B			A		
Approach Delay (s)	21.2	20.3		0.3			0.8		
Approach LOS	C	C							

Intersection Summary

Average Delay	3.4				
Intersection Capacity Utilization	50.4%	ICU Level of Service		A	
Analysis Period (min)	15				

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	47	138	250	70	87	56	113	368	31	73	642	69
Future Volume (vph)	47	138	250	70	87	56	113	368	31	73	642	69
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2
Total Lost time (s)	5.9	5.9	5.9	5.9	5.9		6.7	6.7		6.7	6.7	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		0.99	1.00		0.99	1.00	
Frt	1.00	1.00	0.85	1.00	0.94		1.00	0.99		1.00	0.99	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1658	1773	1513	1675	1717		1658	3360		1646	3409	
Flt Permitted	0.55	1.00	1.00	0.57	1.00		0.35	1.00		0.50	1.00	
Satd. Flow (perm)	963	1773	1513	1006	1717		617	3360		866	3409	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	51	150	272	76	95	61	123	400	34	79	698	75
RTOR Reduction (vph)	0	0	192	0	28	0	0	4	0	0	5	0
Lane Group Flow (vph)	51	150	80	76	128	0	123	430	0	79	768	0
Confl. Peds. (#/hr)							11		8	8		11
Heavy Vehicles (%)	4%	6%	2%	3%	3%	3%	3%	4%	14%	4%	3%	0%
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)	14.0	14.0	14.0	14.0	14.0		73.4	73.4		73.4	73.4	
Effective Green, g (s)	14.0	14.0	14.0	14.0	14.0		73.4	73.4		73.4	73.4	
Actuated g/C Ratio	0.14	0.14	0.14	0.14	0.14		0.73	0.73		0.73	0.73	
Clearance Time (s)	5.9	5.9	5.9	5.9	5.9		6.7	6.7		6.7	6.7	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	134	248	211	140	240		452	2466		635	2502	
v/s Ratio Prot		c0.08			0.07			0.13			c0.23	
v/s Ratio Perm	0.05		0.05	0.08			0.20			0.09		
v/c Ratio	0.38	0.60	0.38	0.54	0.54		0.27	0.17		0.12	0.31	
Uniform Delay, d1	39.1	40.4	39.1	40.0	40.0		4.4	4.1		3.9	4.6	
Progression Factor	1.00	1.00	1.00	1.30	1.39		0.71	0.71		1.00	1.00	
Incremental Delay, d2	1.8	4.1	1.1	4.2	2.3		1.5	0.2		0.4	0.3	
Delay (s)	40.9	44.5	40.2	56.4	57.7		4.6	3.0		4.3	4.9	
Level of Service	D	D	D	E	E		A	A		A	A	
Approach Delay (s)		41.6			57.3			3.4			4.8	
Approach LOS		D			E			A			A	

Intersection Summary				
HCM 2000 Control Delay	18.4	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.35			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.6	
Intersection Capacity Utilization	62.0%	ICU Level of Service	B	
Analysis Period (min)	15			
c Critical Lane Group				

P.M. Peak Hour

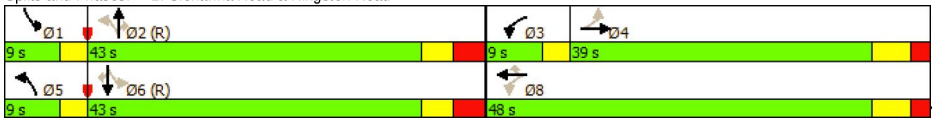
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	24	1184	142	156	595	132	119	177	194	178	199	36
Future Volume (vph)	24	1184	142	156	595	132	119	177	194	178	199	36
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2
Total Lost time (s)	6.4	6.4		3.0	6.4	6.4	3.0	7.0	7.0	3.0	7.0	7.0
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.98		1.00	1.00	0.90	1.00	1.00	0.91	1.00	1.00	0.73
Flpb, ped/bikes	0.97	1.00		1.00	1.00	1.00	0.93	1.00	1.00	0.97	1.00	1.00
Frt	1.00	0.98		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1666	3371		1658	3500	1373	1599	1879	1385	1673	1824	1130
Flt Permitted	0.41	1.00		0.08	1.00	1.00	0.47	1.00	1.00	0.53	1.00	1.00
Satd. Flow (perm)	712	3371		147	3500	1373	790	1879	1385	935	1824	1130
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	26	1287	154	170	647	143	129	192	211	193	216	39
RTOR Reduction (vph)	0	8	0	0	0	40	0	0	171	0	0	32
Lane Group Flow (vph)	26	1433	0	170	647	103	129	192	40	193	216	7
Confl. Peds. (#/hr)	30		55	55		30	91		50	50		91
Heavy Vehicles (%)	0%	2%	5%	4%	2%	1%	0%	0%	1%	0%	3%	0%
Turn Type	Perm	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4		3	8		5	2		1	6	
Permitted Phases	4			8		8	2		2	6		6
Actuated Green, G (s)	44.5	44.5		60.3	60.3	60.3	23.3	17.3	17.3	23.3	17.3	17.3
Effective Green, g (s)	44.5	44.5		60.3	60.3	60.3	23.3	17.3	17.3	23.3	17.3	17.3
Actuated g/C Ratio	0.44	0.44		0.60	0.60	0.60	0.23	0.17	0.17	0.23	0.17	0.17
Clearance Time (s)	6.4	6.4		3.0	6.4	6.4	3.0	7.0	7.0	3.0	7.0	7.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	316	1500		282	2110	827	232	325	239	262	315	195
v/s Ratio Prot		c0.43		c0.08	0.18		0.03	0.10		c0.04	0.12	
v/s Ratio Perm	0.04			0.29		0.07	0.10		0.03	c0.13		0.01
v/c Ratio	0.08	0.96		0.60	0.31	0.12	0.56	0.59	0.17	0.74	0.69	0.03
Uniform Delay, d1	16.0	26.8		20.8	9.7	8.5	32.5	38.1	35.2	34.7	38.8	34.4
Progression Factor	0.48	0.56		1.00	1.00	1.00	1.00	1.00	1.00	1.07	1.08	1.00
Incremental Delay, d2	0.1	8.1		3.6	0.1	0.1	2.9	7.7	1.5	10.3	11.5	0.3
Delay (s)	7.7	23.1		24.4	9.8	8.6	35.4	45.8	36.7	47.6	53.4	34.7
Level of Service	A	C		C	A	A	D	D	D	D	D	C
Approach Delay (s)		22.8			12.2			39.7			49.3	
Approach LOS		C			B			D			D	

Intersection Summary				
HCM 2000 Control Delay	25.9	HCM 2000 Level of Service	C	
HCM 2000 Volume to Capacity ratio	0.84			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	19.4	
Intersection Capacity Utilization	89.0%	ICU Level of Service	E	
Analysis Period (min)	15			
c Critical Lane Group				

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations											
Traffic Volume (vph)	24	1184	156	595	132	119	177	194	178	199	36
Future Volume (vph)	24	1184	156	595	132	119	177	194	178	199	36
Lane Group Flow (vph)	26	1441	170	647	143	129	192	211	193	216	39
Turn Type	Perm	NA	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4	3	8		5	2		1	6	
Permitted Phases	4		8		8	2		2	6		6
Detector Phase	4	4	3	8	8	5	2	2	1	6	6
Switch Phase											
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	24.4	24.4	8.0	24.4	24.4	8.0	25.0	25.0	8.0	25.0	25.0
Total Split (s)	39.0	39.0	9.0	48.0	48.0	9.0	43.0	43.0	9.0	43.0	43.0
Total Split (%)	39.0%	39.0%	9.0%	48.0%	48.0%	9.0%	43.0%	43.0%	9.0%	43.0%	43.0%
Yellow Time (s)	4.2	4.2	3.0	4.2	4.2	3.0	3.3	3.3	3.0	3.3	3.3
All-Red Time (s)	2.2	2.2	0.0	2.2	2.2	0.0	3.7	3.7	0.0	3.7	3.7
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.4	6.4	3.0	6.4	6.4	3.0	7.0	7.0	3.0	7.0	7.0
Lead/Lag	Lag	Lag	Lead			Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?											
Recall Mode	None	None	None	None	None	None	C-Min	C-Min	None	C-Min	C-Min
v/c Ratio	0.08	0.96	0.59	0.31	0.16	0.51	0.59	0.51	0.65	0.69	0.14
Control Delay	9.6	27.1	25.0	10.8	4.2	33.2	44.9	9.8	41.2	52.5	2.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	9.6	27.1	25.0	10.8	4.2	33.2	44.9	9.8	41.2	52.5	2.1
Queue Length 50th (m)	0.9	158.0	15.7	31.3	3.2	19.7	36.5	0.7	34.1	44.1	0.0
Queue Length 95th (m)	m2.8	m#216.7	39.7	49.2	13.2	31.7	55.0	19.2	40.7	67.0	1.5
Internal Link Dist (m)		393.2		523.9			174.6			416.6	
Turn Bay Length (m)	42.6		33.0		23.2	25.4		25.0	27.3		16.5
Base Capacity (vph)	316	1507	287	2110	868	252	676	631	296	656	472
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.08	0.96	0.59	0.31	0.16	0.51	0.28	0.33	0.65	0.33	0.08

Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Glenanna Road & Kingston Road



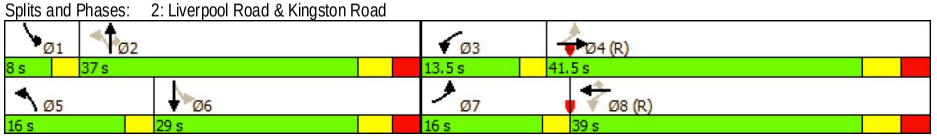
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	214	1048	330	226	515	78	302	936	278	109	370	84
Future Volume (vph)	214	1048	330	226	515	78	302	936	278	109	370	84
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2
Total Lost time (s)	3.0	7.4	7.4	3.0	7.4	7.4	3.0	6.9	6.9	3.0	6.9	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.91	
Frpb, ped/bikes	1.00	1.00	0.94	1.00	1.00	0.95	1.00	1.00	0.85	1.00	0.99	
Flpb, ped/bikes	0.99	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1699	3500	1416	1708	3500	1431	1677	3535	1273	1670	4898	
Flt Permitted	0.35	1.00	1.00	0.12	1.00	1.00	0.37	1.00	1.00	0.18	1.00	
Satd. Flow (perm)	627	3500	1416	219	3500	1431	660	3535	1273	318	4898	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	233	1139	359	246	560	85	328	1017	302	118	402	91
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	152	0	37	0
Lane Group Flow (vph)	233	1139	359	246	560	85	328	1017	150	118	456	0
Confl. Peds. (#/hr)	26		32	32		26	34		48	48		34
Heavy Vehicles (%)	1%	2%	2%	1%	2%	2%	2%	1%	3%	3%	0%	3%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		
Actuated Green, G (s)	45.9	34.1	34.1	43.3	32.8	32.8	38.1	30.1	30.1	27.1	22.1	
Effective Green, g (s)	45.9	34.1	34.1	43.3	32.8	32.8	38.1	30.1	30.1	27.1	22.1	
Actuated g/C Ratio	0.46	0.34	0.34	0.43	0.33	0.33	0.38	0.30	0.30	0.27	0.22	
Clearance Time (s)	3.0	7.4	7.4	3.0	7.4	7.4	3.0	6.9	6.9	3.0	6.9	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	414	1193	482	251	1148	469	383	1064	383	153	1082	
v/s Ratio Prot	c0.07	c0.33		c0.10	0.16		c0.11	c0.29		0.04	0.09	
v/s Ratio Perm	0.19		0.25	0.32		0.06	0.21		0.12	0.17		
v/c Ratio	0.56	0.95	0.74	0.98	0.49	0.18	0.86	0.96	0.39	0.77	0.42	
Uniform Delay, d1	17.3	32.2	29.1	25.3	26.9	24.0	24.8	34.3	27.7	31.0	33.5	
Progression Factor	1.00	1.00	1.00	1.36	1.44	1.45	1.00	1.00	1.00	1.12	1.05	
Incremental Delay, d2	1.8	17.2	10.0	50.2	1.4	0.8	16.9	17.8	0.7	21.0	0.3	
Delay (s)	19.1	49.4	39.1	84.5	40.1	35.5	41.7	52.1	28.4	55.9	35.4	
Level of Service	B	D	D	F	D	D	D	D	C	E	D	
Approach Delay (s)		43.2			51.9			45.7			39.4	
Approach LOS		D			D			D			D	

Intersection Summary				
HCM 2000 Control Delay	45.1	HCM 2000 Level of Service	D	
HCM 2000 Volume to Capacity ratio	0.98			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	20.3	
Intersection Capacity Utilization	92.0%	ICU Level of Service	F	
Analysis Period (min)	15			
c Critical Lane Group				

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations											
Traffic Volume (vph)	214	1048	330	226	515	78	302	936	278	109	370
Future Volume (vph)	214	1048	330	226	515	78	302	936	278	109	370
Lane Group Flow (vph)	233	1139	359	246	560	85	328	1017	302	118	493
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA
Protected Phases	7	4		3	8		5	2		1	6
Permitted Phases	4		4	8		8	2		2	6	
Detector Phase	7	4	4	3	8	8	5	2	2	1	6
Switch Phase											
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	8.0	25.4	25.4	8.5	25.4	25.4	8.0	24.9	24.9	8.0	24.9
Total Split (s)	16.0	41.5	41.5	13.5	39.0	39.0	16.0	37.0	37.0	8.0	29.0
Total Split (%)	16.0%	41.5%	41.5%	13.5%	39.0%	39.0%	16.0%	37.0%	37.0%	8.0%	29.0%
Yellow Time (s)	3.0	4.2	4.2	3.0	4.2	4.2	3.0	3.7	3.7	3.0	3.7
All-Red Time (s)	0.0	3.2	3.2	0.0	3.2	3.2	0.0	3.2	3.2	0.0	3.2
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	3.0	7.4	7.4	3.0	7.4	7.4	3.0	6.9	6.9	3.0	6.9
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag
Lead-Lag Optimize?											
Recall Mode	None	C-Min	C-Min	None	C-Min	C-Min	None	Min	Min	None	Min
v/c Ratio	0.53	0.95	0.74	0.95	0.49	0.18	0.80	0.96	0.57	0.72	0.44
Control Delay	18.1	50.2	40.2	73.2	41.0	37.2	38.6	53.9	13.4	48.9	33.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.1	50.2	40.2	73.2	41.0	37.2	38.6	53.9	13.4	48.9	33.2
Queue Length 50th (m)	25.2	118.2	64.0	40.5	61.7	15.4	47.1	106.7	13.0	13.5	26.3
Queue Length 95th (m)	40.5	#163.6	#102.7	#83.1	76.7	29.2	#85.2	#149.8	40.5	#33.8	42.8
Internal Link Dist (m)		667.5			393.2			242.2			116.1
Turn Bay Length (m)	33.5		49.1	103.2		61.6	46.2		51.8	47.9	
Base Capacity (vph)	461	1193	482	260	1146	468	408	1064	534	165	1118
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.51	0.95	0.74	0.95	0.49	0.18	0.80	0.96	0.57	0.72	0.44

Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 13 (13%), Referenced to phase 4:EBTL and 8:WBTL, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 2: Liverpool Road & Kingston Road



Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations									
Traffic Volume (vph)	45	72	111	53	145	349	612	67	345
Future Volume (vph)	45	72	111	53	145	349	612	67	345
Lane Group Flow (vph)	49	78	121	58	206	379	743	73	408
Turn Type	Perm	NA	Perm	Perm	NA	Perm	NA	Perm	NA
Protected Phases		4			8		2		6
Permitted Phases	4		4	8		2		6	
Detector Phase	4	4	4	8	8	2	2	6	6
Switch Phase									
Minimum Initial (s)	8.0	8.0	8.0	8.0	8.0	5.0	5.0	5.0	5.0
Minimum Split (s)	23.9	23.9	23.9	23.9	23.9	24.7	24.7	24.7	24.7
Total Split (s)	36.0	36.0	36.0	36.0	36.0	64.0	64.0	64.0	64.0
Total Split (%)	36.0%	36.0%	36.0%	36.0%	36.0%	64.0%	64.0%	64.0%	64.0%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	4.6	4.6	4.6	4.6
All-Red Time (s)	2.2	2.2	2.2	2.2	2.2	2.1	2.1	2.1	2.1
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.9	5.9	5.9	5.9	5.9	6.7	6.7	6.7	6.7
Lead/Lag									
Lead-Lag Optimize?									
Recall Mode	None	None	None	None	None	C-Min	C-Min	C-Min	C-Min
v/c Ratio	0.39	0.27	0.35	0.28	0.69	0.58	0.30	0.16	0.16
Control Delay	45.0	37.4	9.2	27.8	39.1	9.0	3.1	6.6	5.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	45.0	37.4	9.2	27.8	39.1	9.0	3.1	6.6	5.1
Queue Length 50th (m)	9.1	14.1	0.0	5.3	23.5	13.1	12.0	4.1	11.6
Queue Length 95th (m)	19.6	25.9	14.5	22.8	60.4	m75.8	m14.1	11.5	21.0
Internal Link Dist (m)		107.2			416.6		192.1		478.0
Turn Bay Length (m)	22.0			24.3		24.4		46.2	
Base Capacity (vph)	237	549	549	385	550	656	2470	467	2521
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.21	0.14	0.22	0.15	0.37	0.58	0.30	0.16	0.16

Intersection Summary

Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 6: Liverpool Road & Glenanna Road

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	23	0	44	123	0	98	58	923	247	76	396	36
Future Volume (Veh/h)	23	0	44	123	0	98	58	923	247	76	396	36
Sign Control		Stop			Stop			Free			Free	
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)	25	0	48	134	0	107	63	1003	268	83	430	39
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			TWLTL	
Median storage veh)											2	
Upstream signal (m)								140			216	
pX, platoon unblocked	0.72	0.72		0.72	0.72	0.72				0.72		
vC, conflicting volume	1350	2012	234	1692	1898	636	469			1271		
vC1, stage 1 conf vol	616	616		1263	1263							
vC2, stage 2 conf vol	734	1397		429	635							
vCu, unblocked vol	717	1634	234	1191	1476	0	469			608		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)	6.5	5.5		6.5	5.5							
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	93	100	94	48	100	86	94			88		
cM capacity (veh/h)	344	179	773	258	250	786	1103			709		

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	73	134	107	63	669	602	83	287	182
Volume Left	25	134	0	63	0	0	83	0	0
Volume Right	48	0	107	0	0	268	0	0	39
cSH	542	258	786	1103	1700	1700	709	1700	1700
Volume to Capacity	0.13	0.52	0.14	0.06	0.39	0.35	0.12	0.17	0.11
Queue Length 95th (m)	3.7	22.0	3.8	1.5	0.0	0.0	3.2	0.0	0.0
Control Delay (s)	12.7	33.1	10.3	8.5	0.0	0.0	10.8	0.0	0.0
Lane LOS	B	D	B	A			B		
Approach Delay (s)	12.7	23.0		0.4			1.6		
Approach LOS	B	C							

Intersection Summary

Average Delay	3.6				
Intersection Capacity Utilization	61.1%	ICU Level of Service		B	
Analysis Period (min)	15				

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	45	72	111	53	145	44	349	612	72	67	345	30
Future Volume (vph)	45	72	111	53	145	44	349	612	72	67	345	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2
Total Lost time (s)	5.9	5.9	5.9	5.9	5.9		6.7	6.7		6.7	6.7	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00		0.99	1.00	
Frt	1.00	1.00	0.85	1.00	0.97		1.00	0.98		1.00	0.99	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1725	1824	1543	1725	1791		1708	3454		1714	3527	
Flt Permitted	0.43	1.00	1.00	0.71	1.00		0.51	1.00		0.36	1.00	
Satd. Flow (perm)	788	1824	1543	1282	1791		921	3454		655	3527	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	49	78	121	58	158	48	379	665	78	73	375	33
RTOR Reduction (vph)	0	0	102	0	13	0	0	6	0	0	4	0
Lane Group Flow (vph)	49	78	19	58	193	0	379	737	0	73	404	0
Confl. Peds. (#/hr)									11	11		
Heavy Vehicles (%)	0%	3%	0%	0%	1%	2%	1%	1%	5%	0%	0%	0%
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)	16.0	16.0	16.0	16.0	16.0		71.4	71.4		71.4	71.4	
Effective Green, g (s)	16.0	16.0	16.0	16.0	16.0		71.4	71.4		71.4	71.4	
Actuated g/C Ratio	0.16	0.16	0.16	0.16	0.16		0.71	0.71		0.71	0.71	
Clearance Time (s)	5.9	5.9	5.9	5.9	5.9		6.7	6.7		6.7	6.7	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	126	291	246	205	286		657	2466		467	2518	
v/s Ratio Prot		0.04			c0.11			0.21			0.11	
v/s Ratio Perm	0.06		0.01	0.05			c0.41			0.11		
v/c Ratio	0.39	0.27	0.08	0.28	0.67		0.58	0.30		0.16	0.16	
Uniform Delay, d1	37.6	36.9	35.7	37.0	39.5		7.0	5.2		4.6	4.6	
Progression Factor	1.00	1.00	1.00	0.69	0.76		0.74	0.51		1.00	1.00	
Incremental Delay, d2	2.0	0.5	0.1	0.7	6.0		2.4	0.2		0.7	0.1	
Delay (s)	39.6	37.4	35.9	26.4	36.2		7.6	2.9		5.3	4.8	
Level of Service	D	D	D	C	D		A	A		A	A	
Approach Delay (s)		37.1			34.1			4.5			4.8	
Approach LOS		D			C			A			A	

Intersection Summary				
HCM 2000 Control Delay	12.1	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.59			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.6	
Intersection Capacity Utilization	67.8%	ICU Level of Service	C	
Analysis Period (min)	15			
c Critical Lane Group				

Year 2029

A.M. Peak Hour

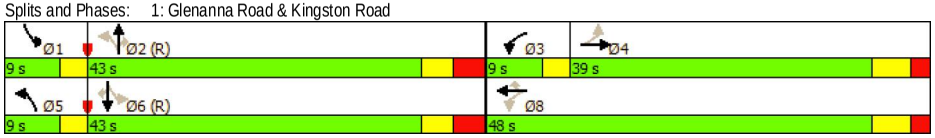
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	407	92	96	590	122	52	73	64	190	102	26
Future Volume (vph)	10	407	92	96	590	122	52	73	64	190	102	26
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2
Total Lost time (s)	6.4	6.4		3.0	6.4	6.4	3.0	7.0	7.0	3.0	7.0	7.0
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.98		1.00	1.00	0.96	1.00	1.00	0.93	1.00	1.00	0.88
Flpb, ped/bikes	0.99	1.00		1.00	1.00	1.00	0.94	1.00	1.00	0.97	1.00	1.00
Frt	1.00	0.97		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1568	3162		1651	3400	1464	1629	1860	1397	1641	1773	1365
Flt Permitted	0.41	1.00		0.25	1.00	1.00	0.69	1.00	1.00	0.65	1.00	1.00
Satd. Flow (perm)	674	3162		437	3400	1464	1175	1860	1397	1129	1773	1365
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	11	442	100	104	641	133	57	79	70	207	111	28
RTOR Reduction (vph)	0	23	0	0	0	0	0	0	44	0	0	16
Lane Group Flow (vph)	11	519	0	104	641	133	57	79	26	207	111	12
Confl. Peds. (#/hr)	8		25	25		8	35		34	34		35
Heavy Vehicles (%)	9%	8%	8%	4%	5%	1%	0%	1%	3%	2%	6%	0%
Turn Type	Perm	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4		3	8		5	2		1	6	
Permitted Phases	4			8		8	2		2	6		6
Actuated Green, G (s)	22.4	22.4		33.8	33.8	33.8	43.8	37.8	37.8	52.8	43.8	43.8
Effective Green, g (s)	22.4	22.4		33.8	33.8	33.8	43.8	37.8	37.8	52.8	43.8	43.8
Actuated g/C Ratio	0.22	0.22		0.34	0.34	0.34	0.44	0.38	0.38	0.53	0.44	0.44
Clearance Time (s)	6.4	6.4		3.0	6.4	6.4	3.0	7.0	7.0	3.0	7.0	7.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	150	708		249	1149	494	541	703	528	657	776	597
v/s Ratio Prot		c0.16		0.03	c0.19		0.01	0.04		c0.04	0.06	
v/s Ratio Perm	0.02			0.11		0.09	0.04		0.02	c0.13		0.01
v/c Ratio	0.07	0.73		0.42	0.56	0.27	0.11	0.11	0.05	0.32	0.14	0.02
Uniform Delay, d1	30.6	36.0		24.1	27.0	24.1	16.4	20.2	19.7	12.8	16.8	15.9
Progression Factor	0.57	0.72		1.00	1.00	1.00	1.00	1.00	1.00	0.81	0.86	1.00
Incremental Delay, d2	0.2	3.8		1.1	0.6	0.3	0.1	0.3	0.2	0.3	0.4	0.1
Delay (s)	17.7	29.8		25.2	27.6	24.4	16.5	20.5	19.9	10.6	14.9	16.0
Level of Service	B	C		C	C	C	B	C	B	B	B	B
Approach Delay (s)		29.5			26.8			19.2			12.4	
Approach LOS		C			C			B			B	

Intersection Summary				
HCM 2000 Control Delay	24.3	HCM 2000 Level of Service	C	
HCM 2000 Volume to Capacity ratio	0.47			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	19.4	
Intersection Capacity Utilization	54.9%	ICU Level of Service	A	
Analysis Period (min)	15			
c Critical Lane Group				

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations											
Traffic Volume (vph)	10	407	96	590	122	52	73	64	190	102	26
Future Volume (vph)	10	407	96	590	122	52	73	64	190	102	26
Lane Group Flow (vph)	11	542	104	641	133	57	79	70	207	111	28
Turn Type	Perm	NA	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4	3	8		5	2		1	6	
Permitted Phases	4		8		8	2		2	6		6
Detector Phase	4	4	3	8	8	5	2	2	1	6	6
Switch Phase											
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	8.0	8.0	5.0	8.0	8.0
Minimum Split (s)	24.4	24.4	8.0	24.4	24.4	8.0	25.4	25.4	8.0	25.4	25.4
Total Split (s)	39.0	39.0	9.0	48.0	48.0	9.0	43.0	43.0	9.0	43.0	43.0
Total Split (%)	39.0%	39.0%	9.0%	48.0%	48.0%	9.0%	43.0%	43.0%	9.0%	43.0%	43.0%
Yellow Time (s)	4.2	4.2	3.0	4.2	4.2	3.0	3.3	3.3	3.0	3.3	3.3
All-Red Time (s)	2.2	2.2	0.0	2.2	2.2	0.0	3.7	3.7	0.0	3.7	3.7
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.4	6.4	3.0	6.4	6.4	3.0	7.0	7.0	3.0	7.0	7.0
Lead/Lag	Lag	Lag	Lead			Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?											
Recall Mode	None	None	None	None	None	None	C-Min	C-Min	None	C-Min	C-Min
v/c Ratio	0.07	0.74	0.38	0.57	0.27	0.09	0.11	0.12	0.29	0.14	0.04
Control Delay	17.3	30.7	22.9	28.5	23.8	13.2	25.8	3.1	11.2	18.3	2.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	17.3	30.7	22.9	28.5	23.8	13.2	25.8	3.1	11.2	18.3	2.1
Queue Length 50th (m)	0.8	20.7	13.8	54.7	19.3	5.0	10.4	0.0	20.2	17.8	0.2
Queue Length 95th (m)	m2.1	23.8	21.7	61.7	29.2	13.4	26.1	5.7	48.6	33.8	2.3
Internal Link Dist (m)		393.2		523.9			174.6			416.6	
Turn Bay Length (m)	42.6		33.0		23.2	25.4		25.0	27.3		16.5
Base Capacity (vph)	219	1050	277	1428	615	607	781	646	703	814	682
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.05	0.52	0.38	0.45	0.22	0.09	0.10	0.11	0.29	0.14	0.04

Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 70
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Glenanna Road & Kingston Road



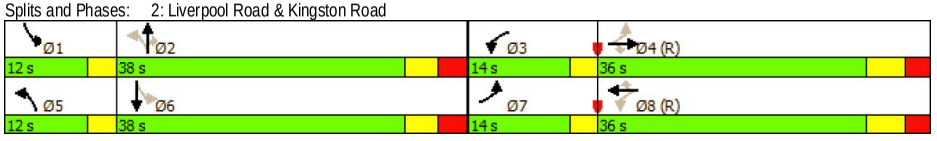
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	90	396	254	178	495	46	215	469	122	77	875	101
Future Volume (vph)	90	396	254	178	495	46	215	469	122	77	875	101
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2
Total Lost time (s)	3.0	7.0	7.0	3.0	7.0	7.0	3.0	6.9	6.9	3.0	6.9	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.91	
Frpb, ped/bikes	1.00	1.00	0.96	1.00	1.00	0.96	1.00	1.00	0.91	1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1652	3368	1462	1639	3400	1487	1690	3500	1279	1666	4916	
Flt Permitted	0.38	1.00	1.00	0.37	1.00	1.00	0.16	1.00	1.00	0.46	1.00	
Satd. Flow (perm)	659	3368	1462	634	3400	1487	285	3500	1279	814	4916	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	98	430	276	193	538	50	234	510	133	84	951	110
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	80	0	14	0
Lane Group Flow (vph)	98	430	276	193	538	50	234	510	53	84	1047	0
Confl. Peds. (#/hr)	15		19	9		15	22		25	25		22
Heavy Vehicles (%)	4%	6%	1%	5%	5%	0%	2%	2%	10%	2%	2%	4%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		
Actuated Green, G (s)	30.9	23.3	23.3	36.9	26.3	26.3	49.2	39.6	39.6	41.0	34.4	
Effective Green, g (s)	30.9	23.3	23.3	36.9	26.3	26.3	49.2	39.6	39.6	41.0	34.4	
Actuated g/C Ratio	0.31	0.23	0.23	0.37	0.26	0.26	0.49	0.40	0.40	0.41	0.34	
Clearance Time (s)	3.0	7.0	7.0	3.0	7.0	7.0	3.0	6.9	6.9	3.0	6.9	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	279	784	340	340	894	391	306	1386	506	389	1691	
v/s Ratio Prot	0.03	0.13		c0.06	0.16		c0.09	0.15		0.01	0.21	
v/s Ratio Perm	0.08		c0.19	0.15		0.03	c0.29		0.04	0.07		
v/c Ratio	0.35	0.55	0.81	0.57	0.60	0.13	0.76	0.37	0.10	0.22	0.62	
Uniform Delay, d1	25.5	33.7	36.3	22.9	32.3	28.1	17.0	21.4	19.0	18.3	27.3	
Progression Factor	1.00	1.00	1.00	2.36	1.84	1.92	1.00	1.00	1.00	0.93	0.93	
Incremental Delay, d2	0.8	2.8	18.7	2.1	2.8	0.6	10.8	0.8	0.4	0.3	1.7	
Delay (s)	26.2	36.5	55.0	56.1	62.3	54.5	27.9	22.1	19.4	17.3	27.1	
Level of Service	C	D	D	E	E	D	C	C	B	B	C	
Approach Delay (s)		41.6			60.3			23.2			26.4	
Approach LOS		D			E			C			C	

Intersection Summary				
HCM 2000 Control Delay	36.3	HCM 2000 Level of Service	D	
HCM 2000 Volume to Capacity ratio	0.78			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	19.9	
Intersection Capacity Utilization	74.4%	ICU Level of Service	D	
Analysis Period (min)	15			
c Critical Lane Group				

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations											
Traffic Volume (vph)	90	396	254	178	495	46	215	469	122	77	875
Future Volume (vph)	90	396	254	178	495	46	215	469	122	77	875
Lane Group Flow (vph)	98	430	276	193	538	50	234	510	133	84	1061
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA
Protected Phases	7	4		3	8		5	2		1	6
Permitted Phases	4		4	8		8	2		2	6	
Detector Phase	7	4	4	3	8	8	5	2	2	1	6
Switch Phase											
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	11.9	25.0	25.0	9.5	25.0	25.0	9.5	24.9	24.9	8.0	24.9
Total Split (s)	14.0	36.0	36.0	14.0	36.0	36.0	12.0	38.0	38.0	12.0	38.0
Total Split (%)	14.0%	36.0%	36.0%	14.0%	36.0%	36.0%	12.0%	38.0%	38.0%	12.0%	38.0%
Yellow Time (s)	3.0	4.2	4.2	3.0	4.2	4.2	3.0	3.7	3.7	3.0	3.7
All-Red Time (s)	0.0	2.8	2.8	0.0	2.8	2.8	0.0	3.2	3.2	0.0	3.2
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	3.0	7.0	7.0	3.0	7.0	7.0	3.0	6.9	6.9	3.0	6.9
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag
Lead-Lag Optimize?											
Recall Mode	None	C-Min	C-Min	None	C-Min	C-Min	None	Max	Max	None	Max
v/c Ratio	0.30	0.53	0.79	0.53	0.58	0.12	0.75	0.37	0.23	0.19	0.63
Control Delay	19.3	35.1	51.8	49.3	60.3	52.9	34.2	24.5	5.6	13.9	28.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	19.3	35.1	51.8	49.3	60.3	52.9	34.2	24.5	5.6	13.9	28.1
Queue Length 50th (m)	11.8	39.8	52.4	39.5	61.3	10.7	25.9	40.3	0.0	7.4	62.4
Queue Length 95th (m)	20.6	52.4	78.5	61.2	78.8	23.0	#73.3	59.8	13.4	16.6	82.0
Internal Link Dist (m)		667.5			393.2			242.2			116.1
Turn Bay Length (m)	33.5		49.1	103.2		61.6	46.2		51.8	47.9	
Base Capacity (vph)	365	976	423	366	987	431	311	1384	586	454	1672
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.27	0.44	0.65	0.53	0.55	0.12	0.75	0.37	0.23	0.19	0.63

Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 13 (13%), Referenced to phase 4:EBTL and 8:WBTL, Start of Green
Natural Cycle: 75
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 2: Liverpool Road & Kingston Road



Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations									
Traffic Volume (vph)	47	138	250	70	87	113	379	73	662
Future Volume (vph)	47	138	250	70	87	113	379	73	662
Lane Group Flow (vph)	51	150	272	76	156	123	446	79	795
Turn Type	Perm	NA	Perm	Perm	NA	Perm	NA	Perm	NA
Protected Phases		4			8		2		6
Permitted Phases	4		4	8		2		6	
Detector Phase	4	4	4	8	8	2	2	6	6
Switch Phase									
Minimum Initial (s)	8.0	8.0	8.0	5.0	5.0	5.0	5.0	8.0	8.0
Minimum Split (s)	23.9	23.9	23.9	23.9	23.9	24.7	24.7	24.7	24.7
Total Split (s)	34.0	34.0	34.0	34.0	34.0	66.0	66.0	66.0	66.0
Total Split (%)	34.0%	34.0%	34.0%	34.0%	34.0%	66.0%	66.0%	66.0%	66.0%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	4.6	4.6	4.6	4.6
All-Red Time (s)	2.2	2.2	2.2	2.2	2.2	2.1	2.1	2.1	2.1
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.9	5.9	5.9	5.9	5.9	6.7	6.7	6.7	6.7
Lead/Lag									
Lead-Lag Optimize?									
Recall Mode	None	None	None	None	None	C-Min	C-Min	C-Min	C-Min
v/c Ratio	0.38	0.60	0.69	0.54	0.58	0.28	0.18	0.13	0.32
Control Delay	45.3	49.7	19.7	62.5	50.0	5.5	3.2	5.4	5.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	45.3	49.7	19.7	62.5	50.0	5.5	3.2	5.4	5.3
Queue Length 50th (m)	9.6	29.2	11.1	16.3	27.2	5.2	7.1	4.0	24.0
Queue Length 95th (m)	20.1	46.2	35.9	29.7	44.7	9.8	13.1	11.0	41.7
Internal Link Dist (m)		107.2			416.6		192.1		478.0
Turn Bay Length (m)	22.0			24.3		24.4		46.2	
Base Capacity (vph)	271	498	577	283	505	440	2470	627	2506
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.19	0.30	0.47	0.27	0.31	0.28	0.18	0.13	0.32

Intersection Summary

Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 55
Control Type: Actuated-Coordinated

Splits and Phases: 6: Liverpool Road & Glenanna Road

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	34	0	55	106	0	59	19	423	163	94	892	13
Future Volume (Veh/h)	34	0	55	106	0	59	19	423	163	94	892	13
Sign Control		Stop			Stop			Free			Free	
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)	37	0	60	115	0	64	21	460	177	102	970	14
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			TWLTL	
Median storage veh)											2	
Upstream signal (m)								140			216	
pX, platoon unblocked	0.92	0.92	0.97	0.92	0.92	0.91	0.97			0.91		
vC, conflicting volume	1517	1860	492	1340	1778	318	984			637		
vC1, stage 1 conf vol	1181	1181		590	590							
vC2, stage 2 conf vol	336	679		749	1188							
vCu, unblocked vol	1225	1597	403	1033	1509	39	912			391		
tC, single (s)	7.5	6.5	7.3	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)	6.5	5.5		6.5	5.5							
tF (s)	3.5	4.0	3.5	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	80	100	89	59	100	93	97			90		
cM capacity (veh/h)	189	220	528	279	214	933	729			1054		

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	97	115	64	21	307	330	102	647	337
Volume Left	37	115	0	21	0	0	102	0	0
Volume Right	60	0	64	0	0	177	0	0	14
cSH	314	279	933	729	1700	1700	1054	1700	1700
Volume to Capacity	0.31	0.41	0.07	0.03	0.18	0.19	0.10	0.38	0.20
Queue Length 95th (m)	10.2	15.4	1.8	0.7	0.0	0.0	2.6	0.0	0.0
Control Delay (s)	21.5	26.7	9.1	10.1	0.0	0.0	8.8	0.0	0.0
Lane LOS	C	D	A	B			A		
Approach Delay (s)	21.5	20.4		0.3			0.8		
Approach LOS	C	C							

Intersection Summary

Average Delay	3.4				
Intersection Capacity Utilization	50.9%	ICU Level of Service		A	
Analysis Period (min)	15				

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	47	138	250	70	87	56	113	379	31	73	662	69
Future Volume (vph)	47	138	250	70	87	56	113	379	31	73	662	69
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2
Total Lost time (s)	5.9	5.9	5.9	5.9	5.9		6.7	6.7		6.7	6.7	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		0.99	1.00		0.99	1.00	
Frt	1.00	1.00	0.85	1.00	0.94		1.00	0.99		1.00	0.99	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1658	1773	1513	1675	1717		1658	3362		1647	3410	
Flt Permitted	0.55	1.00	1.00	0.57	1.00		0.34	1.00		0.49	1.00	
Satd. Flow (perm)	965	1773	1513	1008	1717		601	3362		856	3410	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	51	150	272	76	95	61	123	412	34	79	720	75
RTOR Reduction (vph)	0	0	182	0	27	0	0	4	0	0	5	0
Lane Group Flow (vph)	51	150	90	76	129	0	123	442	0	79	790	0
Confl. Peds. (#/hr)							11		8	8		11
Heavy Vehicles (%)	4%	6%	2%	3%	3%	3%	3%	4%	14%	4%	3%	0%
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)	14.1	14.1	14.1	14.1	14.1		73.3	73.3		73.3	73.3	
Effective Green, g (s)	14.1	14.1	14.1	14.1	14.1		73.3	73.3		73.3	73.3	
Actuated g/C Ratio	0.14	0.14	0.14	0.14	0.14		0.73	0.73		0.73	0.73	
Clearance Time (s)	5.9	5.9	5.9	5.9	5.9		6.7	6.7		6.7	6.7	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	136	249	213	142	242		440	2464		627	2499	
v/s Ratio Prot		c0.08			0.07			0.13			c0.23	
v/s Ratio Perm	0.05		0.06	0.08			0.20			0.09		
v/c Ratio	0.38	0.60	0.42	0.54	0.53		0.28	0.18		0.13	0.32	
Uniform Delay, d1	39.0	40.3	39.2	39.9	39.9		4.5	4.1		3.9	4.6	
Progression Factor	1.00	1.00	1.00	1.26	1.34		0.68	0.68		1.00	1.00	
Incremental Delay, d2	1.7	4.1	1.4	3.8	2.2		1.5	0.2		0.4	0.3	
Delay (s)	40.7	44.4	40.6	53.9	55.6		4.6	2.9		4.3	5.0	
Level of Service	D	D	D	D	E		A	A		A	A	
Approach Delay (s)		41.8			55.0			3.3			4.9	
Approach LOS		D			E			A			A	

Intersection Summary				
HCM 2000 Control Delay	18.0	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.36			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.6	
Intersection Capacity Utilization	62.5%	ICU Level of Service	B	
Analysis Period (min)	15			
c Critical Lane Group				

P.M. Peak Hour

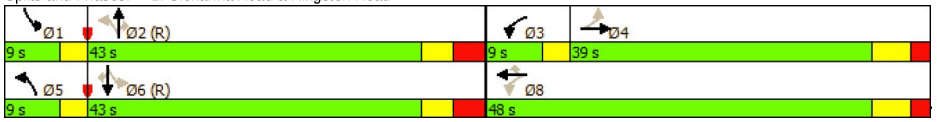
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	24	1214	142	156	610	132	119	177	194	178	199	36
Future Volume (vph)	24	1214	142	156	610	132	119	177	194	178	199	36
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2
Total Lost time (s)	6.4	6.4		3.0	6.4	6.4	3.0	7.0	7.0	3.0	7.0	7.0
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.98		1.00	1.00	0.90	1.00	1.00	0.91	1.00	1.00	0.73
Flpb, ped/bikes	0.97	1.00		1.00	1.00	1.00	0.93	1.00	1.00	0.97	1.00	1.00
Frt	1.00	0.98		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1668	3374		1658	3500	1373	1599	1879	1385	1673	1824	1130
Flt Permitted	0.40	1.00		0.08	1.00	1.00	0.47	1.00	1.00	0.53	1.00	1.00
Satd. Flow (perm)	702	3374		147	3500	1373	790	1879	1385	935	1824	1130
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	26	1320	154	170	663	143	129	192	211	193	216	39
RTOR Reduction (vph)	0	7	0	0	0	39	0	0	171	0	0	32
Lane Group Flow (vph)	26	1467	0	170	663	104	129	192	40	193	216	7
Confl. Peds. (#/hr)	30		55	55		30	91		50	50		91
Heavy Vehicles (%)	0%	2%	5%	4%	2%	1%	0%	0%	1%	0%	3%	0%
Turn Type	Perm	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4		3	8		5	2		1	6	
Permitted Phases	4			8		8	2		2	6		6
Actuated Green, G (s)	44.5	44.5		60.3	60.3	60.3	23.3	17.3	17.3	23.3	17.3	17.3
Effective Green, g (s)	44.5	44.5		60.3	60.3	60.3	23.3	17.3	17.3	23.3	17.3	17.3
Actuated g/C Ratio	0.44	0.44		0.60	0.60	0.60	0.23	0.17	0.17	0.23	0.17	0.17
Clearance Time (s)	6.4	6.4		3.0	6.4	6.4	3.0	7.0	7.0	3.0	7.0	7.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	312	1501		282	2110	827	232	325	239	262	315	195
v/s Ratio Prot		c0.43		c0.08	0.19		0.03	0.10		c0.04	0.12	
v/s Ratio Perm	0.04			0.29		0.08	0.10		0.03	c0.13		0.01
v/c Ratio	0.08	0.98		0.60	0.31	0.13	0.56	0.59	0.17	0.74	0.69	0.03
Uniform Delay, d1	16.0	27.3		21.1	9.7	8.5	32.5	38.1	35.2	34.7	38.8	34.4
Progression Factor	0.48	0.56		1.00	1.00	1.00	1.00	1.00	1.00	1.07	1.08	1.00
Incremental Delay, d2	0.1	10.7		3.6	0.1	0.1	2.9	7.7	1.5	10.3	11.5	0.3
Delay (s)	7.7	25.9		24.7	9.8	8.6	35.4	45.8	36.7	47.5	53.3	34.7
Level of Service	A	C		C	A	A	D	D	D	D	D	C
Approach Delay (s)		25.6			12.2			39.7			49.2	
Approach LOS		C			B			D			D	

Intersection Summary				
HCM 2000 Control Delay	27.0	HCM 2000 Level of Service	C	
HCM 2000 Volume to Capacity ratio	0.85			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	19.4	
Intersection Capacity Utilization	89.9%	ICU Level of Service	E	
Analysis Period (min)	15			
c Critical Lane Group				

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations											
Traffic Volume (vph)	24	1214	156	610	132	119	177	194	178	199	36
Future Volume (vph)	24	1214	156	610	132	119	177	194	178	199	36
Lane Group Flow (vph)	26	1474	170	663	143	129	192	211	193	216	39
Turn Type	Perm	NA	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4	3	8		5	2		1	6	
Permitted Phases	4		8		8	2		2	6		6
Detector Phase	4	4	3	8	8	5	2	2	1	6	6
Switch Phase											
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	24.4	24.4	8.0	24.4	24.4	8.0	25.0	25.0	8.0	25.0	25.0
Total Split (s)	39.0	39.0	9.0	48.0	48.0	9.0	43.0	43.0	9.0	43.0	43.0
Total Split (%)	39.0%	39.0%	9.0%	48.0%	48.0%	9.0%	43.0%	43.0%	9.0%	43.0%	43.0%
Yellow Time (s)	4.2	4.2	3.0	4.2	4.2	3.0	3.3	3.3	3.0	3.3	3.3
All-Red Time (s)	2.2	2.2	0.0	2.2	2.2	0.0	3.7	3.7	0.0	3.7	3.7
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.4	6.4	3.0	6.4	6.4	3.0	7.0	7.0	3.0	7.0	7.0
Lead/Lag	Lag	Lag	Lead			Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?											
Recall Mode	None	None	None	None	None	None	C-Min	C-Min	None	C-Min	C-Min
v/c Ratio	0.08	0.98	0.59	0.31	0.16	0.51	0.59	0.51	0.65	0.69	0.14
Control Delay	9.6	30.0	25.0	10.9	4.3	33.2	44.9	9.8	41.2	52.4	2.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	9.6	30.0	25.0	10.9	4.3	33.2	44.9	9.8	41.2	52.4	2.1
Queue Length 50th (m)	0.9	161.9	15.7	32.2	3.4	19.7	36.5	0.7	34.2	44.2	0.0
Queue Length 95th (m)	m2.9	m#218.4	39.7	50.5	13.4	31.7	55.0	19.2	40.8	67.0	1.5
Internal Link Dist (m)		393.2		523.9			174.6			416.6	
Turn Bay Length (m)	42.6		33.0		23.2	25.4		25.0	27.3		16.5
Base Capacity (vph)	312	1507	287	2110	867	252	676	631	296	656	472
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.08	0.98	0.59	0.31	0.16	0.51	0.28	0.33	0.65	0.33	0.08

Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Glenanna Road & Kingston Road



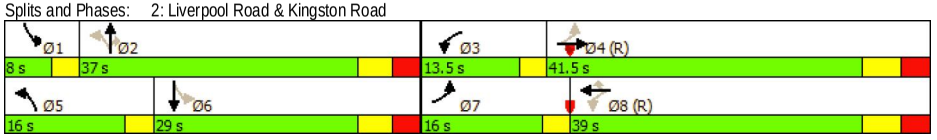
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	214	1074	330	226	528	78	302	959	278	109	379	84
Future Volume (vph)	214	1074	330	226	528	78	302	959	278	109	379	84
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2
Total Lost time (s)	3.0	7.4	7.4	3.0	7.4	7.4	3.0	6.9	6.9	3.0	6.9	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.91	
Frpb, ped/bikes	1.00	1.00	0.94	1.00	1.00	0.95	1.00	1.00	0.85	1.00	0.99	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1700	3500	1416	1708	3500	1431	1677	3535	1273	1670	4903	
Flt Permitted	0.34	1.00	1.00	0.12	1.00	1.00	0.37	1.00	1.00	0.18	1.00	
Satd. Flow (perm)	610	3500	1416	219	3500	1431	647	3535	1273	318	4903	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	233	1167	359	246	574	85	328	1042	302	118	412	91
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	148	0	35	0
Lane Group Flow (vph)	233	1167	359	246	574	85	328	1042	154	118	468	0
Confl. Peds. (#/hr)	26		32	32		26	34		48	48		34
Heavy Vehicles (%)	1%	2%	2%	1%	2%	2%	2%	1%	3%	3%	0%	3%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		
Actuated Green, G (s)	45.9	34.1	34.1	43.3	32.8	32.8	38.1	30.1	30.1	27.1	22.1	
Effective Green, g (s)	45.9	34.1	34.1	43.3	32.8	32.8	38.1	30.1	30.1	27.1	22.1	
Actuated g/C Ratio	0.46	0.34	0.34	0.43	0.33	0.33	0.38	0.30	0.30	0.27	0.22	
Clearance Time (s)	3.0	7.4	7.4	3.0	7.4	7.4	3.0	6.9	6.9	3.0	6.9	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	408	1193	482	251	1148	469	380	1064	383	153	1083	
v/s Ratio Prot	c0.07	c0.33		c0.10	0.16		c0.11	c0.29		0.04	0.10	
v/s Ratio Perm	0.19		0.25	0.32		0.06	0.22		0.12	0.17		
v/c Ratio	0.57	0.98	0.74	0.98	0.50	0.18	0.86	0.98	0.40	0.77	0.43	
Uniform Delay, d1	17.4	32.6	29.1	25.5	27.0	24.0	24.9	34.6	27.8	31.2	33.5	
Progression Factor	1.00	1.00	1.00	1.37	1.44	1.45	1.00	1.00	1.00	1.12	1.05	
Incremental Delay, d2	1.9	21.3	10.0	50.1	1.5	0.8	18.0	22.4	0.7	21.0	0.3	
Delay (s)	19.3	53.9	39.1	84.9	40.5	35.7	42.8	57.0	28.5	55.9	35.4	
Level of Service	B	D	D	F	D	D	D	E	C	E	D	
Approach Delay (s)		46.3			52.1			49.1			39.3	
Approach LOS		D			D			D			D	

Intersection Summary				
HCM 2000 Control Delay	47.4	HCM 2000 Level of Service	D	
HCM 2000 Volume to Capacity ratio	1.00			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	20.3	
Intersection Capacity Utilization	93.3%	ICU Level of Service	F	
Analysis Period (min)	15			
c Critical Lane Group				

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations											
Traffic Volume (vph)	214	1074	330	226	528	78	302	959	278	109	379
Future Volume (vph)	214	1074	330	226	528	78	302	959	278	109	379
Lane Group Flow (vph)	233	1167	359	246	574	85	328	1042	302	118	503
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA
Protected Phases	7	4		3	8		5	2		1	6
Permitted Phases	4		4	8		8	2		2	6	
Detector Phase	7	4	4	3	8	8	5	2	2	1	6
Switch Phase											
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	8.0	25.4	25.4	8.5	25.4	25.4	8.0	24.9	24.9	8.0	24.9
Total Split (s)	16.0	41.5	41.5	13.5	39.0	39.0	16.0	37.0	37.0	8.0	29.0
Total Split (%)	16.0%	41.5%	41.5%	13.5%	39.0%	39.0%	16.0%	37.0%	37.0%	8.0%	29.0%
Yellow Time (s)	3.0	4.2	4.2	3.0	4.2	4.2	3.0	3.7	3.7	3.0	3.7
All-Red Time (s)	0.0	3.2	3.2	0.0	3.2	3.2	0.0	3.2	3.2	0.0	3.2
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	3.0	7.4	7.4	3.0	7.4	7.4	3.0	6.9	6.9	3.0	6.9
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag
Lead-Lag Optimize?											
Recall Mode	None	C-Min	C-Min	None	C-Min	C-Min	None	Min	Min	None	Min
v/c Ratio	0.54	0.98	0.74	0.95	0.50	0.18	0.81	0.98	0.57	0.72	0.45
Control Delay	18.3	54.8	40.2	73.3	41.4	37.4	39.4	58.6	13.9	48.9	33.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.3	54.8	40.2	73.3	41.4	37.4	39.4	58.6	13.9	48.9	33.5
Queue Length 50th (m)	25.2	122.6	64.0	40.7	63.3	15.6	47.1	110.4	13.8	13.6	27.2
Queue Length 95th (m)	40.5	#170.1	#102.7	#83.4	78.7	29.7	#86.2	#155.6	41.7	#33.8	43.7
Internal Link Dist (m)		667.5			393.2			242.2			116.1
Turn Bay Length (m)	33.5		49.1	103.2		61.6	46.2		51.8	47.9	
Base Capacity (vph)	454	1193	482	260	1146	468	404	1064	531	165	1118
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.51	0.98	0.74	0.95	0.50	0.18	0.81	0.98	0.57	0.72	0.45

Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 13 (13%), Referenced to phase 4:EBTL and 8:WBTL, Start of Green
Natural Cycle: 100
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 2: Liverpool Road & Kingston Road



Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations									
Traffic Volume (vph)	45	72	111	53	145	349	635	67	354
Future Volume (vph)	45	72	111	53	145	349	635	67	354
Lane Group Flow (vph)	49	78	121	58	206	379	768	73	418
Turn Type	Perm	NA	Perm	Perm	NA	Perm	NA	Perm	NA
Protected Phases		4			8		2		6
Permitted Phases	4		4	8		2		6	
Detector Phase	4	4	4	8	8	2	2	6	6
Switch Phase									
Minimum Initial (s)	8.0	8.0	8.0	8.0	8.0	5.0	5.0	5.0	5.0
Minimum Split (s)	23.9	23.9	23.9	23.9	23.9	24.7	24.7	24.7	24.7
Total Split (s)	36.0	36.0	36.0	36.0	36.0	64.0	64.0	64.0	64.0
Total Split (%)	36.0%	36.0%	36.0%	36.0%	36.0%	64.0%	64.0%	64.0%	64.0%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	4.6	4.6	4.6	4.6
All-Red Time (s)	2.2	2.2	2.2	2.2	2.2	2.1	2.1	2.1	2.1
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.9	5.9	5.9	5.9	5.9	6.7	6.7	6.7	6.7
Lead/Lag									
Lead-Lag Optimize?									
Recall Mode	None	None	None	None	None	C-Min	C-Min	C-Min	C-Min
v/c Ratio	0.39	0.27	0.35	0.28	0.69	0.58	0.31	0.16	0.17
Control Delay	45.0	37.4	9.2	28.1	39.4	9.0	3.1	6.7	5.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	45.0	37.4	9.2	28.1	39.4	9.0	3.1	6.7	5.1
Queue Length 50th (m)	9.1	14.1	0.0	5.9	34.6	11.4	10.8	4.1	12.0
Queue Length 95th (m)	19.6	25.9	14.5	22.7	60.4	m74.6	m14.8	11.6	21.6
Internal Link Dist (m)		107.2			416.6		192.1		478.0
Turn Bay Length (m)	22.0			24.3		24.4		46.2	
Base Capacity (vph)	237	549	549	385	550	650	2472	454	2521
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.21	0.14	0.22	0.15	0.37	0.58	0.31	0.16	0.17

Intersection Summary

Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 6: Liverpool Road & Glenanna Road

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	23	0	44	123	0	98	58	946	247	76	405	36
Future Volume (Veh/h)	23	0	44	123	0	98	58	946	247	76	405	36
Sign Control		Stop			Stop			Free			Free	
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)	25	0	48	134	0	107	63	1028	268	83	440	39
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			TWLTL	
Median storage veh)											2	
Upstream signal (m)								140			216	
pX, platoon unblocked	0.72	0.72		0.72	0.72	0.72				0.72		
vC, conflicting volume	1372	2048	240	1722	1933	648	479			1296		
vC1, stage 1 conf vol	626	626		1288	1288							
vC2, stage 2 conf vol	747	1422		434	645							
vCu, unblocked vol	729	1671	240	1217	1511	0	479			622		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)	6.5	5.5		6.5	5.5							
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	93	100	94	47	100	86	94			88		
cM capacity (veh/h)	338	172	768	251	245	779	1094			694		

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	73	134	107	63	685	611	83	293	186
Volume Left	25	134	0	63	0	0	83	0	0
Volume Right	48	0	107	0	0	268	0	0	39
cSH	535	251	779	1094	1700	1700	694	1700	1700
Volume to Capacity	0.14	0.53	0.14	0.06	0.40	0.36	0.12	0.17	0.11
Queue Length 95th (m)	3.8	22.9	3.8	1.5	0.0	0.0	3.2	0.0	0.0
Control Delay (s)	12.8	34.6	10.4	8.5	0.0	0.0	10.9	0.0	0.0
Lane LOS	B	D	B	A			B		
Approach Delay (s)	12.8	23.8		0.4			1.6		
Approach LOS	B	C							

Intersection Summary

Average Delay	3.6				
Intersection Capacity Utilization	61.7%	ICU Level of Service		B	
Analysis Period (min)	15				

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	45	72	111	53	145	44	349	635	72	67	354	30
Future Volume (vph)	45	72	111	53	145	44	349	635	72	67	354	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2
Total Lost time (s)	5.9	5.9	5.9	5.9	5.9		6.7	6.7		6.7	6.7	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00		0.99	1.00	
Frt	1.00	1.00	0.85	1.00	0.97		1.00	0.98		1.00	0.99	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1725	1824	1543	1725	1791		1708	3456		1714	3528	
Flt Permitted	0.43	1.00	1.00	0.71	1.00		0.51	1.00		0.35	1.00	
Satd. Flow (perm)	788	1824	1543	1282	1791		912	3456		636	3528	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	49	78	121	58	158	48	379	690	78	73	385	33
RTOR Reduction (vph)	0	0	102	0	13	0	0	6	0	0	4	0
Lane Group Flow (vph)	49	78	19	58	193	0	379	762	0	73	414	0
Confl. Peds. (#/hr)									11	11		
Heavy Vehicles (%)	0%	3%	0%	0%	1%	2%	1%	1%	5%	0%	0%	0%
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)	16.0	16.0	16.0	16.0	16.0		71.4	71.4		71.4	71.4	
Effective Green, g (s)	16.0	16.0	16.0	16.0	16.0		71.4	71.4		71.4	71.4	
Actuated g/C Ratio	0.16	0.16	0.16	0.16	0.16		0.71	0.71		0.71	0.71	
Clearance Time (s)	5.9	5.9	5.9	5.9	5.9		6.7	6.7		6.7	6.7	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	126	291	246	205	286		651	2467		454	2518	
v/s Ratio Prot		0.04			c0.11			0.22			0.12	
v/s Ratio Perm	0.06		0.01	0.05			c0.42			0.11		
v/c Ratio	0.39	0.27	0.08	0.28	0.67		0.58	0.31		0.16	0.16	
Uniform Delay, d1	37.6	36.9	35.7	37.0	39.5		7.0	5.2		4.6	4.6	
Progression Factor	1.00	1.00	1.00	0.70	0.77		0.74	0.50		1.00	1.00	
Incremental Delay, d2	2.0	0.5	0.1	0.7	6.0		2.4	0.2		0.8	0.1	
Delay (s)	39.6	37.4	35.9	26.7	36.6		7.6	2.8		5.4	4.8	
Level of Service	D	D	D	C	D		A	A		A	A	
Approach Delay (s)		37.1			34.4			4.4			4.9	
Approach LOS		D			C			A			A	

Intersection Summary				
HCM 2000 Control Delay	12.0	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.60			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.6	
Intersection Capacity Utilization	68.0%	ICU Level of Service	C	
Analysis Period (min)	15			
c Critical Lane Group				

APPENDIX G

Traffic Signal Warrant Analyses

EXHIBIT 4

Liverpool Road at North Site Driveway/Private Access

19225.200

Survey Date: Tuesday March 19, 2019
Municipality: City of Pickering

Hour Starting	Northbound			South Side Pedestrians	Eastbound			West Side Pedestrians	Southbound			North Side Pedestrians	Westbound			East Side Pedestrians	Total Volume	Raking	Peds Crossing Major Road	% of peak hour
	Left	Through	Right		Left	Through	Right		Left	Through	Right		Left	Through	Right					
7:00	13	297	89	0	61	799	14	0	1	0	6	1	86	0	46	6	1412	6	0	68%
8:00	19	285	159	0	97	789	14	1	3	3	10	4	105	3	61	14	1549	4	1	75%
9:00	7	213	194	1	84	504	7	0	2	1	3	7	116	1	72	12	1205	11	1	58%
10:00	16	217	169	0	69	353	6	1	2	4	3	2	129	2	50	20	1021	12	1	49%
11:00	10	320	242	0	62	360	2	0	1	1	5	2	142	1	74	16	1220	9	0	59%
12:00	11	337	238	0	71	371	5	0	3	4	6	8	197	6	91	19	1340	8	0	65%
13:00	12	341	232	0	49	320	14	0	5	1	5	6	164	2	74	15	1219	10	0	59%
14:00	10	396	222	0	66	384	10	0	6	1	7	7	149	3	99	68	1353	7	0	65%
15:00	16	564	235	0	59	385	8	0	6	3	8	13	142	2	93	29	1521	5	0	73%
16:00	17	700	245	1	53	412	10	0	6	2	6	6	119	2	95	13	1668	3	1	80%
17:00	36	948	264	1	50	493	16	1	14	0	26	6	114	4	108	15	2075	1	2	100%
18:00	14	701	249	1	64	518	7	0	7	2	11	7	121	1	95	12	1791	2	1	86%
Total all	181	5319	2538		785	5688	113		56	22	96		1584	27	958					

Input Data Sheet

Analysis Sheet | Results Sheet | Proposed Collision

GO TO Justification:

What are the intersecting roadways? Liverpool Rd. at 1848-1852 Liverpool Rd. North Site Driveway

What is the direction of the Main Road street? North-South

When was the data collected? 2019-03-19

Justification 1 - 4: Volume Warrants

a.- Number of lanes on the Main Road? 2 or more

b.- Number of lanes on the Minor Road? 1

c.- How many approaches? 4

d.- What is the operating environment? Urban **Population >= 10,000** **AND** **Speed < 70 km/hr**

e.- What is the eight hour vehicle volume at the intersection? (Please fill in table below)

Hour Ending	Liverpoool Rd. (Northbound)			1848-1852 Liverpool Rd.			Liverpool Rd. (Southbound)			Private Access (Westbound)			Pedestrians Crossing Main Road
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT	
7:00	13	297	89	61	799	14	1	0	6	86	0	46	0
8:00	19	285	159	97	789	14	3	3	10	105	3	61	1
12:00	11	337	238	71	371	5	3	4	6	197	6	91	0
14:00	10	396	222	66	384	10	6	1	7	149	3	99	0
15:00	16	564	235	59	385	8	6	3	8	142	2	93	0
16:00	17	700	245	53	412	10	6	2	6	119	2	95	1
17:00	36	948	264	50	493	16	14	0	26	114	4	108	2
18:00	14	701	249	64	518	7	7	2	11	121	1	95	1
Total	**136**	**4,228**	**1,701**	**521**	**4,151**	**84**	**46**	**15**	**80**	**1,033**	**21**	**688**	**5**

Justification 5: Collision Experience

Preceding Months	Number of Collisions*
1-12	0
13-24	0
25-36	0

***** Include only collisions that are susceptable to correction through the installation of traffic signal control

Justification 6: Pedestrian Volume

a.- Please fill in table below summarizing total pedestrians crossing major roadway at the intersection or in proximity to the intersection (zones). Please reference Section 4.8 of the Manual for further explanation and graphical representation.

	Zone 1		Zone 2		Zone 3 (if needed)		Zone 4 (if needed)		Total
	Assisted	Unassisted	Assisted	Unassisted	Assisted	Unassisted	Assisted	Unassisted	
Total 8 hour pedestrian volume	20	80	0	15	1	5	0	0	
Factored 8 hour pedestrian volume	120		15		7		0		
% Assigned to crossing rate	100%		50%		0%		0%		
Net 8 Hour Pedestrian Volume at Crossing									128
Net 8 Hour Vehicular Volume on Street Being Crossed									6,411

b.- Please fill in table below summarizing delay to pedestrians crossing major roadway at the intersection or in proximity to the intersection (zones). Please reference Section 4.8 of the Manual for further explanation and graphical representation.

	Zone 1		Zone 2		Zone 3 (if needed)		Zone 4 (if needed)		Total
	Assisted	Unassisted	Assisted	Unassisted	Assisted	Unassisted	Assisted	Unassisted	
Total 8 hour pedestrian volume	20	80	0	15	1	5	0	0	
Total 8 hour pedestrians delayed greater than 10 seconds	10	10	1	6	2	4	0	0	
Factored volume of total pedestrians	120		15		7		0		
Factored volume of delayed pedestrians	30		8		8		0		
% Assigned to Crossing Rate	100%		50%		0%		0%		
Net 8 Hour Volume of Total Pedestrians									128
Net 8 Hour Volume of Delayed Pedestrians									34

Analysis Sheet

Input Sheet | Results Sheet | Proposed Collision

GO TO Justification:

Intersection: Liverpool Rd. at 1848-1852 Liverpool Rd. North Site Driveway Count Date: 2019-03-19

Justification 1: Minimum Vehicle Volumes

Restricted Flow Urban Conditions

Justification	Guidance Approach Lanes				Percentage Warrant								Total Across	Section Percent
	1 Lanes		2 or More Lanes		Hour Ending									
Flow Condition	FREE FLOW ☐	RESTR. FLOW ☐	FREE FLOW ☐	RESTR. FLOW ☑	7:00	8:00	12:00	14:00	15:00	16:00	17:00	18:00		
1A	480	720	600	900	1,412	1,548	1,340	1,353	1,521	1,667	2,073	1,790		
	COMPLIANCE %				100	100	100	100	100	100	100	100	800	100
1B	120	170	120	170	1,006	1,069	741	711	689	691	785	806		
	COMPLIANCE %				100	100	100	100	100	100	100	100	800	100
Restricted Flow Signal Justification 1:					Both 1A and 1B 100% Fulfilled each of 8 hours				Yes ☑		No ☐			
					Lesser of 1A or 1B at least 80% fulfilled each of 8 hours				Yes ☑		No ☐			

Justification 2: Delay to Cross Traffic

Restricted Flow Urban Conditions

Justification	Guidance Approach Lanes				Percentage Warrant								Total Across	Section Percent
	1 lanes		2 or More lanes		Hour Ending									
Flow Condition	FREE FLOW ☐	RESTR. FLOW ☐	FREE FLOW ☐	RESTR. FLOW ☑	7:00	8:00	12:00	14:00	15:00	16:00	17:00	18:00		
2A	480	720	600	900	406	479	599	642	832	976	1,288	984		
	COMPLIANCE %				45	53	67	71	92	100	100	100	629	79
2B	50	75	50	75	946	992	639	599	586	585	659	704		
	COMPLIANCE %				100	100	100	100	100	100	100	100	800	100
Restricted Flow Signal Justification 2:					Both 2A and 2B 100% fulfilled each of 8 hours				Yes ☐		No ☑			
					Lesser of 2A or 2B at least 80% fulfilled each of 8 hours				Yes ☐		No ☑			

Justification 3: Combination

Combination Justification 1 and 2

	Justification Satisfied 80% or More			Two Justifications Satisfied 80% or More	
Justification 1	Minimum Vehicle Volume	YES ☑	NO ☐	YES ☐	NO ☑
Justification 2	Delay Cross Traffic	YES ☐	NO ☑		NOT JUSTIFIED

Justification 4: Four Hour Volume

Justification	Time Period	Total Volume of Both Approaches (Main)	Heaviest Minor Approach	Required Value	Average % Compliance	Overall % Compliance
		X	Y (actual)	Y (warrant threshold)		
Justification 4	15:00	832	452	262	100 %	100 %
	16:00	976	475	203	100 %	
	17:00	1,288	559	120	100 %	
	18:00	984	589	200	100 %	

Analysis Sheet

Input Sheet | Results Sheet | Proposed Collision

GO TO Justification:

Intersection: Liverpool Rd. at 1848-1852 Liverpool Rd. North Site Driveway Count Date: 2019-03-19

Justification 5: Collision Experience

Justification	Preceding Months	% Fulfillment	Overall % Compliance
Justification 5	1-12	0 %	0 %
	13-24	0 %	
	25-36	0 %	

Justification 6: Pedestrian Volume

Pedestrian Volume Analysis

8 Hour Vehicular Volume V_8		Net 8 Hour Pedestrian Volume				
		< 200	200 - 275	276 - 475	476 - 1000	>1000
Justification 6A	< 1440					
	1440 - 2600					
	2601 - 7000	Not Justified				
	> 7000					

Pedestrian Delay Analysis

Net Total 8 Hour Volume of Total Pedestrians		Net Total 8 Hour Volume of Delayed Pedestrians		
		< 75	75 - 130	> 130
Justification 6B	< 200	Not Justified		
	200 - 300			
	> 300			

Results Sheet

Input Sheet | Analysis Sheet | Proposed Collision

GO TO Justification:

Intersection: Liverpool Rd. at 1848-1852 Liverpool Rd. North Site | Count Date: 2019-03-19

Summary Results

Justification			Compliance		Signal Justified? YES	Signal Justified? NO
1. Minimum Vehicular Volume	A	Total Volume	100	%	☑	☐
	B	Crossing Volume	100	%		
2. Delay to Cross Traffic	A	Main Road	79	%	☐	☑
	B	Crossing Road	100	%		
3. Combination	A	Justificaton 1	100	%	☐	☑
	B	Justification 2	79	%		
4. 4-Hr Volume			100	%	☑	☐
5. Collision Experience			0	%	☐	☑
6. Pedestrians	A	Volume	Justification not met		☐	☑
	B	Delay	Justification not met			

Year 2024

EXHIBIT 5

RESIDENTIAL PROXY SITE SURVEY

19225.200

Survey Date: Tuesday March 19, 2019 Municipality: City of Pickering

Location: 1000-1200 The Esplanade North

Time Start	Residential Driveways								Gated Driveways								Total				
	Inbound		Outbound		Total				Inbound		Outbound		Total								
	Left	Right	Left	Right	In	Out	Two-way	Hourly	Left	Right	Left	Right	In	Out	Two-way	Hourly	In	Out	All	Hourly	
7:00	3	2	6	10	5	16	21		3	0	0	0	3	0	3		8	16	24		
7:15	0	3	1	25	3	26	29		2	1	2	1	3	3	6		6	29	35		
7:30	2	1	10	3	3	13	16		1	2	0	2	3	2	5		6	15	21		
7:45	0	1	3	17	1	20	21	87	0	1	0	0	1	0	1	15	2	20	22	102	
8:00	3	0	8	11	3	19	22		2	4	0	4	6	4	10		9	23	32	110	
8:15	1	3	6	21	4	27	31		3	1	1	3	4	4	8		8	31	39	114	
8:30	4	4	3	14	8	17	25		2	3	1	4	5	5	10		13	22	35	128	
8:45	4	3	5	12	7	17	24	102	2	7	1	4	9	5	14	42	16	22	38	144	<-- Peak Hour
9:00	2	3	4	10	5	14	19		6	3	1	0	9	1	10		14	15	29	141	
9:15	5	2	11	8	7	19	26		5	5	2	2	10	4	14		17	23	40	142	
9:30	2	0	4	15	2	19	21		3	0	4	4	3	8	11		5	27	32	139	
9:45	4	2	6	9	6	15	21	87	7	3	1	1	10	2	12	47	16	17	33	134	
10:00	1	0	5	11	1	16	17		1	3	1	4	4	5	9		5	21	26	131	
10:15	3	1	5	9	4	14	18		2	5	4	4	7	8	15		11	22	33	124	
10:30	6	2	2	5	8	7	15		3	1	2	5	4	7	11		12	14	26	118	
10:45	3	2	0	7	5	7	12	62	2	3	2	5	5	7	12	47	10	14	24	109	
11:00	4	4	3	7	8	10	18		3	3	2	3	6	5	11		14	15	29	112	
11:15	4	1	6	9	5	15	20		2	1	0	0	3	0	3		8	15	23	102	
11:30	6	0	4	10	6	14	20		2	6	1	3	8	4	12		14	18	32	108	
11:45	3	4	3	2	7	5	12	70	2	2	5	1	4	6	10	36	11	11	22	106	
12:00	4	2	1	3	6	4	10		5	2	3	3	7	6	13		13	10	23	100	
12:15	3	4	6	3	7	9	16		2	3	3	1	5	4	9		12	13	25	102	
12:30	4	4	4	7	8	11	19		4	4	3	2	8	5	13		16	16	32	102	
12:45	2	5	3	8	7	11	18	63	3	4	2	6	7	8	15	50	14	19	33	113	
13:00	3	2	6	6	5	12	17		4	4	3	6	8	9	17		13	21	34	124	
13:15	4	3	4	10	7	14	21		5	3	0	1	8	1	9		15	15	30	129	
13:30	4	4	4	2	8	6	14		3	4	6	3	7	9	16		15	15	30	127	
13:45	3	7	1	5	10	6	16	68	3	3	4	4	6	8	14	56	16	14	30	124	
14:00	6	5	7	4	11	11	22		0	3	1	3	3	4	7		14	15	29	119	
14:15	5	6	7	6	11	13	24		2	6	5	4	8	9	17		19	22	41	130	
14:30	10	4	1	10	14	11	25		6	4	4	3	10	7	17		24	18	42	142	
14:45	4	8	1	5	12	6	18	89	10	3	2	6	13	8	21	62	25	14	39	151	<-- Peak Hour
15:00	4	4	3	6	8	9	17		3	2	4	4	5	8	13		13	17	30	152	
15:15	12	7	1	7	19	8	27		4	5	0	11	9	11	20		28	19	47	158	
15:30	14	9	2	2	23	4	27		1	5	5	7	6	12	18		29	16	45	161	
15:45	13	2	4	2	15	6	21	92	8	0	4	4	8	8	16	67	23	14	37	159	
16:00	12	4	2	2	16	4	20		2	1	1	1	3	2	5		19	6	25	154	
16:15	12	6	2	1	18	3	21		3	1	6	4	4	10	14		22	13	35	142	
16:30	0	1	1	5	1	6	7		5	2	2	3	7	5	12		8	11	19	116	
16:45	16	9	1	2	25	3	28	76	5	2	5	2	7	7	14	45	32	10	42	121	
17:00	14	5	1	2	19	3	22		6	1	2	5	7	7	14		26	10	36	132	
17:15	13	4	3	3	17	6	23		1	2	2	2	3	4	7		20	10	30	127	
17:30	14	6	5	3	20	8	28		1	5	2	1	6	3	9		26	11	37	145	
17:45	14	4	3	6	18	9	27	100	2	4	3	5	6	8	14	44	24	17	41	144	
18:00	4	4	1	3	8	4	12		4	5	4	5	9	9	18		17	13	30	138	
18:15	12	6	2	5	18	7	25		6	1	4	4	7	8	15		25	15	40	148	<-- Peak Hour
18:30	7	3	3	1	10	4	14		3	1	1	1	4	2	6		14	6	20	131	
18:45	5	4	2	6	9	8	17	68	3	3	1	5	6	6	12	51	15	14	29	119	
Total All	278	170	176	340	448	516	964	964	157	137	112	156	294	268	562	562	742	784	1526		

Hourly Summary

Hour Start	Residential Driveways								Gated Driveways								Total				% of peak hour	Ranking
	Inbound		Outbound		Total				Inbound		Outbound		Total									
	Left	Right	Left	Right	In	Out	Two-way	Hourly	Left	Right	Left	Right	In	Out	Two-way	Hourly	In	Out	All	Hourly		
7:00	5	7	20	55	12	75	87	87	6	4	2	3	10	5	15	15	22	80	102	102	64%	12
8:00	12	10	22	58	22	80	102	102	9	15	3	15	24	18	42	42	46	98	144	496	91%	3
9:00	13	5	12	32	18	44	62	62	8	12	9	18	20	27	47	47	38	71	109	482	84%	5
10:00	13	5	12	32	18	44	62	62	8	12	9	18	20	27	47	47	38	71	109	482	69%	10
11:00	17	9	16	28	26	44	70	70	9	12	8	7	21	15	36	36	47	59	106	428	67%	11
12:00	13	15	14	21	28	35	63	63	14	13	11	12	27	23	50	50	55	58	113	417	71%	9
13:00	14	16	15	23	30	38	68	68	15	14	13	14	29	27	56	56	59	65	124	504	78%	6
14:00	25	23	16	25	48	41	89	89	18	16	12	16	34	28	62	62	82	69	151	542	95%	2
15:00	43	22	10	17	65	27	92	92	16	12	13	26	28	39	67	67	93	66	159	630	100%	1
16:00	40	20	6	10	60	16	76	76	15	6	14	10	21	24	45	45	81	40	121	533	76%	7
17:00	55	19	12	14	74	26	100	100	10	12	9	13	22	22	44	44	96	48	144	548	91%	4
18:00	28	17	8	15	45	23	68	68	16	10	10	15	26	25	51	51	71	48	119	536	75%	8

Two-Access

EXHIBIT 6

WARRANT CALCULATIONS (2 Subject Site Accesses)

Existing Traffic Volumes Minus Exissting Subject Site Traffic

Hour Start	Liverpool Road								North Site Driveway				Private Driveway				Total All
	Northbound			South	Southbound			North	Eastbound			West	Westbound			East Side	
	Left	Through	Right	Side	Left	Through	Right	Side	Left	Through	Right	Side	Left	Through	Right	Pedestria	
7:00	0	297	89	0	61	799	0	1	0	0	0	0	86	0	46	6	1385
8:00	0	285	159	0	97	789	0	4	0	0	0	1	105	0	61	14	1515
9:00	0	213	194	1	84	504	0	7	0	0	0	0	116	0	72	12	1203
10:00	0	217	169	0	69	353	0	2	0	0	0	1	129	0	50	20	1010
11:00	0	320	242	0	62	360	0	2	0	0	0	0	142	0	74	16	1218
12:00	0	337	238	0	71	371	0	8	0	0	0	0	197	0	91	19	1332
13:00	0	341	232	0	49	320	0	6	0	0	0	0	164	0	74	15	1201
14:00	0	396	222	0	66	384	0	7	0	0	0	0	149	0	99	68	1391
15:00	*0*	*564*	*235*	*0*	*59*	*385*	*0*	*13*	*0*	*0*	*0*	*0*	*142*	*0*	*93*	*29*	*1520*
16:00	0	700	245	1	53	412	0	6	0	0	0	0	119	0	95	13	1644
17:00	0	948	264	1	50	493	0	6	0	0	0	1	114	0	108	15	2000
18:00	0	701	249	1	64	518	0	7	0	0	0	0	121	0	95	12	1768

	Liverpool Road								North Site Driveway				Private Driveway				Total All
	Northbound			South Side Pedestria	Southbound			North Side Pedestria	Eastbound			West Side Pedestria	Westbound			East Side Pedestria ns	
	Left	Through	Right		Left	Through	Right		Left	Through	Right		Left	Through	Right		
Corritdor 5																	
AM		11				20											
PM		22				9											
Corridor 10																	
AM		22				40											
PM		45				18											
Background		18				12											
Site (PM)	57						34		23	0	21			0			

Taken from TMD_Mar2019_v2.xlsx Col 76

1854-1858 Liverpool Road Site Traffic

Hour Start	Liverpool Road								North Site Driveway				Private Driveway				Total All
	Northbound			South Side Pedestria	Southbound			North Side Pedestria	Eastbound			West Side Pedestria	Westbound			East Side Pedestria ns	
	Left	Through	Right		Left	Through	Right		Left	Through	Right		Left	Through	Right		
7:00		12				8											20
8:00		16				11											27
9:00		15				10											25
10:00		12				8											20
11:00		12				8											20
12:00		13				9											22
13:00		14				9											23
14:00		17				11											28
15:00		*18*				*12*											*30*
16:00		14				9											23
17:00		16				11											27
18:00		14				9											23

1294 Kingston Rd., 1848-1852 Liverpool Road Site Traffic

North Access

Hour Start	Liverpool Road								North Site Driveway				Private Driveway				Total All
	Northbound			South Side Pedestria	Southbound			North Side Pedestria	Eastbound			West Side Pedestria ns	Westbound			East Side Pedestria ns	
	Left	Through	Right		Left	Through	Right		Left	Through	Right		Left	Through	Right		
7:00	36						22		15		13						86
8:00	52						31		21		19						123
9:00	48						29		19		18						114
10:00	39						23		16		14						92
11:00	38						23		15		14						90
12:00	40						24		16		15						95
13:00	44						27		18		16						105
14:00	54						32		22		20						128
15:00	*57*						*34*		*23*		*21*						*135*
16:00	43						26		17		16						102
17:00	52						31		21		19						123
18:00	43						26		17		16						102

Corridor Growth (5 Years to 2024)

Hour Start	Liverpool Road								North Site Driveway				Private Driveway				Total All
	Northbound			South Side	Southbound			North Side	Eastbound			West Side	Westbound			East Side Pedestria	
	Left	Through	Right		Left	Through	Right		Left	Through	Right		Left	Through	Right		
7:00		15				6											21
8:00		17				7											24
9:00		13				5											18
10:00		11				4											15
11:00		13				5											18
12:00		14				6											20
13:00		13				5											18
14:00		14				6											20
15:00		16				7											23
16:00		18				7											25
17:00		*22*				*9*											*31*
18:00		19				8											27

Corridor Growth (10 Years to 2029)

Hour Start	Liverpool Road								North Site Driveway				Private Driveway				Total All
	Northbound			South Side	Southbound			North Side	Eastbound			West Side Pedestria	Westbound			East Side Pedestria	
	Left	Through	Right		Left	Through	Right		Left	Through	Right		Left	Through	Right		
7:00		31				12											43
8:00		34				14											48
9:00		26				10											36
10:00		22				9											31
11:00		27				11											38
12:00		29				12											41
13:00		27				11											38
14:00		29				12											41
15:00		33				13											46
16:00		36				14											50
17:00		*45*				*18*											*63*
18:00		39				15											54

Future Total Traffic (2024)

Hour Start	Liverpool Road								North Site Driveway				Private Driveway				Total All
	Northbound			South Side	Southbound			North Side	Eastbound			West Side	Westbound			East Side Pedestria	
	Left	Through	Right		Left	Through	Right		Left	Through	Right		Left	Through	Right		
7:00	36	324	89	0	61	813	22	1	15	0	13	0	86	0	46	6	1512
8:00	52	318	159	0	97	807	31	4	21	0	19	1	105	0	61	14	1689
9:00	48	241	194	1	84	519	29	7	19	0	18	0	116	0	72	12	1360
10:00	39	240	169	0	69	365	23	2	16	0	14	1	129	0	50	20	1137
11:00	38	345	242	0	62	373	23	2	15	0	14	0	142	0	74	16	1346
12:00	40	364	238	0	71	386	24	8	16	0	15	0	197	0	91	19	1469
13:00	44	368	232	0	49	334	27	6	18	0	16	0	164	0	74	15	1347
14:00	54	427	222	0	66	401	32	7	22	0	20	0	149	0	99	68	1567
15:00	57	598	235	0	59	404	34	13	23	0	21	0	142	0	93	29	1708
16:00	43	732	245	1	53	428	26	6	17	0	16	0	119	0	95	13	1794
17:00	52	986	264	1	50	513	31	6	21	0	19	1	114	0	108	15	2181
18:00	43	734	249	1	64	535	26	7	17	0	16	0	121	0	95	12	1920

Future Total Traffic (2029)

Hour Start	Liverpool Road								North Site Driveway				Private Driveway				Total All
	Northbound			South Side	Southbound			North Side	Eastbound			West Side Pedestria	Westbound			East Side Pedestria	
	Left	Through	Right		Left	Through	Right		Left	Through	Right		Left	Through	Right		
7:00	36	340	89	0	61	819	22	1	15	0	13	0	86	0	46	6	1534
8:00	52	335	159	0	97	814	31	4	21	0	19	1	105	0	61	14	1713
9:00	48	254	194	1	84	524	29	7	19	0	18	0	116	0	72	12	1378
10:00	39	251	169	0	69	370	23	2	16	0	14	1	129	0	50	20	1153
11:00	38	359	242	0	62	379	23	2	15	0	14	0	142	0	74	16	1366
12:00	40	379	238	0	71	392	24	8	16	0	15	0	197	0	91	19	1490
13:00	44	382	232	0	49	340	27	6	18	0	16	0	164	0	74	15	1367
14:00	54	442	222	0	66	407	32	7	22	0	20	0	149	0	99	68	1588
15:00	57	615	235	0	59	410	34	13	23	0	21	0	142	0	93	29	1731
16:00	43	750	245	1	53	435	26	6	17	0	16	0	119	0	95	13	1819
17:00	52	1009	264	1	50	522	31	6	21	0	19	1	114	0	108	15	2213
18:00	43	754	249	1	64	542	26	7	17	0	16	0	121	0	95	12	1947

Signal Warrant Values (2024)

Hour Start	Liverpool Road								North Site Driveway				Private Driveway				Total All
	Northbound			South Side	Southbound			North Side	Eastbound			West Side	Westbound			East Side Pedestria	
	Left	Through	Right		Left	Through	Right		Left	Through	Right		Left	Through	Right		
7:00	36	324	89	0	61	813	22	1	15	0	13	0	86	0	46	6	1512
8:00	52	318	159	0	97	807	31	4	21	0	19	1	105	0	61	14	1689
12:00	40	364	238	0	71	386	24	8	16	0	15	0	197	0	91	19	1469
14:00	54	427	222	0	66	401	32	7	22	0	20	0	149	0	99	68	1567
15:00	57	598	235	0	59	404	34	13	23	0	21	0	142	0	93	29	1708
16:00	43	732	245	1	53	428	26	6	17	0	16	0	119	0	95	13	1794
17:00	52	986	264	1	50	513	31	6	21	0	19	1	114	0	108	15	2181
18:00	43	734	249	1	64	535	26	7	17	0	16	0	121	0	95	12	1920

Signal Warrant Values (2029)

Hour Start	Liverpool Road								North Site Driveway				Private Driveway				Total All
	Northbound			South Side	Southbound			North Side	Eastbound			West Side Pedestria	Westbound			East Side Pedestria	
	Left	Through	Right		Left	Through	Right		Left	Through	Right		Left	Through	Right		
7:00	36	340	89	0	61	819	22	1	15	0	13	0	86	0	46	6	1534
8:00	52	335	159	0	97	814	31	4	21	0	19	1	105	0	61	14	1713
12:00	40	379	238	0	71	392	24	8	16	0	15	0	197	0	91	19	1490
14:00	54	442	222	0	66	407	32	7	22	0	20	0	149	0	99	68	1588
15:00	57	615	235	0	59	410	34	13	23	0	21	0	142	0	93	29	1731
16:00	43	750	245	1	53	435	26	6	17	0	16	0	119	0	95	13	1819
17:00	52	1009	264	1	50	522	31	6	21	0	19	1	114	0	108	15	2213
18:00	43	754	249	1	64	542	26	7	17	0	16	0	121	0	95	12	1947

Input Data Sheet

Analysis Sheet | Results Sheet | Proposed Collision

GO TO Justification:

What are the intersecting roadways? Liverpool Rd. at Subject Site North Driveway (2 Access - 2024)

What is the direction of the Main Road street? North-South

When was the data collected? 2019-03-19

Justification 1 - 4: Volume Warrants

a.- Number of lanes on the Main Road? 2 or more

b.- Number of lanes on the Minor Road? 1

c.- How many approaches? 4

d.- What is the operating environment? Urban **Population >= 10,000 AND Speed < 70 km/hr**

e.- What is the eight hour vehicle volume at the intersection? (Please fill in table below)

Hour Ending	Liverpool Rd. (Northbound)			Subecjt Site (Eastbound)			Liverpool Rd. (Southbound)			Private Access (Westbound)			Pedestrians Crossing Main Road
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT	
7:00	36	324	89	15	0	13	61	813	22	86	0	46	0
8:00	52	318	159	21	0	19	97	807	31	105	0	61	1
12:00	40	364	238	16	0	15	71	386	24	197	0	91	0
14:00	54	427	222	22	0	20	66	401	32	149	0	99	0
15:00	57	598	235	23	0	21	59	404	34	142	0	93	0
16:00	43	732	245	17	0	16	53	428	26	119	0	95	1
17:00	52	986	264	21	0	19	50	513	31	114	0	108	2
18:00	43	734	249	17	0	16	64	535	26	121	0	95	1
Total	**377**	**4,483**	**1,701**	**152**	**0**	**139**	**521**	**4,287**	**226**	**1,033**	**0**	**688**	**5**

Justification 5: Collision Experience

Preceding Months	Number of Collisions*
1-12	0
13-24	0
25-36	0

* Include only collisions that are susceptable to correction through the installation of traffic signal control

Justification 6: Pedestrian Volume

a.- Please fill in table below summarizing total pedestrians crossing major roadway at the intersection or in proximity to the intersection (zones). Please reference Section 4.8 of the Manual for further explanation and graphical representation.

	Zone 1		Zone 2		Zone 3 (if needed)		Zone 4 (if needed)		Total
	Assisted	Unassisted	Assisted	Unassisted	Assisted	Unassisted	Assisted	Unassisted	
Total 8 hour pedestrian volume	20	80	0	15	1	5	0	0	
Factored 8 hour pedestrian volume	120		15		7		0		
% Assigned to crossing rate	100%		50%		0%		0%		
Net 8 Hour Pedestrian Volume at Crossing									128
Net 8 Hour Vehicular Volume on Street Being Crossed									6,411

b.- Please fill in table below summarizing delay to pedestrians crossing major roadway at the intersection or in proximity to the intersection (zones). Please reference Section 4.8 of the Manual for further explanation and graphical representation.

	Zone 1		Zone 2		Zone 3 (if needed)		Zone 4 (if needed)		Total
	Assisted	Unassisted	Assisted	Unassisted	Assisted	Unassisted	Assisted	Unassisted	
Total 8 hour pedestrian volume	20	80	0	15	1	5	0	0	
Total 8 hour pedestrians delayed greater than 10 seconds	10	10	1	6	2	4	0	0	
Factored volume of total pedestrians	120		15		7		0		
Factored volume of delayed pedestrians	30		8		8		0		
% Assigned to Crossing Rate	100%		50%		0%		0%		
Net 8 Hour Volume of Total Pedestrians									128
Net 8 Hour Volume of Delayed Pedestrians									34

Analysis Sheet

Input Sheet | Results Sheet | Proposed Collision

GO TO Justification:

Intersection: Liverpool Rd. at Subject Site North Driveway (2 Access - 2024 Count Date: 2019-03-19

Justification 1: Minimum Vehicle Volumes

Restricted Flow Urban Conditions

Justification	Guidance Approach Lanes				Percentage Warrant								Total Across	Section Percent
	1 Lanes		2 or More Lanes		Hour Ending									
Flow Condition	FREE FLOW ☐	RESTR. FLOW ☐	FREE FLOW ☐	RESTR. FLOW ☑	7:00	8:00	12:00	14:00	15:00	16:00	17:00	18:00		
1A	480	720	600	900	1,505	1,670	1,442	1,492	1,666	1,774	2,158	1,900		
	COMPLIANCE %				100	100	100	100	100	100	100	100	800	100
1B	120	170	120	170	160	206	319	290	279	247	262	249		
	COMPLIANCE %				94	100	100	100	100	100	100	100	794	99
Restricted Flow Signal Justification 1:					Both 1A and 1B 100% Fulfilled each of 8 hours — Yes ☐ No ☑									
					Lesser of 1A or 1B at least 80% fulfilled each of 8 hours — Yes ☑ No ☐									

Justification 2: Delay to Cross Traffic

Restricted Flow Urban Conditions

Justification	Guidance Approach Lanes				Percentage Warrant								Total Across	Section Percent
	1 lanes		2 or More lanes		Hour Ending									
Flow Condition	FREE FLOW ☐	RESTR. FLOW ☐	FREE FLOW ☐	RESTR. FLOW ☑	7:00	8:00	12:00	14:00	15:00	16:00	17:00	18:00		
2A	480	720	600	900	1,345	1,464	1,123	1,202	1,387	1,527	1,896	1,651		
	COMPLIANCE %				100	100	100	100	100	100	100	100	800	100
2B	50	75	50	75	101	127	213	171	165	137	137	139		
	COMPLIANCE %				100	100	100	100	100	100	100	100	800	100
Restricted Flow Signal Justification 2:					Both 2A and 2B 100% fulfilled each of 8 hours — Yes ☑ No ☐									
					Lesser of 2A or 2B at least 80% fulfilled each of 8 hours — Yes ☑ No ☐									

Justification 3: Combination

Combination Justification 1 and 2

Justification Satisfied 80% or More				Two Justifications Satisfied 80% or More	
Justification 1	Minimum Vehicle Volume	YES ☑	NO ☐	YES ☑	NO ☐
Justification 2	Delay Cross Traffic	YES ☑	NO ☐	JUSTIFIED	

Justification 4: Four Hour Volume

Justification	Time Period	Total Volume of Both Approaches (Main)	Heaviest Minor Approach	Required Value	Average % Compliance	Overall % Compliance
		X	Y (actual)	Y (warrant threshold)		
Justification 4	8:00	1,464	166	115	100 %	100 %
	16:00	1,527	214	115	100 %	
	17:00	1,896	222	115	100 %	
	18:00	1,651	216	115	100 %	

Analysis Sheet

Input Sheet | Results Sheet | Proposed Collision

GO TO Justification:

Intersection: Liverpool Rd. at Subject Site North Driveway (2 Access - 2024 Count Date: 2019-03-19

Justification 5: Collision Experience

Justification	Preceding Months	% Fulfillment	Overall % Compliance
Justification 5	1-12	0 %	0 %
	13-24	0 %	
	25-36	0 %	

Justification 6: Pedestrian Volume

Pedestrian Volume Analysis

8 Hour Vehicular Volume V_8		Net 8 Hour Pedestrian Volume				
		< 200	200 - 275	276 - 475	476 - 1000	>1000
Justification 6A	< 1440					
	1440 - 2600					
	2601 - 7000	Not Justified				
	> 7000					

Pedestrian Delay Analysis

Net Total 8 Hour Volume of Total Pedestrians		Net Total 8 Hour Volume of Delayed Pedestrians		
		< 75	75 - 130	> 130
Justification 6B	< 200	Not Justified		
	200 - 300			
	> 300			

Results Sheet

Input Sheet | Analysis Sheet | Proposed Collision

GO TO Justification:

Intersection: Liverpool Rd. at Subject Site North Driveway (2 Acce Count Date: 2019-03-19

Summary Results

Justification			Compliance		Signal Justified? YES	Signal Justified? NO
1. Minimum Vehicular Volume	A	Total Volume	100	%	☐	☑
	B	Crossing Volume	99	%		
2. Delay to Cross Traffic	A	Main Road	100	%	☑	☐
	B	Crossing Road	100	%		
3. Combination	A	Justificaton 1	99	%	☑	☐
	B	Justification 2	100	%		
4. 4-Hr Volume			100	%	☑	☐
5. Collision Experience			0	%	☐	☑
6. Pedestrians	A	Volume	Justification not met		☐	☑
	B	Delay	Justification not met			

One-Access

EXHIBIT 7

WARRANT CALCULATIONS (1 Subject Site Access)

Existing Traffic Volumes Minus Exissting Subject Site Traffic

Hour Start	Liverpool Road								North Site Driveway				Private Driveway				Total All
	Northbound			South	Southbound			North	Eastbound			West Side	Westbound			East Side	
	Left	Through	Right	Side	Left	Through	Right	Side	Left	Through	Right	Pedestria	Left	Through	Right	Pedestria	
7:00	0	297	89	0	61	799	0	1	0	0	0	0	86	0	46	6	1385
8:00	0	285	159	0	97	789	0	4	0	0	0	1	105	0	61	14	1515
9:00	0	213	194	1	84	504	0	7	0	0	0	0	116	0	72	12	1203
10:00	0	217	169	0	69	353	0	2	0	0	0	1	129	0	50	20	1010
11:00	0	320	242	0	62	360	0	2	0	0	0	0	142	0	74	16	1218
12:00	0	337	238	0	71	371	0	8	0	0	0	0	197	0	91	19	1332
13:00	0	341	232	0	49	320	0	6	0	0	0	0	164	0	74	15	1201
14:00	0	396	222	0	66	384	0	7	0	0	0	0	149	0	99	68	1391
15:00	*0*	*564*	*235*	*0*	*59*	*385*	*0*	*13*	*0*	*0*	*0*	*0*	*142*	*0*	*93*	*29*	*1520*
16:00	0	700	245	1	53	412	0	6	0	0	0	0	119	0	95	13	1644
17:00	0	948	264	1	50	493	0	6	0	0	0	1	114	0	108	15	2000
18:00	0	701	249	1	64	518	0	7	0	0	0	0	121	0	95	12	1768

	Liverpool Road								North Site Driveway				Private Driveway				Total All
	Northbound			South	Southbound			North	Eastbound			West Side	Westbound			East Side	
	Left	Through	Right	Side Pedestria	Left	Through	Right	Side Pedestria	Left	Through	Right	Pedestrians	Left	Through	Right	Pedestrians	
Corritdor 5																	
AM		11				20											
PM		22				9											
Corridor 10																	
AM		22				40											
PM		45				18											
Background		18				12											
Site (PM)	58						36		34	0	55			0			

1854-1858 Liverpool Road Site Traffic

Hour Start	Liverpool Road								North Site Driveway				Private Driveway				Total All
	Northbound			South	Southbound			North	Eastbound			West Side	Westbound			East Side	
	Left	Through	Right	Side Pedestria	Left	Through	Right	Side Pedestria	Left	Through	Right	Pedestrians	Left	Through	Right	Pedestrians	
7:00		12				8											20
8:00		16				11											27
9:00		15				10											25
10:00		12				8											20
11:00		12				8											20
12:00		13				9											22
13:00		14				9											23
14:00		17				11											28
15:00		*18*				*12*											*30*
16:00		14				9											23
17:00		16				11											27
18:00		14				9											23

1294 Kingston Rd., 1848-1852 Liverpool Road Site Traffic

North Access

Hour Start	Liverpool Road								North Site Driveway				Private Driveway				Total All
	Northbound			South	Southbound			North	Eastbound			West Side	Westbound			East Side	
	Left	Through	Right	Side Pedestria	Left	Through	Right	Side Pedestria	Left	Through	Right	Pedestrians	Left	Through	Right	Pedestrians	
7:00	37						23		22		35						117
8:00	53						33		31		50						167
9:00	49						30		29		46						154
10:00	40						25		23		38						126
11:00	39						24		23		37						123
12:00	41						26		24		39						130
13:00	45						28		27		43						143
14:00	55						34		32		52						173
15:00	*58*						*36*		*34*		*55*						*183*
16:00	44						27		26		42						139
17:00	53						33		31		50						167
18:00	44						27		26		41						138

Corridor Growth (5 Years to 2024)

Hour Start	Liverpool Road								North Site Driveway				Private Driveway				Total All
	Northbound			South	Southbound			North	Eastbound			West Side	Westbound			East Side	
	Left	Through	Right	Side	Left	Through	Right	Side	Left	Through	Right	Pedestria	Left	Through	Right	Pedestria	
7:00		15				6											21
8:00		17				7											24
9:00		13				5											18
10:00		11				4											15
11:00		13				5											18
12:00		14				6											20
13:00		13				5											18
14:00		14				6											20
15:00		16				7											23
16:00		18				7											25
17:00		*22*				*9*											*31*
18:00		19				8											27

Corridor Growth (10 Years to 2029)

Hour Start	Liverpool Road								North Site Driveway				Private Driveway				Total All
	Northbound			South	Southbound			North	Eastbound			West Side	Westbound			East Side	
	Left	Through	Right	Side	Left	Through	Right	Side	Left	Through	Right	Pedestria	Left	Through	Right	Pedestria	
7:00		31				12											43
8:00		34				14											48
9:00		26				10											36
10:00		22				9											31
11:00		27				11											38
12:00		29				12											41
13:00		27				11											38
14:00		29				12											41
15:00		33				13											46
16:00		36				14											50
17:00		*45*				*18*											*63*
18:00		39				15											54

Future Total Traffic (2024)

Hour Start	Liverpool Road								North Site Driveway				Private Driveway				Total All
	Northbound			South	Southbound			North	Eastbound			West Side	Westbound			East Side	
	Left	Through	Right	Side	Left	Through	Right	Side	Left	Through	Right	Pedestria	Left	Through	Right	Pedestria	
7:00	37	324	89	0	61	813	23	1	22	0	35	0	86	0	46	6	1543
8:00	53	318	159	0	97	807	33	4	31	0	50	1	105	0	61	14	1733
9:00	49	241	194	1	84	519	30	7	29	0	46	0	116	0	72	12	1400
10:00	40	240	169	0	69	365	25	2	23	0	38	1	129	0	50	20	1171
11:00	39	345	242	0	62	373	24	2	23	0	37	0	142	0	74	16	1379
12:00	41	364	238	0	71	386	26	8	24	0	39	0	197	0	91	19	1504
13:00	45	368	232	0	49	334	28	6	27	0	43	0	164	0	74	15	1385
14:00	55	427	222	0	66	401	34	7	32	0	52	0	149	0	99	68	1612
15:00	58	598	235	0	59	404	36	13	34	0	55	0	142	0	93	29	1756
16:00	44	732	245	1	53	428	27	6	26	0	42	0	119	0	95	13	1831
17:00	53	986	264	1	50	513	33	6	31	0	50	1	114	0	108	15	2225
18:00	44	734	249	1	64	535	27	7	26	0	41	0	121	0	95	12	1956

Future Total Traffic (2029)

Hour Start	Liverpool Road								North Site Driveway				Private Driveway				Total All
	Northbound			South	Southbound			North	Eastbound			West Side	Westbound			East Side	
	Left	Through	Right	Side	Left	Through	Right	Side	Left	Through	Right	Pedestria	Left	Through	Right	Pedestria	
7:00	37	340	89	0	61	819	23	1	22	0	35	0	86	0	46	6	4651.292
8:00	53	335	159	0	97	814	33	4	31	0	50	1	105	0	61	14	1757
9:00	49	254	194	1	84	524	30	7	29	0	46	0	116	0	72	12	1418
10:00	40	251	169	0	69	370	25	2	23	0	38	1	129	0	50	20	1187
11:00	39	359	242	0	62	379	24	2	23	0	37	0	142	0	74	16	1399
12:00	41	379	238	0	71	392	26	8	24	0	39	0	197	0	91	19	1525
13:00	45	382	232	0	49	340	28	6	27	0	43	0	164	0	74	15	1405
14:00	55	442	222	0	66	407	34	7	32	0	52	0	149	0	99	68	1633
15:00	58	615	235	0	59	410	36	13	34	0	55	0	142	0	93	29	1779
16:00	44	750	245	1	53	435	27	6	26	0	42	0	119	0	95	13	1856
17:00	53	1009	264	1	50	522	33	6	31	0	50	1	114	0	108	15	2257
18:00	44	754	249	1	64	542	27	7	26	0	41	0	121	0	95	12	1983

Signal Warrant Values (2024)

Hour Start	Liverpool Road								North Site Driveway				Private Driveway				Total All
	Northbound			South	Southbound			North	Eastbound			West Side	Westbound			East Side	
	Left	Through	Right	Side	Left	Through	Right	Side	Left	Through	Right	Pedestria	Left	Through	Right	Pedestria	
7:00	37	324	89	0	61	813	23	1	22	0	35	0	86	0	46	6	1543
8:00	53	318	159	0	97	807	33	4	31	0	50	1	105	0	61	14	1733
12:00	41	364	238	0	71	386	26	8	24	0	39	0	197	0	91	19	1504
14:00	55	427	222	0	66	401	34	7	32	0	52	0	149	0	99	68	1612
15:00	58	598	235	0	59	404	36	13	34	0	55	0	142	0	93	29	1756
16:00	44	732	245	1	53	428	27	6	26	0	42	0	119	0	95	13	1831
17:00	53	986	264	1	50	513	33	6	31	0	50	1	114	0	108	15	2225
18:00	44	734	249	1	64	535	27	7	26	0	41	0	121	0	95	12	1956

Signal Warrant Values (2029)

Hour Start	Liverpool Road								North Site Driveway				Private Driveway				Total All
	Northbound			South	Southbound			North	Eastbound			West Side	Westbound			East Side	
	Left	Through	Right	Side	Left	Through	Right	Side	Left	Through	Right	Pedestria	Left	Through	Right	Pedestria	
7:00	37	340	89	0	61	819	23	1	22	0	35	0	86	0	46	6	4651.292
8:00	53	335	159	0	97	814	33	4	31	0	50	1	105	0	61	14	1757
12:00	41	379	238	0	71	392	26	8	24	0	39	0	197	0	91	19	1525
14:00	55	442	222	0	66	407	34	7	32	0	52	0	149	0	99	68	1633
15:00	58	615	235	0	59	410	36	13	34	0	55	0	142	0	93	29	1779
16:00	44	750	245	1	53	435	27	6	26	0	42	0	119	0	95	13	1856
17:00	53	1009	264	1	50	522	33	6	31	0	50	1	114	0	108	15	2257
18:00	44	754	249	1	64	542	27	7	26	0	41	0	121	0	95	12	1983

Input Data Sheet

Analysis Sheet | Results Sheet | Proposed Collision

GO TO Justification:

What are the intersecting roadways? Liverpool Rd. at Subject Site North Driveway (1 Access - 2024)

What is the direction of the Main Road street? North-South

When was the data collected? 2019-03-19

Justification 1 - 4: Volume Warrants

a.- Number of lanes on the Main Road? 2 or more

b.- Number of lanes on the Minor Road? 1

c.- How many approaches? 4

d.- What is the operating environment? Urban **Population >= 10,000 AND Speed < 70 km/hr**

e.- What is the eight hour vehicle volume at the intersection? (Please fill in table below)

Hour Ending	Liverpool Rd. (Northbound)			Subject Site (Eastbound)			Liverpool Rd. (Southbound)			Private Access (Westbound)			Pedestrians Crossing Main Road
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT	
7:00	37	324	89	22	0	35	61	813	23	86	0	46	0
8:00	53	318	159	31	0	50	97	807	33	105	0	61	1
12:00	41	364	238	24	0	39	71	386	26	197	0	91	0
14:00	55	427	222	32	0	52	66	401	34	149	0	99	0
15:00	58	598	235	34	0	55	59	404	36	142	0	93	0
16:00	44	732	245	26	0	42	53	428	27	119	0	95	1
17:00	53	986	264	31	0	50	50	513	33	114	0	108	2
18:00	44	734	249	26	0	41	64	535	27	121	0	95	1
Total	**385**	**4,483**	**1,701**	**226**	**0**	**364**	**521**	**4,287**	**239**	**1,033**	**0**	**688**	**5**

Justification 5: Collision Experience

Preceding Months	Number of Collisions*
1-12	0
13-24	0
25-36	0

***** Include only collisions that are susceptable to correction through the installation of traffic signal control

Justification 6: Pedestrian Volume

a.- Please fill in table below summarizing total pedestrians crossing major roadway at the intersection or in proximity to the intersection (zones). Please reference Section 4.8 of the Manual for further explanation and graphical representation.

	Zone 1		Zone 2		Zone 3 (if needed)		Zone 4 (if needed)		Total
	Assisted	Unassisted	Assisted	Unassisted	Assisted	Unassisted	Assisted	Unassisted	
Total 8 hour pedestrian volume	20	80	0	15	1	5	0	0	
Factored 8 hour pedestrian volume	120		15		7		0		
% Assigned to crossing rate	100%		50%		0%		0%		
Net 8 Hour Pedestrian Volume at Crossing									128
Net 8 Hour Vehicular Volume on Street Being Crossed									6,411

b.- Please fill in table below summarizing delay to pedestrians crossing major roadway at the intersection or in proximity to the intersection (zones). Please reference Section 4.8 of the Manual for further explanation and graphical representation.

	Zone 1		Zone 2		Zone 3 (if needed)		Zone 4 (if needed)		Total
	Assisted	Unassisted	Assisted	Unassisted	Assisted	Unassisted	Assisted	Unassisted	
Total 8 hour pedestrian volume	20	80	0	15	1	5	0	0	
Total 8 hour pedestrians delayed greater than 10 seconds	10	10	1	6	2	4	0	0	
Factored volume of total pedestrians	120		15		7		0		
Factored volume of delayed pedestrians	30		8		8		0		
% Assigned to Crossing Rate	100%		50%		0%		0%		
Net 8 Hour Volume of Total Pedestrians									128
Net 8 Hour Volume of Delayed Pedestrians									34

Analysis Sheet

Input Sheet | Results Sheet | Proposed Collision

GO TO Justification:

Intersection: Liverpool Rd. at Subject Site North Driveway (1 Access - 2024 Count Date: 2019-03-19

Justification 1: Minimum Vehicle Volumes

Restricted Flow Urban Conditions

Justification	Guidance Approach Lanes				Percentage Warrant								Total Across	Section Percent
	1 Lanes		2 or More Lanes		Hour Ending									
Flow Condition	FREE FLOW ☐	RESTR. FLOW ☐	FREE FLOW ☐	RESTR. FLOW ☑	7:00	8:00	12:00	14:00	15:00	16:00	17:00	18:00		
1A	480	720	600	900	1,536	1,714	1,477	1,537	1,714	1,811	2,202	1,936		
	COMPLIANCE %				100	100	100	100	100	100	100	100	800	100
1B	120	170	120	170	189	247	351	332	324	282	303	283		
	COMPLIANCE %				100	100	100	100	100	100	100	100	800	100
Restricted Flow Signal Justification 1:					Both 1A and 1B 100% Fulfilled each of 8 hours					Yes ☑		No ☐		
					Lesser of 1A or 1B at least 80% fulfilled each of 8 hours					Yes ☑		No ☐		

Justification 2: Delay to Cross Traffic

Restricted Flow Urban Conditions

Justification	Guidance Approach Lanes				Percentage Warrant								Total Across	Section Percent
	1 lanes		2 or More lanes		Hour Ending									
Flow Condition	FREE FLOW ☐	RESTR. FLOW ☐	FREE FLOW ☐	RESTR. FLOW ☑	7:00	8:00	12:00	14:00	15:00	16:00	17:00	18:00		
2A	480	720	600	900	1,347	1,467	1,126	1,205	1,390	1,529	1,899	1,653		
	COMPLIANCE %				100	100	100	100	100	100	100	100	800	100
2B	50	75	50	75	108	137	221	181	176	146	147	148		
	COMPLIANCE %				100	100	100	100	100	100	100	100	800	100
Restricted Flow Signal Justification 2:					Both 2A and 2B 100% fulfilled each of 8 hours					Yes ☑		No ☐		
					Lesser of 2A or 2B at least 80% fulfilled each of 8 hours					Yes ☑		No ☐		

Justification 3: Combination

Combination Justification 1 and 2

Justification Satisfied 80% or More				Two Justifications Satisfied 80% or More	
Justification 1	Minimum Vehicle Volume	YES ☑	NO ☐	YES ☑	NO ☐
Justification 2	Delay Cross Traffic	YES ☑	NO ☐	JUSTIFIED	

Justification 4: Four Hour Volume

Justification	Time Period	Total Volume of Both Approaches (Main)	Heaviest Minor Approach	Required Value	Average % Compliance	Overall % Compliance
		X	Y (actual)	Y (warrant threshold)		
Justification 4	8:00	1,467	166	115	100 %	100 %
	16:00	1,529	214	115	100 %	
	17:00	1,899	222	115	100 %	
	18:00	1,653	216	115	100 %	

Analysis Sheet

Input Sheet | Results Sheet | Proposed Collision

GO TO Justification:

Intersection: Liverpool Rd. at Subject Site North Driveway (1 Access - 2024 Count Date: 2019-03-19

Justification 5: Collision Experience

Justification	Preceding Months	% Fulfillment	Overall % Compliance
Justification 5	1-12	0 %	0 %
	13-24	0 %	
	25-36	0 %	

Justification 6: Pedestrian Volume

Pedestrian Volume Analysis

8 Hour Vehicular Volume V_8		Net 8 Hour Pedestrian Volume				
		< 200	200 - 275	276 - 475	476 - 1000	>1000
Justification 6A	< 1440					
	1440 - 2600					
	2601 - 7000	Not Justified				
	> 7000					

Pedestrian Delay Analysis

Net Total 8 Hour Volume of Total Pedestrians		Net Total 8 Hour Volume of Delayed Pedestrians		
		< 75	75 - 130	> 130
Justification 6B	< 200	Not Justified		
	200 - 300			
	> 300			

Results Sheet

Input Sheet | Analysis Sheet | Proposed Collision

GO TO Justification:

Intersection: Liverpool Rd. at Subject Site North Driveway (1 Acce Count Date: 2019-03-19

Summary Results

Justification			Compliance		Signal Justified? YES	Signal Justified? NO
1. Minimum Vehicular Volume	A	Total Volume	100	%	☑	☐
	B	Crossing Volume	100	%		
2. Delay to Cross Traffic	A	Main Road	100	%	☑	☐
	B	Crossing Road	100	%		
3. Combination	A	Justificaton 1	100	%	☑	☐
	B	Justification 2	100	%		
4. 4-Hr Volume			100	%	☑	☐
5. Collision Experience			0	%	☐	☑
6. Pedestrians	A	Volume	Justification not met		☐	☑
	B	Delay	Justification not met			

Signalized Intersection Capacity Analyses
(Liverpool Road at North Subject Site Driveway)

Two-Access

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	34	0	55	106	0	59	19	412	163	94	872	13
Future Volume (vph)	34	0	55	106	0	59	19	412	163	94	872	13
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2
Total Lost time (s)		6.9		6.9	6.9		6.9	6.9		6.9	6.9	
Lane Util. Factor		1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frt		0.92		1.00	0.85		1.00	0.96		1.00	1.00	
Flt Protected		0.98		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1496		1708	1597		1725	3323		1691	3491	
Flt Permitted		0.85		0.74	1.00		0.28	1.00		0.41	1.00	
Satd. Flow (perm)		1291		1322	1597		511	3323		738	3491	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	37	0	60	115	0	64	21	448	177	102	948	14
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	97	0	115	64	0	21	625	0	102	962	0
Heavy Vehicles (%)	0%	0%	21%	1%	0%	0%	0%	4%	0%	2%	2%	5%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		13.9		13.9	13.9		72.3	72.3		72.3	72.3	
Effective Green, g (s)		13.9		13.9	13.9		72.3	72.3		72.3	72.3	
Actuated g/C Ratio		0.14		0.14	0.14		0.72	0.72		0.72	0.72	
Clearance Time (s)		6.9		6.9	6.9		6.9	6.9		6.9	6.9	
Vehicle Extension (s)		3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		179		183	221		369	2402		533	2523	
v/s Ratio Prot					0.04			0.19			c0.28	
v/s Ratio Perm		0.08		c0.09			0.04			0.14		
v/c Ratio		0.54		0.63	0.29		0.06	0.26		0.19	0.38	
Uniform Delay, d1		40.1		40.6	38.6		4.0	4.7		4.5	5.3	
Progression Factor		1.00		1.00	1.00		1.00	1.00		0.82	0.79	
Incremental Delay, d2		3.3		6.6	0.7		0.3	0.3		0.8	0.4	
Delay (s)		43.4		47.2	39.3		4.3	5.0		4.4	4.6	
Level of Service		D		D	D		A	A		A	A	
Approach Delay (s)		43.4			44.4			5.0			4.6	
Approach LOS		D			D			A			A	

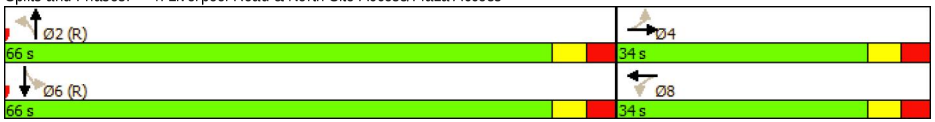
Intersection Summary				
HCM 2000 Control Delay	10.2	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.42			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	13.8	
Intersection Capacity Utilization	58.5%	ICU Level of Service	B	
Analysis Period (min)	15			

c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	34	0	106	0	19	412	94	872
Future Volume (vph)	34	0	106	0	19	412	94	872
Lane Group Flow (vph)	0	97	115	64	21	625	102	962
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases		4		8		2		6
Permitted Phases	4		8		2		6	
Detector Phase	4	4	8	8	2	2	6	6
Switch Phase								
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	24.9	24.9	24.9	24.9	24.9	24.9	25.4	25.4
Total Split (s)	34.0	34.0	34.0	34.0	66.0	66.0	66.0	66.0
Total Split (%)	34.0%	34.0%	34.0%	34.0%	66.0%	66.0%	66.0%	66.0%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2
Lost Time Adjust (s)		0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)		6.9	6.9	6.9	6.9	6.9	6.9	6.9
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode	None	None	None	None	C-Min	C-Min	C-Min	C-Min
v/c Ratio		0.54	0.62	0.29	0.06	0.26	0.19	0.38
Control Delay		50.1	54.6	40.1	5.6	5.5	5.4	5.0
Queue Delay		0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay		50.1	54.6	40.1	5.6	5.5	5.4	5.0
Queue Length 50th (m)		18.7	22.4	11.9	1.1	19.5	5.5	29.2
Queue Length 95th (m)		33.3	38.5	23.1	4.1	33.4	13.2	44.8
Internal Link Dist (m)		19.8		34.1		116.1		192.1
Turn Bay Length (m)								
Base Capacity (vph)		349	358	432	368	2402	534	2522
Starvation Cap Reductn		0	0	0	0	0	0	0
Spillback Cap Reductn		0	0	0	0	0	0	0
Storage Cap Reductn		0	0	0	0	0	0	0
Reduced v/c Ratio		0.28	0.32	0.15	0.06	0.26	0.19	0.38

Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 55
Control Type: Actuated-Coordinated

Splits and Phases: 4: Liverpool Road & North Site Access/Plaza Access



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	23	0	44	123	0	98	58	923	247	76	396	36
Future Volume (vph)	23	0	44	123	0	98	58	923	247	76	396	36
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2
Total Lost time (s)		6.9		6.9	6.9		6.9	6.9		6.9	6.9	
Lane Util. Factor		1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frt		0.91		1.00	0.85		1.00	0.97		1.00	0.99	
Flt Protected		0.98		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1683		1725	1581		1725	3430		1725	3462	
Flt Permitted		0.85		0.81	1.00		0.48	1.00		0.19	1.00	
Satd. Flow (perm)		1461		1467	1581		877	3430		338	3462	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	25	0	48	134	0	107	63	1003	268	83	430	39
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	73	0	134	107	0	63	1271	0	83	469	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	1%	0%	1%	0%	0%	2%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		15.6		15.6	15.6		70.6	70.6		70.6	70.6	
Effective Green, g (s)		15.6		15.6	15.6		70.6	70.6		70.6	70.6	
Actuated g/C Ratio		0.16		0.16	0.16		0.71	0.71		0.71	0.71	
Clearance Time (s)		6.9		6.9	6.9		6.9	6.9		6.9	6.9	
Vehicle Extension (s)		3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		227		228	246		619	2421		238	2444	
v/s Ratio Prot					0.07			c0.37			0.14	
v/s Ratio Perm		0.05		c0.09			0.07			0.25		
v/c Ratio		0.32		0.59	0.43		0.10	0.52		0.35	0.19	
Uniform Delay, d1		37.5		39.2	38.2		4.7	6.9		5.7	5.0	
Progression Factor		1.00		1.00	1.00		2.03	2.68		1.15	1.12	
Incremental Delay, d2		0.8		3.8	1.2		0.2	0.4		4.0	0.2	
Delay (s)		38.3		43.0	39.4		9.6	18.8		10.6	5.8	
Level of Service		D		D	D		A	B		B	A	
Approach Delay (s)		38.3			41.4			18.4			6.5	
Approach LOS		D			D			B			A	

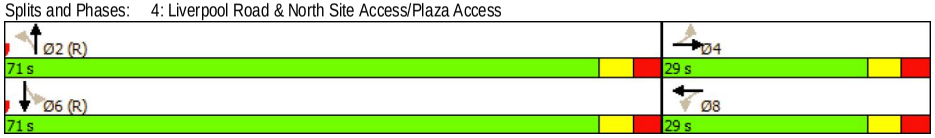
Intersection Summary				
HCM 2000 Control Delay	18.6	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.54			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	13.8	
Intersection Capacity Utilization	68.3%	ICU Level of Service	C	
Analysis Period (min)	15			

c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	23	0	123	0	58	923	76	396
Future Volume (vph)	23	0	123	0	58	923	76	396
Lane Group Flow (vph)	0	73	134	107	63	1271	83	469
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases		4		8		2		6
Permitted Phases	4		8		2		6	
Detector Phase	4	4	8	8	2	2	6	6
Switch Phase								
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	25.4	25.4	25.4	25.4	24.9	24.9	24.9	24.9
Total Split (s)	29.0	29.0	29.0	29.0	71.0	71.0	71.0	71.0
Total Split (%)	29.0%	29.0%	29.0%	29.0%	71.0%	71.0%	71.0%	71.0%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2
Lost Time Adjust (s)		0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)		6.9	6.9	6.9	6.9	6.9	6.9	6.9
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode	None	None	None	None	C-Max	C-Max	C-Max	C-Max
v/c Ratio		0.32	0.59	0.43	0.10	0.52	0.35	0.19
Control Delay		39.5	48.7	42.4	12.3	21.0	13.4	6.4
Queue Delay		0.0	0.0	0.0	0.0	3.0	0.0	0.0
Total Delay		39.5	48.7	42.4	12.3	24.0	13.4	6.4
Queue Length 50th (m)		13.4	25.7	20.0	8.0	129.0	8.1	21.5
Queue Length 95th (m)		25.0	42.0	34.1	m13.5	m149.0	24.1	21.5
Internal Link Dist (m)		19.8		34.1		116.1		192.1
Turn Bay Length (m)								
Base Capacity (vph)		322	324	349	619	2421	238	2446
Starvation Cap Reductn		0	0	0	0	1012	0	0
Spillback Cap Reductn		0	0	0	0	0	0	0
Storage Cap Reductn		0	0	0	0	0	0	0
Reduced v/c Ratio		0.23	0.41	0.31	0.10	0.90	0.35	0.19

Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 4: Liverpool Road & North Site Access/Plaza Access



One-Access

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	34	0	55	106	0	59	19	412	163	94	872	13
Future Volume (vph)	34	0	55	106	0	59	19	412	163	94	872	13
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2
Total Lost time (s)		6.9		6.9	6.9		6.9	6.9		6.9	6.9	
Lane Util. Factor		1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frt		0.92		1.00	0.85		1.00	0.96		1.00	1.00	
Flt Protected		0.98		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1496		1708	1597		1725	3323		1691	3491	
Flt Permitted		0.85		0.74	1.00		0.28	1.00		0.41	1.00	
Satd. Flow (perm)		1291		1322	1597		511	3323		738	3491	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	37	0	60	115	0	64	21	448	177	102	948	14
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	97	0	115	64	0	21	625	0	102	962	0
Heavy Vehicles (%)	0%	0%	21%	1%	0%	0%	0%	4%	0%	2%	2%	5%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		13.9		13.9	13.9		72.3	72.3		72.3	72.3	
Effective Green, g (s)		13.9		13.9	13.9		72.3	72.3		72.3	72.3	
Actuated g/C Ratio		0.14		0.14	0.14		0.72	0.72		0.72	0.72	
Clearance Time (s)		6.9		6.9	6.9		6.9	6.9		6.9	6.9	
Vehicle Extension (s)		3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		179		183	221		369	2402		533	2523	
v/s Ratio Prot					0.04			0.19			c0.28	
v/s Ratio Perm		0.08		c0.09			0.04			0.14		
v/c Ratio		0.54		0.63	0.29		0.06	0.26		0.19	0.38	
Uniform Delay, d1		40.1		40.6	38.6		4.0	4.7		4.5	5.3	
Progression Factor		1.00		1.00	1.00		1.00	1.00		0.82	0.79	
Incremental Delay, d2		3.3		6.6	0.7		0.3	0.3		0.8	0.4	
Delay (s)		43.4		47.2	39.3		4.3	5.0		4.4	4.6	
Level of Service		D		D	D		A	A		A	A	
Approach Delay (s)		43.4			44.4			5.0			4.6	
Approach LOS		D			D			A			A	

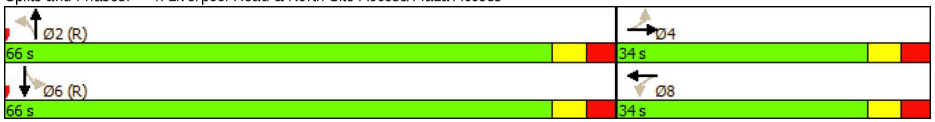
Intersection Summary				
HCM 2000 Control Delay	10.2	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.42			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	13.8	
Intersection Capacity Utilization	58.5%	ICU Level of Service	B	
Analysis Period (min)	15			

c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	34	0	106	0	19	412	94	872
Future Volume (vph)	34	0	106	0	19	412	94	872
Lane Group Flow (vph)	0	97	115	64	21	625	102	962
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases		4		8		2		6
Permitted Phases	4		8		2		6	
Detector Phase	4	4	8	8	2	2	6	6
Switch Phase								
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	24.9	24.9	24.9	24.9	24.9	24.9	25.4	25.4
Total Split (s)	34.0	34.0	34.0	34.0	66.0	66.0	66.0	66.0
Total Split (%)	34.0%	34.0%	34.0%	34.0%	66.0%	66.0%	66.0%	66.0%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2
Lost Time Adjust (s)		0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)		6.9	6.9	6.9	6.9	6.9	6.9	6.9
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode	None	None	None	None	C-Min	C-Min	C-Min	C-Min
v/c Ratio		0.54	0.62	0.29	0.06	0.26	0.19	0.38
Control Delay		50.1	54.6	40.1	5.6	5.5	5.4	5.0
Queue Delay		0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay		50.1	54.6	40.1	5.6	5.5	5.4	5.0
Queue Length 50th (m)		18.7	22.4	11.9	1.1	19.5	5.5	29.2
Queue Length 95th (m)		33.3	38.5	23.1	4.1	33.4	13.2	44.8
Internal Link Dist (m)		19.8		34.1		116.1		192.1
Turn Bay Length (m)								
Base Capacity (vph)		349	358	432	368	2402	534	2522
Starvation Cap Reductn		0	0	0	0	0	0	0
Spillback Cap Reductn		0	0	0	0	0	0	0
Storage Cap Reductn		0	0	0	0	0	0	0
Reduced v/c Ratio		0.28	0.32	0.15	0.06	0.26	0.19	0.38

Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 55
Control Type: Actuated-Coordinated

Splits and Phases: 4: Liverpool Road & North Site Access/Plaza Access



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	23	0	44	123	0	98	58	923	247	76	396	36
Future Volume (vph)	23	0	44	123	0	98	58	923	247	76	396	36
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2
Total Lost time (s)		6.9		6.9	6.9		6.9	6.9		6.9	6.9	
Lane Util. Factor		1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frt		0.91		1.00	0.85		1.00	0.97		1.00	0.99	
Flt Protected		0.98		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1683		1725	1581		1725	3430		1725	3462	
Flt Permitted		0.85		0.81	1.00		0.48	1.00		0.19	1.00	
Satd. Flow (perm)		1461		1467	1581		877	3430		338	3462	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	25	0	48	134	0	107	63	1003	268	83	430	39
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	73	0	134	107	0	63	1271	0	83	469	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	1%	0%	1%	0%	0%	2%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		15.6		15.6	15.6		70.6	70.6		70.6	70.6	
Effective Green, g (s)		15.6		15.6	15.6		70.6	70.6		70.6	70.6	
Actuated g/C Ratio		0.16		0.16	0.16		0.71	0.71		0.71	0.71	
Clearance Time (s)		6.9		6.9	6.9		6.9	6.9		6.9	6.9	
Vehicle Extension (s)		3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		227		228	246		619	2421		238	2444	
v/s Ratio Prot					0.07			c0.37			0.14	
v/s Ratio Perm		0.05		c0.09			0.07			0.25		
v/c Ratio		0.32		0.59	0.43		0.10	0.52		0.35	0.19	
Uniform Delay, d1		37.5		39.2	38.2		4.7	6.9		5.7	5.0	
Progression Factor		1.00		1.00	1.00		2.03	2.68		1.15	1.12	
Incremental Delay, d2		0.8		3.8	1.2		0.2	0.4		4.0	0.2	
Delay (s)		38.3		43.0	39.4		9.6	18.8		10.6	5.8	
Level of Service		D		D	D		A	B		B	A	
Approach Delay (s)		38.3			41.4			18.4			6.5	
Approach LOS		D			D			B			A	

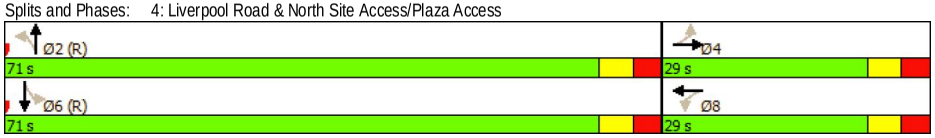
Intersection Summary				
HCM 2000 Control Delay	18.6	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.54			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	13.8	
Intersection Capacity Utilization	68.3%	ICU Level of Service	C	
Analysis Period (min)	15			

c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	23	0	123	0	58	923	76	396
Future Volume (vph)	23	0	123	0	58	923	76	396
Lane Group Flow (vph)	0	73	134	107	63	1271	83	469
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases		4		8		2		6
Permitted Phases	4		8		2		6	
Detector Phase	4	4	8	8	2	2	6	6
Switch Phase								
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	25.4	25.4	25.4	25.4	24.9	24.9	24.9	24.9
Total Split (s)	29.0	29.0	29.0	29.0	71.0	71.0	71.0	71.0
Total Split (%)	29.0%	29.0%	29.0%	29.0%	71.0%	71.0%	71.0%	71.0%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2
Lost Time Adjust (s)		0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)		6.9	6.9	6.9	6.9	6.9	6.9	6.9
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode	None	None	None	None	C-Max	C-Max	C-Max	C-Max
v/c Ratio		0.32	0.59	0.43	0.10	0.52	0.35	0.19
Control Delay		39.5	48.7	42.4	12.3	21.0	13.4	6.4
Queue Delay		0.0	0.0	0.0	0.0	3.0	0.0	0.0
Total Delay		39.5	48.7	42.4	12.3	24.0	13.4	6.4
Queue Length 50th (m)		13.4	25.7	20.0	8.0	129.0	8.1	21.5
Queue Length 95th (m)		25.0	42.0	34.1	m13.5	m149.0	24.1	21.5
Internal Link Dist (m)		19.8		34.1		116.1		192.1
Turn Bay Length (m)								
Base Capacity (vph)		322	324	349	619	2421	238	2446
Starvation Cap Reductn		0	0	0	0	1012	0	0
Spillback Cap Reductn		0	0	0	0	0	0	0
Storage Cap Reductn		0	0	0	0	0	0	0
Reduced v/c Ratio		0.23	0.41	0.31	0.10	0.90	0.35	0.19

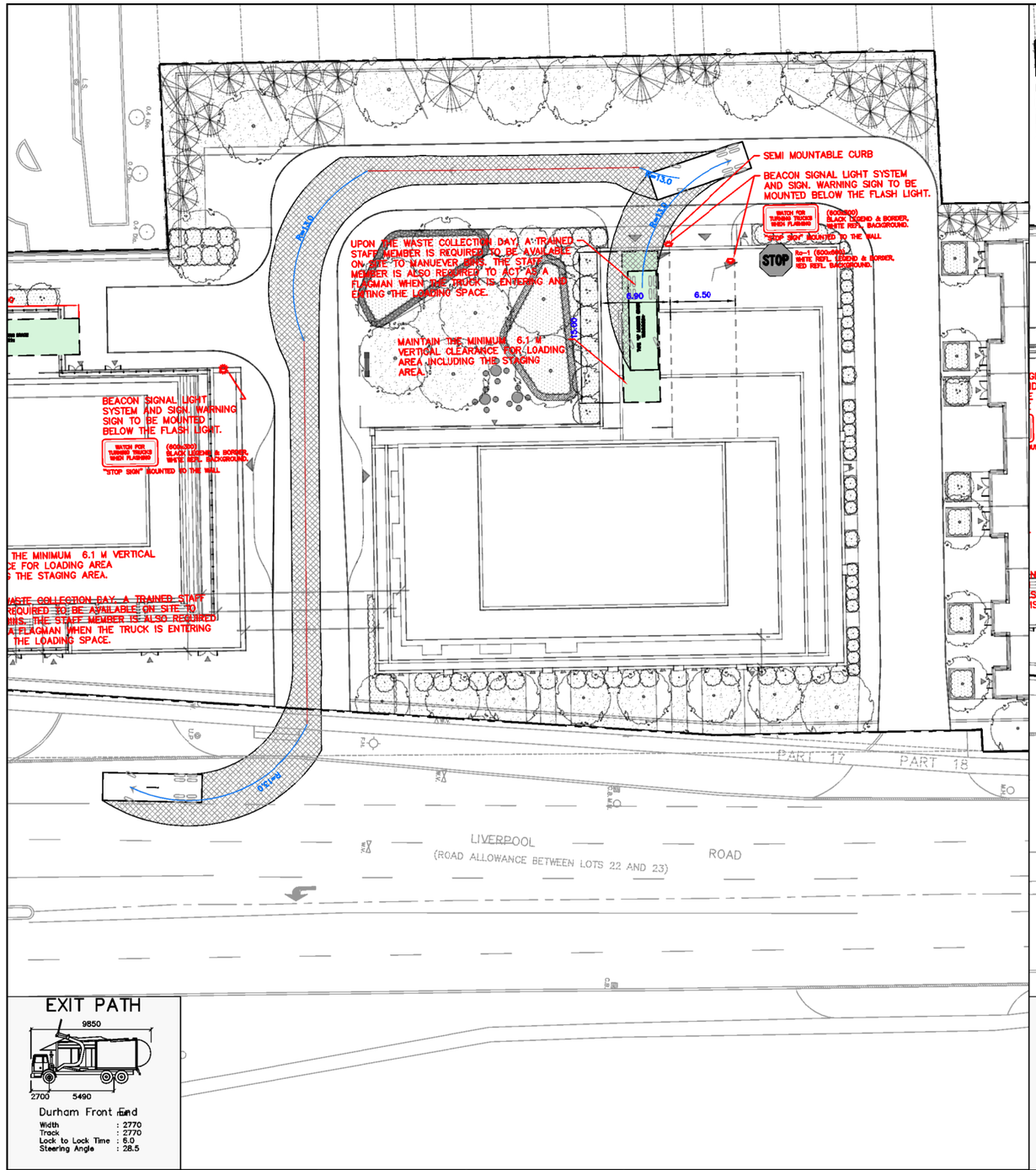
Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

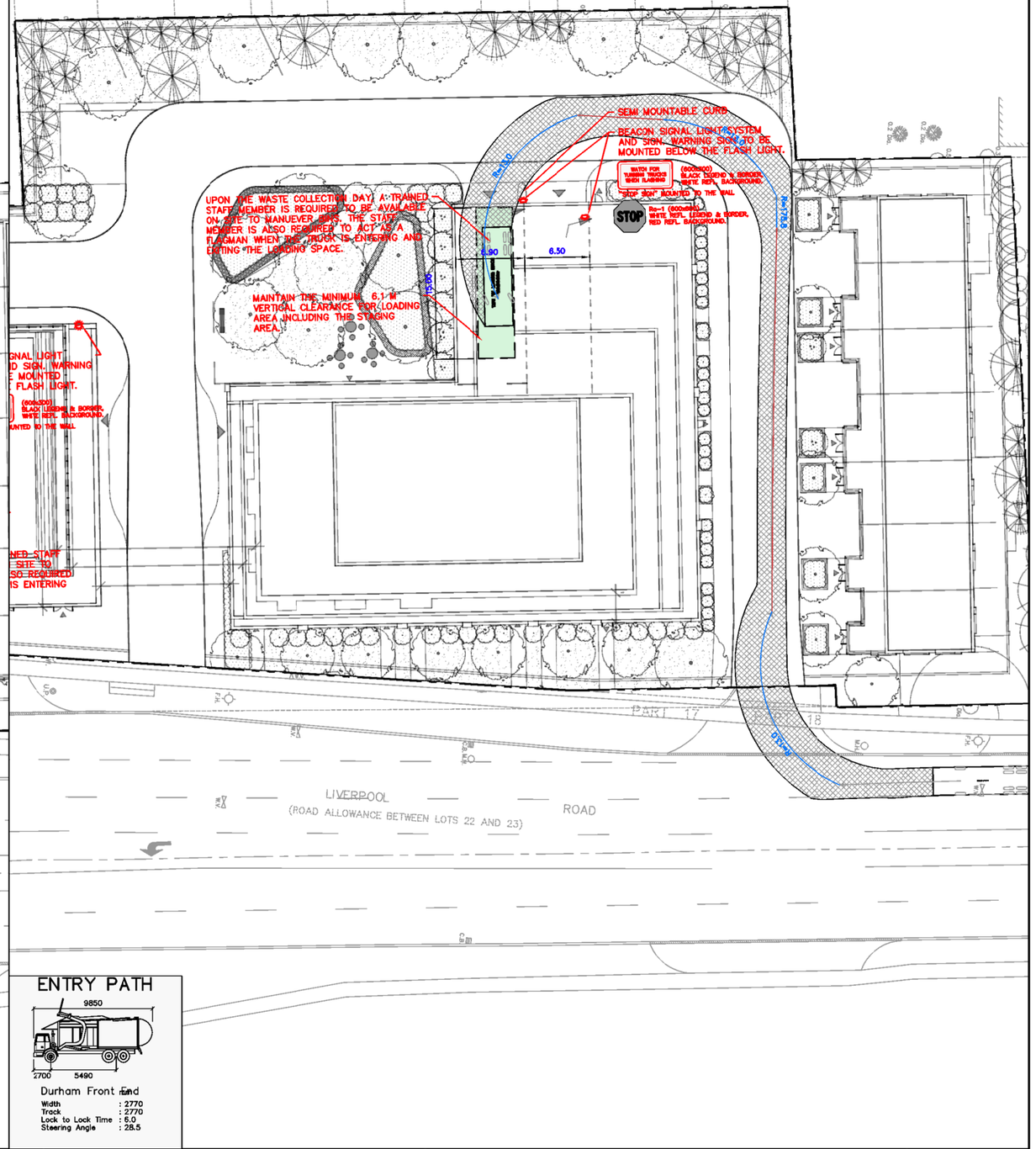
Splits and Phases: 4: Liverpool Road & North Site Access/Plaza Access



APPENDIX H

Loading and Swept Path Review





EXIT PATH

Durham Front End

Width	: 2770
Track	: 2770
Lock to Lock Time	: 6.0
Steering Angle	: 28.5

ENTRY PATH

Durham Front End

Width	: 2770
Track	: 2770
Lock to Lock Time	: 6.0
Steering Angle	: 28.5

LEA Consulting Ltd.
Consulting Engneers and Planners
www.LEA.ca

N

Project No.
19225–200

Date
MAY 15, 2019

DRAFT
NOT FOR CONSTRUCTION

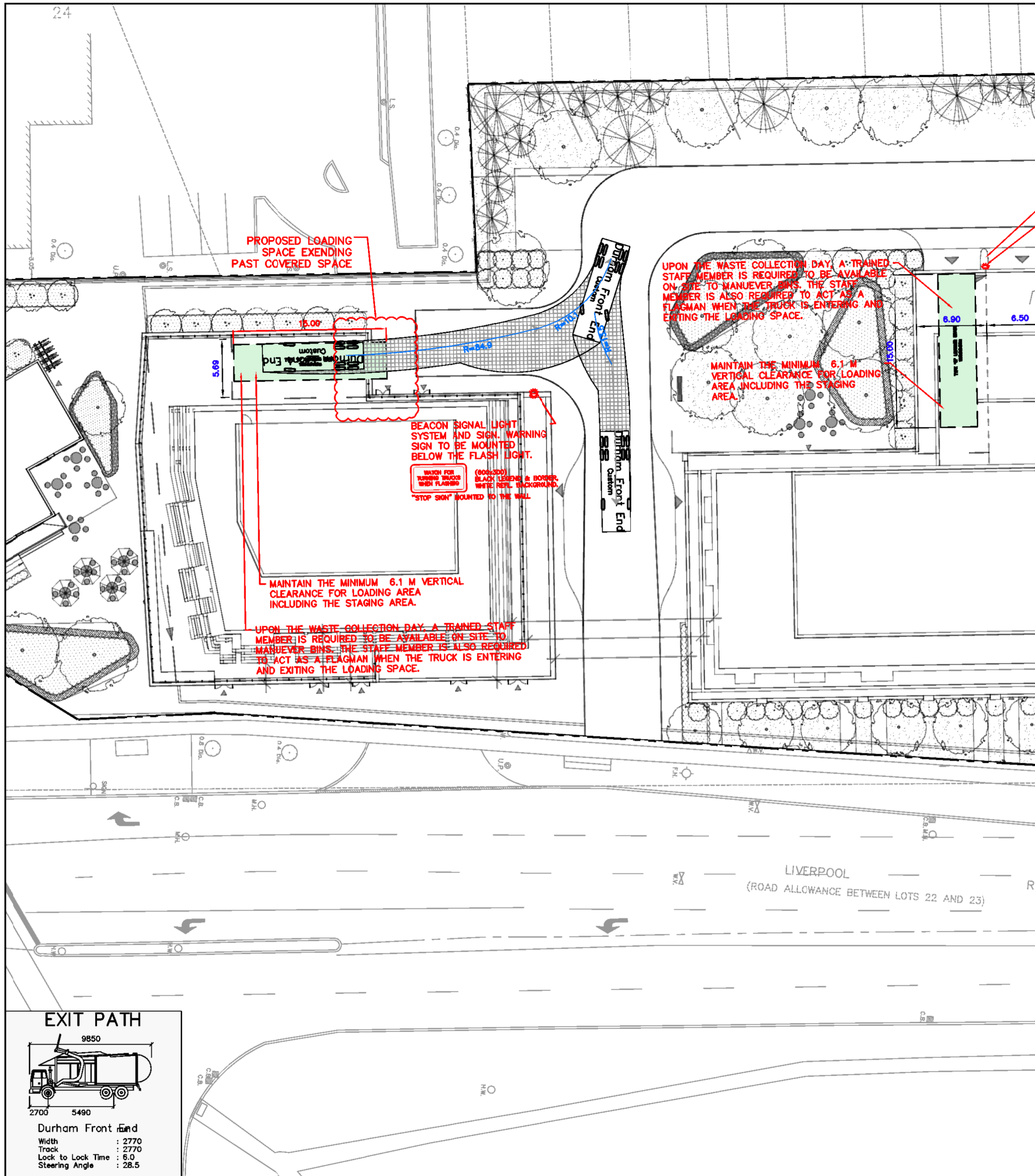
1294 KINGSTON ROAD
PICKERING ONTARIO

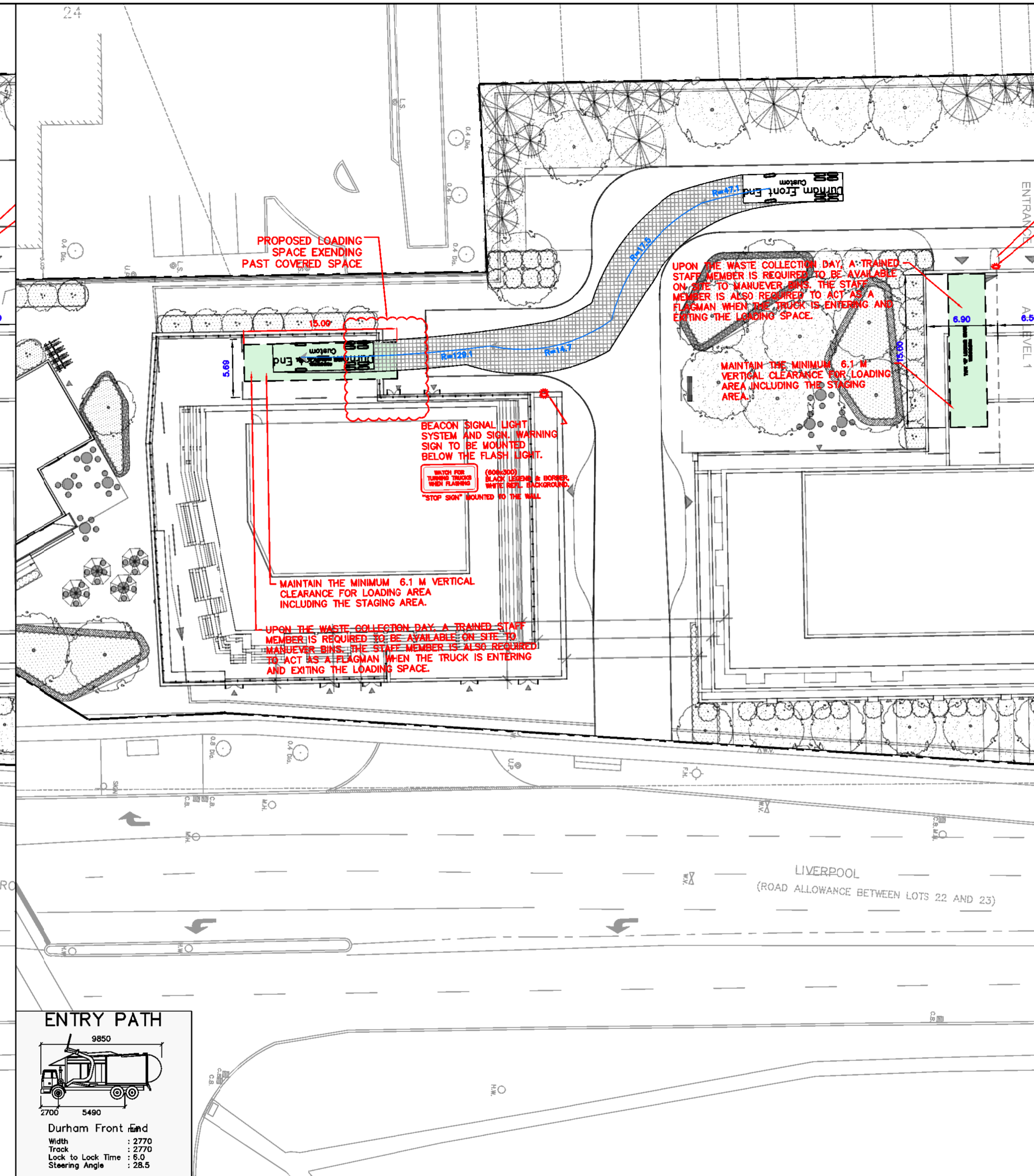
5 0 5 10 15m
1:500

LOADING AREA 1
GARBAGE TRUCK ENTRY AND EXIT PATH (DURHAM REGION TRUCK)

Drawing No.
001

DRAWING NAME: F:\19225\Drafting\19225 WF004.dwg


PROPOSED LOADING SPACE EXENDING PAST COVERED SPACE
UPON THE WASTE COLLECTION DAY, A TRAINED STAFF MEMBER IS REQUIRED TO BE AVAILABLE ON SITE TO MANUEVER BINS. THE STAFF MEMBER IS ALSO REQUIRED TO ACT AS A FLAGMAN WHEN THE TRUCK IS ENTERING AND EXITING THE LOADING SPACE.
MAINTAIN THE MINIMUM 6.1 M VERTICAL CLEARANCE FOR LOADING AREA INCLUDING THE STAGING AREA.
BEACON SIGNAL LIGHT SYSTEM AND SIGN. WARNING SIGN TO BE MOUNTED BELOW THE FLASH LIGHT.
"STOP SIGN" MOUNTED TO THE WALL
MAINTAIN THE MINIMUM 6.1 M VERTICAL CLEARANCE FOR LOADING AREA INCLUDING THE STAGING AREA.
UPON THE WASTE COLLECTION DAY, A TRAINED STAFF MEMBER IS REQUIRED TO BE AVAILABLE ON SITE TO MANUEVER BINS. THE STAFF MEMBER IS ALSO REQUIRED TO ACT AS A FLAGMAN WHEN THE TRUCK IS ENTERING AND EXITING THE LOADING SPACE.
Durham Front End
LIVERPOOL
(ROAD ALLOWANCE BETWEEN LOTS 22 AND 23)
EXIT PATH
9850
2700
5490
Durham Front End
Width : 2770
Track : 2770
Lock to Lock Time : 6.0
Steering Angle : 28.5


PROPOSED LOADING SPACE EXENDING PAST COVERED SPACE
UPON THE WASTE COLLECTION DAY, A TRAINED STAFF MEMBER IS REQUIRED TO BE AVAILABLE ON SITE TO MANUEVER BINS. THE STAFF MEMBER IS ALSO REQUIRED TO ACT AS A FLAGMAN WHEN THE TRUCK IS ENTERING AND EXITING THE LOADING SPACE.
MAINTAIN THE MINIMUM 6.1 M VERTICAL CLEARANCE FOR LOADING AREA INCLUDING THE STAGING AREA.
BEACON SIGNAL LIGHT SYSTEM AND SIGN. WARNING SIGN TO BE MOUNTED BELOW THE FLASH LIGHT.
"STOP SIGN" MOUNTED TO THE WALL
MAINTAIN THE MINIMUM 6.1 M VERTICAL CLEARANCE FOR LOADING AREA INCLUDING THE STAGING AREA.
UPON THE WASTE COLLECTION DAY, A TRAINED STAFF MEMBER IS REQUIRED TO BE AVAILABLE ON SITE TO MANUEVER BINS. THE STAFF MEMBER IS ALSO REQUIRED TO ACT AS A FLAGMAN WHEN THE TRUCK IS ENTERING AND EXITING THE LOADING SPACE.
Durham Front End
LIVERPOOL
(ROAD ALLOWANCE BETWEEN LOTS 22 AND 23)
ENTRY PATH
9850
2700
5490
Durham Front End
Width : 2770
Track : 2770
Lock to Lock Time : 6.0
Steering Angle : 28.5

LEA Consulting Ltd.
Consulting Engineers and Planners
www.LEA.ca

Project No. 19225–200

Date MAY 15, 2019

DRAFT
NOT FOR CONSTRUCTION

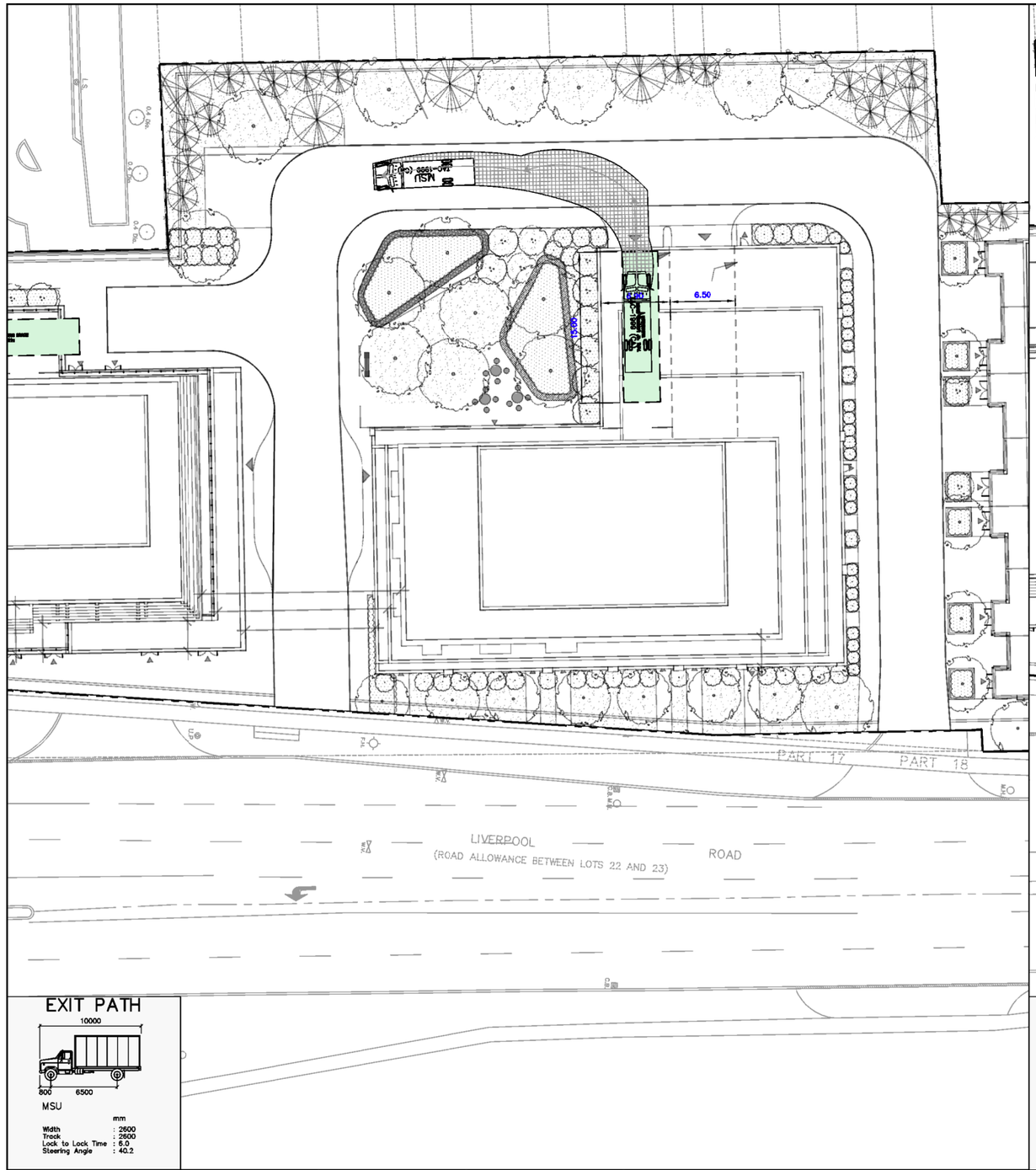
1294 KINGSTON ROAD
PICKERING ONTARIO

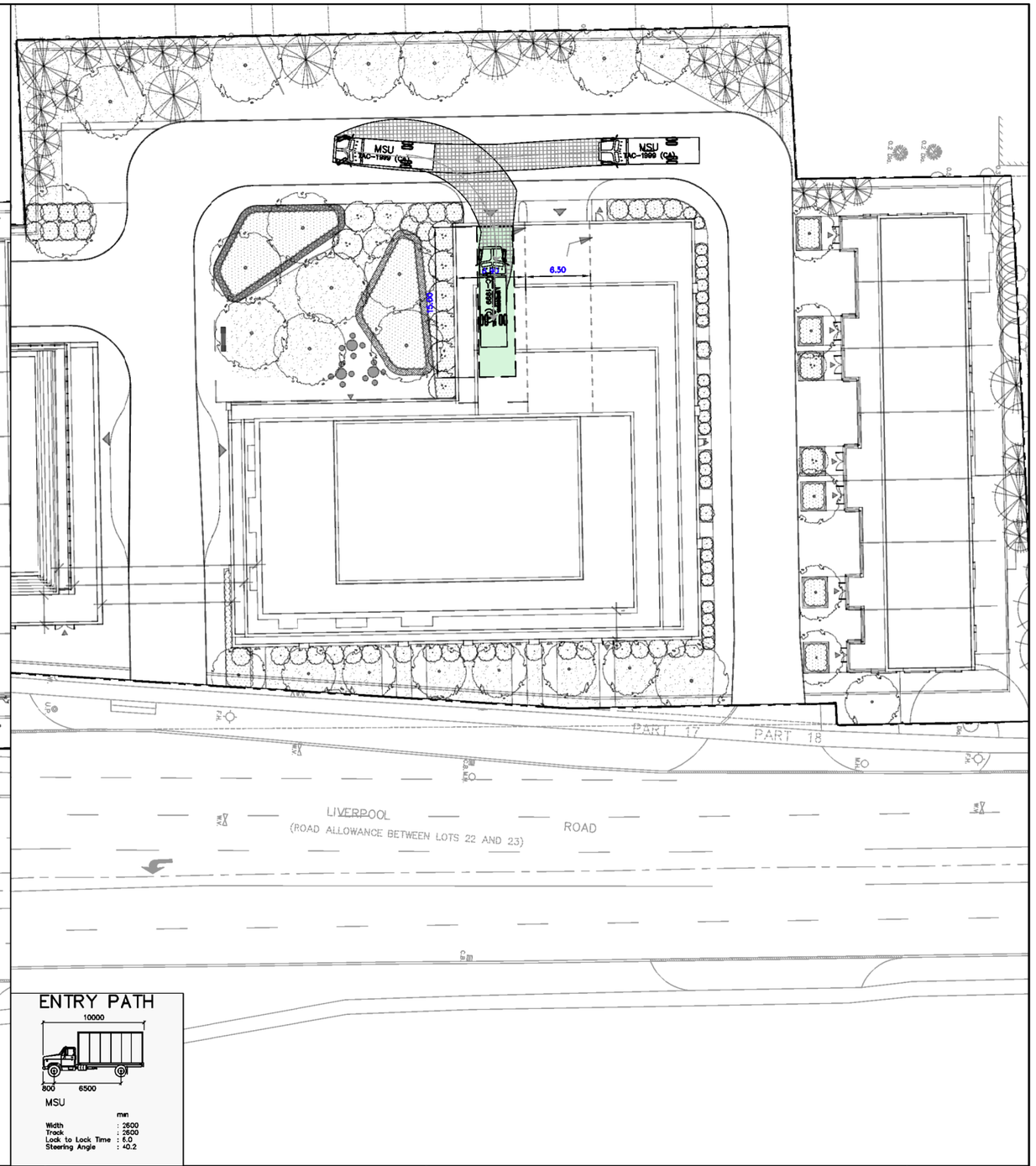
5 0 5 10 15m
1:500

LOADING AREA 2
GARBAGE TRUCK ENTRY AND EXIT PATH
(DURHAM REGION TRUCK)

Drawing No. 002

DRAWING NAME: F:\19225\Drafting\19225 WF004.dwg





EXIT PATH

MSU

	mm
Width	: 2600
Track	: 2600
Lock to Lock Time	: 6.0
Steering Angle	: 40.2

ENTRY PATH

MSU

	mm
Width	: 2600
Track	: 2600
Lock to Lock Time	: 6.0
Steering Angle	: 40.2

LEA Consulting Ltd.
Consulting Engineers and Planners
www.LEA.ca

N

Project No.
19225–200

Date
MAY 15, 2019

DRAFT
NOT FOR CONSTRUCTION

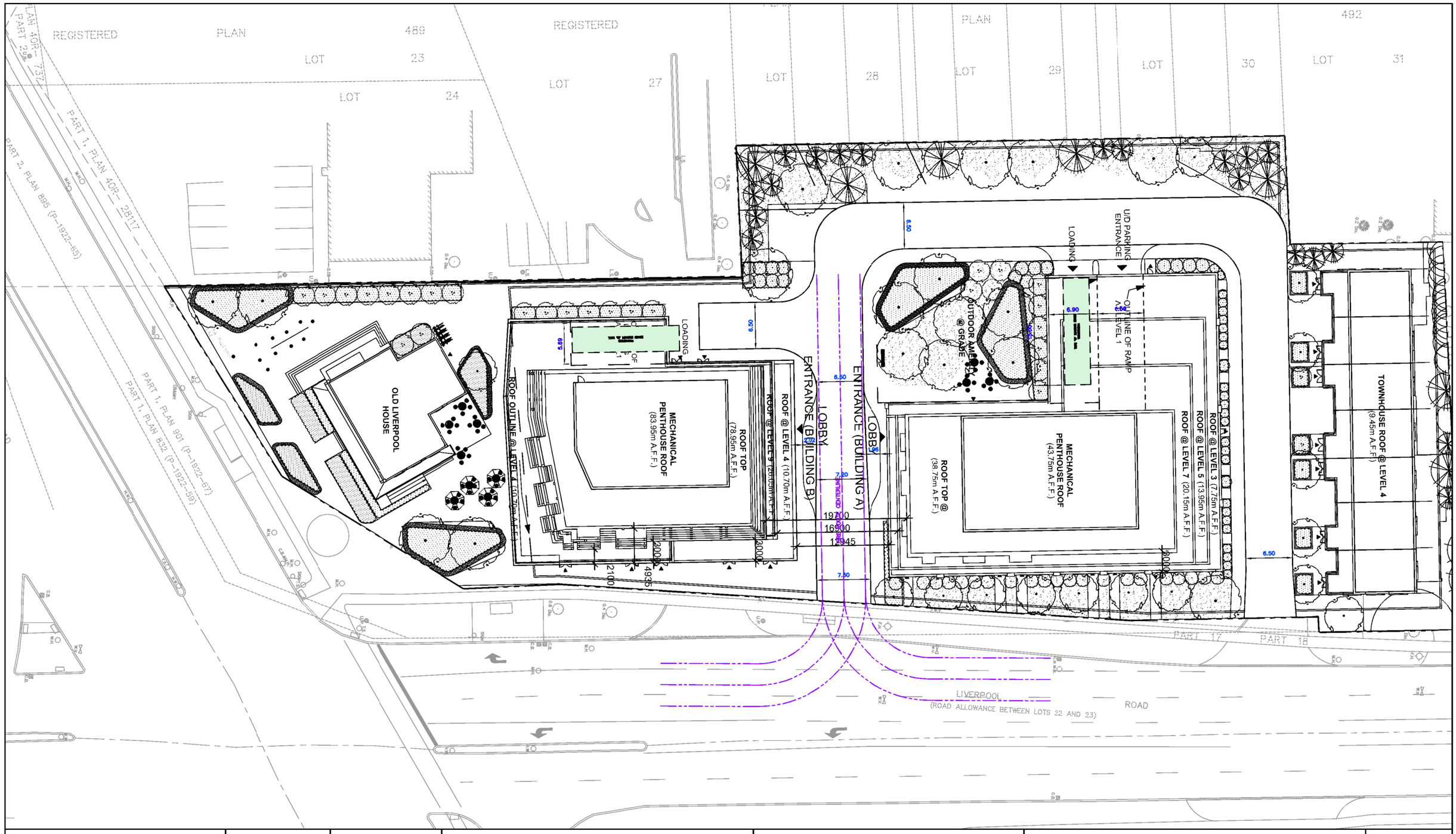
1294 KINGSTON ROAD
PICKERING ONTARIO

5 0 5 10 15m
1:500

LOADING AREA 1
GARBAGE TRUCK ENTRY AND EXIT PATH
(DURHAM REGION TRUCK)

Drawing No.
003

DRAWING NAME: F:\19225\Drafting\19225 WF004.dwg



LEA Consulting Ltd.
Consulting Engineers and Planners
www.LEA.ca

N

Project No.
19225–200

Date
MAY 15, 2019

DRAFT
NOT FOR CONSTRUCTION

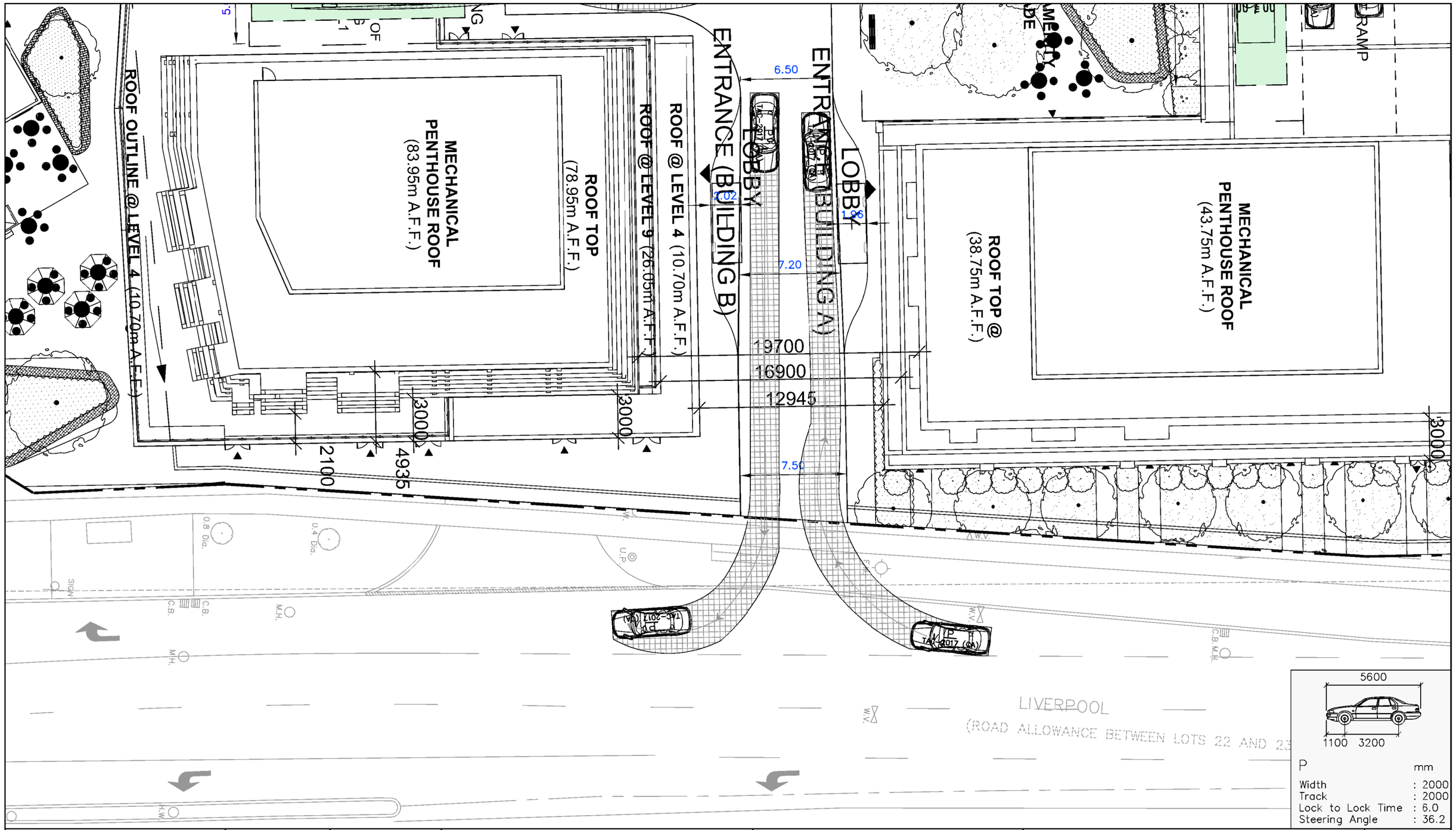
1294 KINGSTON ROAD
PICKERING ONTARIO

5 0 5 10 15m
1:500

FIRE ROUTE ANALYSIS

Drawing No.
004

DRAWING NAME: F:\19225\Drafting\19225 WF004.dwg



LEA Consulting Ltd.
Consulting Engineers and Planners
www.LEA.ca

N

Project No.
19225–200

Date
MAY 15, 2019

DRAFT
NOT FOR CONSTRUCTION

1294 KINGSTON ROAD
PICKERING ONTARIO

2.5 0 2.5 5 7.5m
1:250

LAY BY REVIEW

Drawing No.
005

DRAWING NAME: F:\19225\Drafting\19225 WF004.dwg

LOT 28

LOT 29

L.S.

0.4 Dia.

0.4 Dia.

0.4 Dia.

0.2 Dia.

0.2 Dia.

6.50

LOADING

6.50

LOADING

UD PARKING ENTRANCE

CONVEX MIRRORS MOUNTED ON BUILDING

ELEV=0.00

OUTDOOR AMENITY @ GRADE

6.90

15.00

3.65 @7.5%

LEVEL 1

11.53

RAMP

ELEV=-0.27

ELEV=-2.00

ELEV=-2.27

3.65 @7.5%

ROOF @ LEVEL 9 (26.0

ROOF @ LEVEL 4 (10.7

ROOF TOP (78.95m A.F.F.)

MECHANICAL

6.50

LOBBY ENTRANCE (BUILDING

2.02

1.96

LOBBY ENTRANCE (BUILDIN

7.20

ROOF (38.75m

MECHANI PENTHOUSE (43.75m A.

ROOF @ LEVEL 7

ROOF @ LEVEL 5

ROOF @ LEVEL 3

TOWNH

5600

1100 3200

P mm

Width	: 2000
Track	: 2000
Lock to Lock Time	: 6.0
Steering Angle	: 36.2

LEA Consulting Ltd.
Consulting Engineers and Planners
www.LEA.ca

N

Project No.
19225-200

Date
MAY 15, 2019

DRAFT
NOT FOR CONSTRUCTION

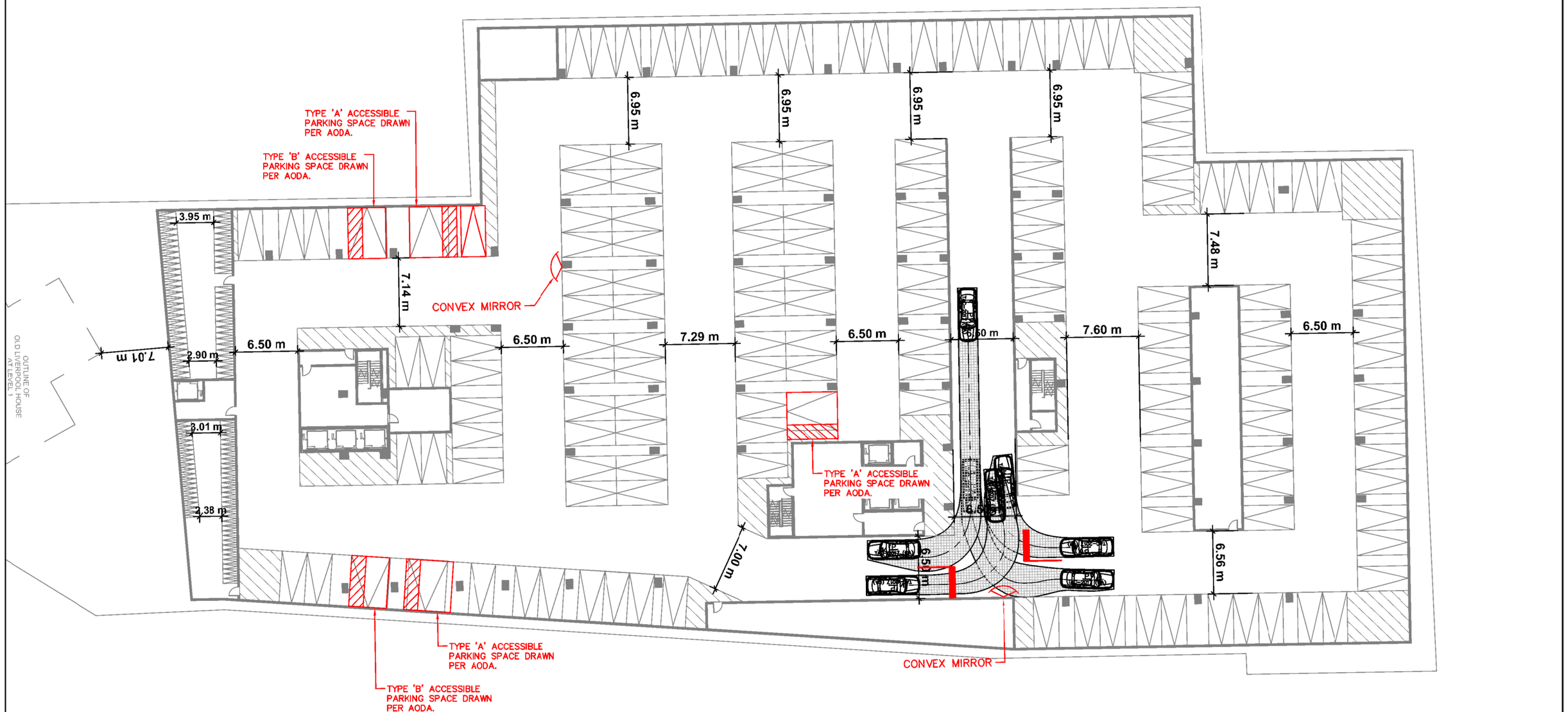
1294 KINGSTON ROAD
PICKERING ONTARIO

2.5 0 2.5 5 7.5m
1:250

RAMP REVIEW

Drawing No.
006

DRAWING NAME: F:\19225\Drafting\19225 WF004.dwg



LEA Consulting Ltd.
Consulting Engneers and Planners
www.LEA.ca

N

Project No.
19225–200

Date
MAY 15, 2019

DRAFT
NOT FOR CONSTRUCTION

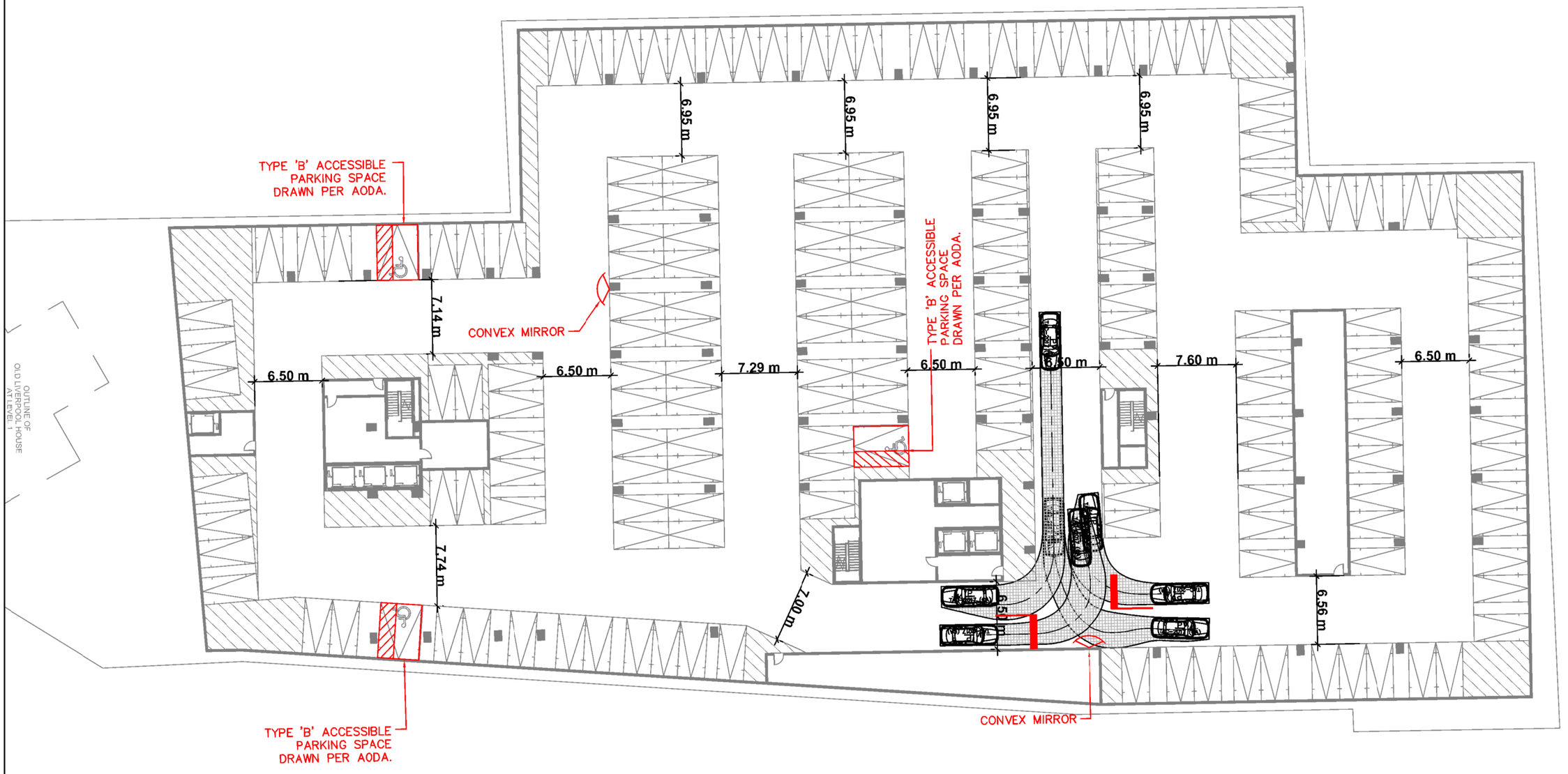
1294 KINGSTON ROAD
PICKERING ONTARIO

2.5 0 2.5 5 7.5m
1:250

PARKING LEVEL 1 REVIEW

Drawing No.
007

DRAWING NAME: F:\19225\Drafting\19225 WF004.dwg



LEA Consulting Ltd.
Consulting Engineers and Planners
www.LEA.ca

N

Project No.
19225–200

Date
MAY 15, 2019

DRAFT
NOT FOR CONSTRUCTION

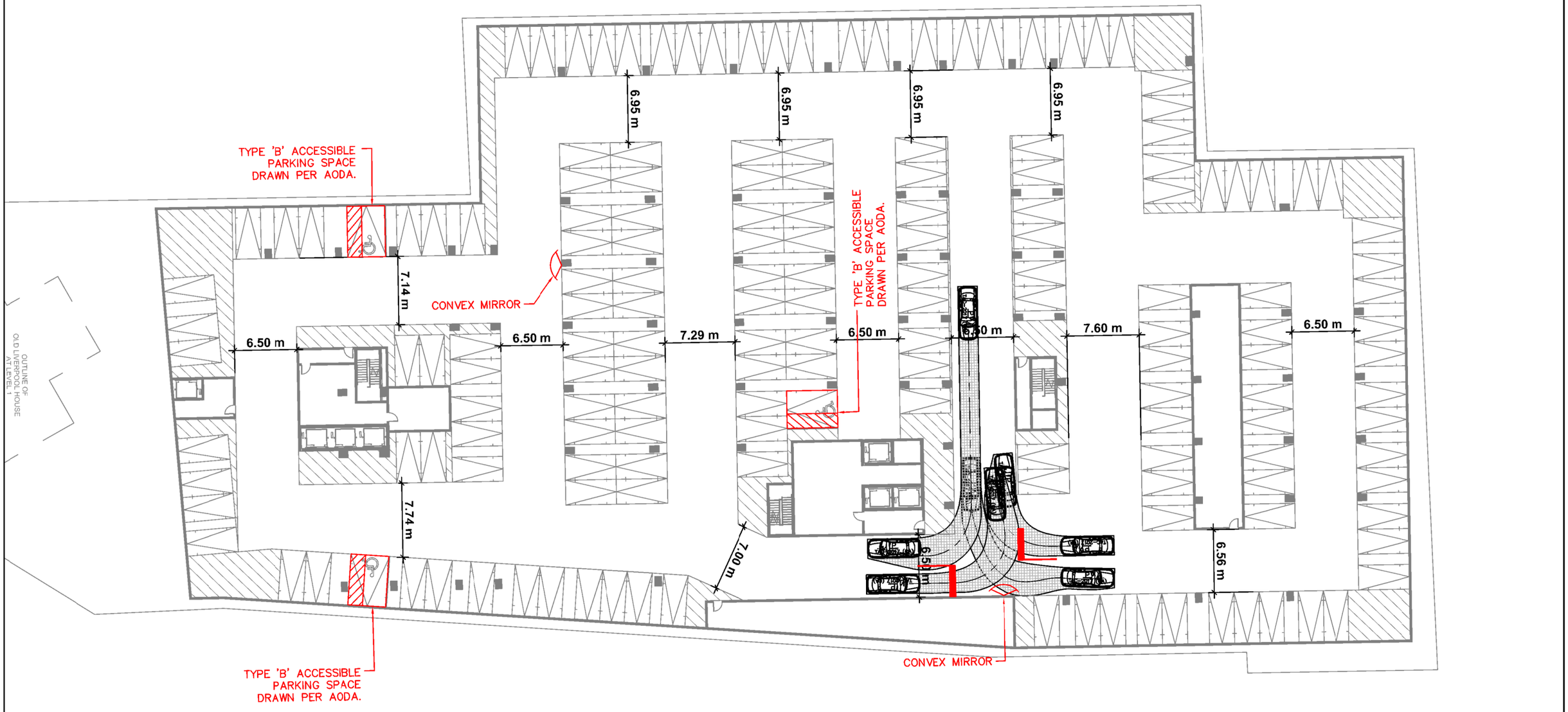
1294 KINGSTON ROAD
PICKERING ONTARIO

2.5 0 2.5 5 7.5m
1:250

PARKING LEVEL 2 REVIEW

Drawing No.
008

DRAWING NAME: F:\19225\Drafting\19225 WF004.dwg



LEA Consulting Ltd.
Consulting Engineers and Planners
www.LEA.ca

N

Project No.
19225–200

Date
MAY 15, 2019

DRAFT
NOT FOR CONSTRUCTION

1294 KINGSTON ROAD
PICKERING ONTARIO

2.5 0 2.5 5 7.5m
1:250

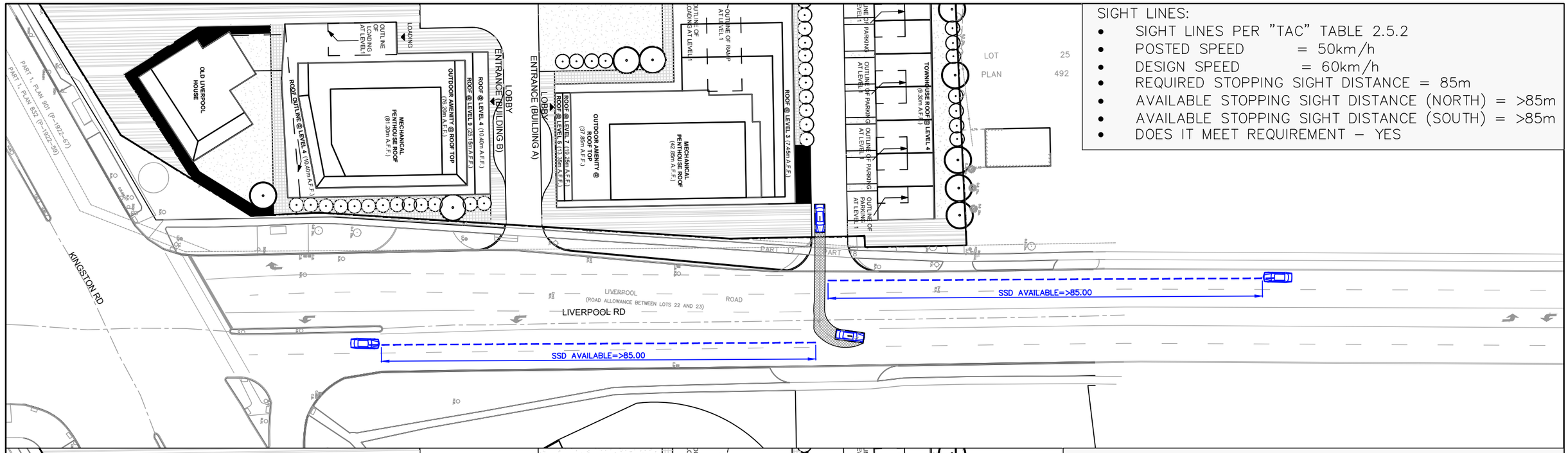
PARKING LEVEL 3 REVIEW

Drawing No.
009

DRAWING NAME: F:\19225\Drafting\19225 WF004.dwg

APPENDIX I

Sightline Analysis



LEA Consulting Ltd.
Consulting Engineers
and Planners
www.LEA.ca

N

Project No.
19225–200

Date
FEB 01, 2019

DRAFT
NOT FOR CONSTRUCTION

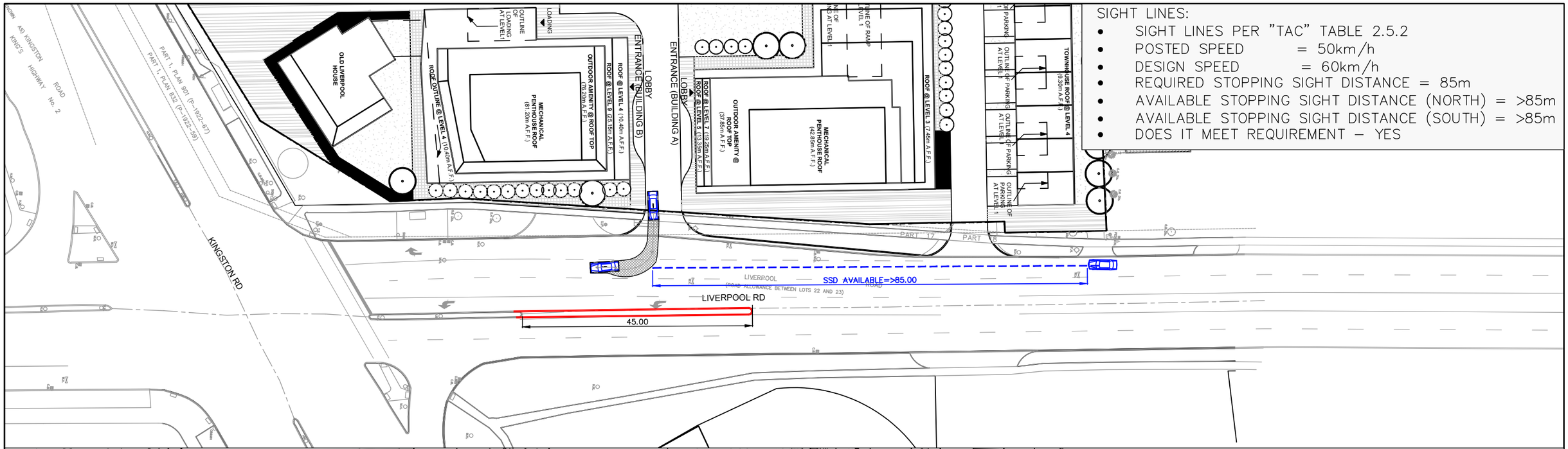
1294 KINGSTON ROAD
PICKERING ONTARIO

7.5 0 7.5 15 22.5m
1:750

NORTH ACCESS
SIGHT LINE ANALYSIS

Drawing No.
001

DRAWING NAME: F:\19225\Drafting\19225 WF001 – SIGHTLINE.dwg



SIGHT LINES:

- SIGHT LINES PER "TAC" TABLE 2.5.2
- POSTED SPEED = 50km/h
- DESIGN SPEED = 60km/h
- REQUIRED STOPPING SIGHT DISTANCE = 85m
- AVAILABLE STOPPING SIGHT DISTANCE (NORTH) = >85m
- AVAILABLE STOPPING SIGHT DISTANCE (SOUTH) = >85m
- DOES IT MEET REQUIREMENT – YES

SIGHT LINES:

- SIGHT LINES PER "TAC" TABLE 9.9.4
- POSTED SPEED = 50km/h
- DESIGN SPEED = 60km/h
- DESIRABLE DECISION SIGHT DISTANCE (NORTH) = 110.0 m
- AVAILABLE DECISION SIGHT DISTANCE (NORTH) = >110.0 m
- DESIRABLE DECISION SIGHT DISTANCE (SOUTH) = 130.0 m
- AVAILABLE DECISION SIGHT DISTANCE (NORTH) = >130.0 m
- DOES IT MEET REQUIREMENT – YES

LEA Consulting Ltd.
Consulting Engineers and Planners
www.LEA.ca

N

Project No.
19225–200

Date
FEB 01, 2019

DRAFT
NOT FOR CONSTRUCTION

1294 KINGSTON ROAD
PICKERING ONTARIO

7.5 0 7.5 15 22.5m
1: 750

SOUTH ACCESS
SIGHT LINE ANALYSIS

Drawing No.
002

DRAWING NAME: F:\19225\Drafting\19225 WF001 – SIGHTLINE.dwg