



# APPENDIX A

Existing Traffic Counts, Collision Data and Signal  
Timing Plans



## Traffic Count Data

TMC Tabular Report

Kingston Rd @ Glenanna Rd

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

Total Count 0 hours*				Ped. ↗↘ 63	
		0%	1%	0%	↑
		0	9	2	2
Ped. ↕ 193		187	720	819	1357
					Cars Trucks Trucks % PHF
←	48	3637	↗	↘	↖
0%	0	131	↖	↘	↗
1%	42	3732	↖	↘	↗
4%	28	642	↖	↘	↗
PHF	Trucks % Trucks	Cars			
		2185	534	541	732
		42	8	2	5
		↘	1%	0%	1%
Ped. ↕ 108				77 Ped. ↕↔	





TMC Tabular Report

Kingston Rd @ Glenanna Rd

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

AM Peak 08:15		0.72		0.88		0.73		Ped. 8	
↑		0%		6%		2%		↑	
3		0		7		3		3	
205		26		102		190		Cars Trucks Trucks % PHF	
Ped. 35		←		↖		↗		↘	
29		634		↘		↗		↖	
122		1		1%		0.81		↘	
0.92		9%		1		10		556	
29		5%		0.94		↘		↗	
0.75		8%		32		384		96	
4		4%		0.81		↘		↗	
0.81		8%		8		93		638	
38		→							
PHF		Trucks % Trucks		Cars		291		34 Ped.	
↖		↗		↘		↖		↗	
52		73		64		3		4%	
0		1		0%		0.81		↖	
19		↖		↗		↘		↖	
Ped. 25		↖		↗		↘		↖	
0.80		0.77		0.81					

MD Peak 12:45		0.84		0.88		0.81		Ped. 32	
↑		4%		0%		0%		↑	
4		2		0		0		4	
305		52		137		187		Cars Trucks Trucks % PHF	
Ped. 68		←		↖		↗		↘	
23		760		↘		↗		↖	
135		2		1%		0.90		↘	
0.79		3%		1		37		586	
21		3%		0.87		↘		↗	
0.93		5%		35		701		170	
6		3%		0.85		↘		↗	
0.86		4%		5		122		1039	
38		→							
PHF		Trucks % Trucks		Cars		429		40 Ped.	
↖		↗		↘		↖		↗	
122		133		151		3		2%	
0		1		0%		0.92		↖	
11		↖		↗		↘		↖	
Ped. 56		↖		↗		↘		↖	
0.76		0.78		0.92					

PM Peak 17:15		0.90		0.81		0.87		Ped. 30	
↑		0%		3%		0%		↑	
1		0		6		0		1	
333		36		199		178		Cars Trucks Trucks % PHF	
Ped. 91		←		↖		↗		↘	
13		731		↘		↗		↖	
132		1		1%		0.92		↘	
0.67		0%		0		24		575	
13		2%		0.90		↘		↗	
0.97		2%		26		1147		156	
6		4%		0.83		↘		↗	
0.97		5%		8		143		1519	
28		→							
PHF		Trucks % Trucks		Cars		498		50 Ped.	
↖		↗		↘		↖		↗	
120		194		2		1%		↖	
0		0		0%		0.92		↖	
20		↖		↗		↘		↖	
Ped. 55		↖		↗		↘		↖	
0.81		0.92		0.92					

Total Count -2 hours*		3%		3%		1%		Ped. 179	
↑		8		31		18		↑	
23		279		955		1184		2017	
933		137		707		886		Cars Trucks Trucks % PHF	
Ped. 455		←		↖		↗		↘	
172		5338		↘		↗		↖	
933		14		1%		0.90		↘	
2%		5		198		4352		157	
3%		4%		0.83		↘		↗	
0.97		2%		26		1147		1013	
41		4%		0.85		↘		↗	
0.97		5%		8		143		7362	
262		→							
PHF		Trucks % Trucks		Cars		2697		313 Ped.	
↖		↗		↘		↖		↗	
707		886		936		22		2%	
4		0%		0.92		↖		↗	
7		↖		↗		↘		↖	
Ped. 334		↖		↗		↘		↖	
1%		0.92							

TMC 15 Min Report

Kingston Rd @ Glenanna Rd

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

Table with columns for Time, Approach (North, East, South, West), and vehicle types (Cars, Trucks, Heavies, Ped). It contains traffic data for three periods (Period 1, Period 2, Period 3) from 06:15 to 18:30.

TMC Tabular Report

Kingston Rd @ Glenanna Rd

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

Total Count -3 hours*				Ped. ↗↘ 78	
		1%	1%	0%	↑
		3	8	2	11
Ped. ↕ 265		224	707	886	1467
					Cars Trucks Trucks % PHF
←	31	3297	↗	↘	↖
1%	2	170	↘	↗	↙
1%	41	3159	↘	↗	↖
4%	18	460	↘	↗	↖
PHF	Trucks % Trucks	Cars	↗	↘	↖
		1868	441	492	561
		37	1	4	5
		↘	0%	1%	1%
Ped. ↕ 150				87 Ped. ↕↔	

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

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

Total Count -1 hours*				Ped. ↗↘ 50	
		0%	0%	0%	↑
		1	9	1	22
		520	2054	423	2725
Ped. ↕ 46				Cars	Trucks Trucks % PHF
←	60	4151	↗	↖	266 2 1%
1%	4	611	↘	↙	2542 43 2%
2%	55	3487	↘	↙	907 4 0%
0%	3	1004	↘	↙	4856 70 →
PHF	Trucks % Trucks	Cars			105 Ped. ↕↔
		3965	1089	1848	946
		16	16	16	14
		↘	1%	1%	1%
				Ped. ↕↔ 44	



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

AM Peak 08:15	0.80	0.93	0.81		Ped. 15	
	4%	2%	2%	↑		
	4	12	11			
	99	712	538			
			Cars	Trucks	Trucks % PHF	
↓↕ Ped. 22	←	33	780	↕	47 0 0% 0.62	
	0.80	4%	4	92	↕	466 24 5% 0.89
	0.72	6%	23	373	↕	178 9 5% 0.92
	0.88	1%	2	254	↕	574 39 →
PHF	Trucks %	Trucks	Cars		25	
					Ped. 19	
			1144	23		
			215	5		
			399	7		
			122	14		
			2%	2%		
			0.81	0.86		
			0.79	0.79		

MD Peak 12:15	0.70	0.86	0.70		Ped. 20	
	2%	3%	2%	↑		
	2	12	7			
	85	444	627			
			Cars	Trucks	Trucks % PHF	
↓↕ Ped. 18	←	36	921	↕	83 0 0% 0.80	
	0.85	1%	2	137	↕	534 21 4% 0.96
	0.93	3%	21	714	↕	194 7 3% 0.95
	0.88	3%	8	295	↕	1048 33 →
PHF	Trucks %	Trucks	Cars		40	
					Ped. 18	
			933	27		
			302	13		
			407	5		
			247	10		
			4%	1%		
			0.84	0.90		
			0.86	0.86		

PM Peak 17:15	0.81	0.91	0.92		Ped. 26	
	3%	0%	3%	↑		
	3	2	11			
	84	516	1192			
			Cars	Trucks	Trucks % PHF	
↓↕ Ped. 34	←	21	883	↕	79 2 2% 0.84	
	0.84	1%	2	217	↕	497 12 2% 0.85
	0.89	2%	18	1012	↕	226 3 1% 0.91
	0.85	2%	7	330	↕	1404 32 →
PHF	Trucks %	Trucks	Cars		48	
					Ped. 32	
			1072	12		
			302	6		
			896	7		
			278	10		
			3%	1%		
			0.95	0.94		
			0.94	0.94		

Total Count -3 hours*					Ped. 158
↓↕ Ped. 160	←	225	6233	↕	478 7 1%
	2%	17	1065	↕	3692 138 4%
	3%	159	4982	↕	1595 36 2%
	2%	49	2171	↕	7082 263 →
PHF	Trucks %	Trucks	Cars		287
					Ped. 172
			7872	147	
			1894	70	
			3840	56	
			1466	91	
			6%	1%	
			172	172	

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									Total				
	Left	Cars Thru	Right	Trucks Left	Trucks Thru	Trucks Right	Heavies Left	Heavies Thru	Heavies Right	Ped Left	Left	Cars Thru	Right	Trucks Left	Trucks Thru	Trucks Right	Heavies Left	Heavies Thru	Heavies Right	Ped Left	Left	Cars Thru	Right	Trucks Left	Trucks Thru	Trucks Right	Heavies Left	Heavies Thru	Heavies Right	Ped Left	Left	Cars Thru	Right	Trucks Left	Trucks Thru	Trucks Right		Heavies Left	Heavies Thru	Heavies Right	Ped Left
Period 1																																									
06:15	4	6	4	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	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	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	6	24	63	18	2	1	3	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	5	19	60	8	3	4	2	0	0	0	7	14	37	45	1	4	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	3	37	77	19	4	2	4	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	6	31	86	17	2	3	2	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	6	46	76	22	3	2	4	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	2	44	103	24	2	2	2	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	9	52	118	32	2	0	4	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	10	51	84	27	1	4	4	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	4	68	94	39	0	1	4	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*	
Period 2																																									
11:45	21	91	24	0	2	0	0	0	0	5	48	118	22	0	4	0	0	0	3	75	107	38	3	2	3	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	5	66	98	57	3	2	2	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	8	90	89	73	4	1	2	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	14	63	114	53	3	1	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	6	75	102	55	4	3	7	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	12	74	102	66	2	0	1	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	10	72	98	46	1	1	2	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	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*	
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	28	71	125	60	0	5	2	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	11	59	127	54	2	2	1	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	11	71	154	60	0	3	4	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	3	68	169	54	3	2	3	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	14	71	200	80	2	2	5	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	20	64	168	72	3	0	3	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	10	75	208	71	3	2	3	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	10	70	196	48	2	1	4	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	10	74	210	70	1	2	2	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	14	75	239	64	2	2	3	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	14	74	221	74	1	2	3	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	10	79	226	70	2	1	2	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*	
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*	



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

Weekend 12:00	0.92	0.74	0.78	Ped. 17	↔			
	0%	0%	0%	↑				
	0	0	2					
↕ Ped. 11	22	358	75	365				
	←	2	352	↔	↔	↔	↔	↔
0.50	0%	0	16	↔	↔	↔	↔	↔
0.97	0%	0	175	↔	↔	↔	↔	↔
0.89	1%	1	192	↔	↔	↔	↔	↔
PHF	Trucks %	Trucks	Cars	632	198	297	62	7
				2	2	1	4	Ped. ↕
				↔	1%	0%	6%	
				↔	0.91	0.81	0.79	
				↔				

Total Count -7 hours*	0%	0%	0%	Ped. 37	↔			
	0	4	1	10	↑			
	0	1355	247	1364				
↕ Ped. 40	92	1355	247	1364				
	←	8	1309	↔	↔	↔	↔	↔
0%	0	77	↔	↔	↔	↔	↔	↔
0%	2	659	↔	↔	↔	↔	↔	↔
1%	6	683	↔	↔	↔	↔	↔	↔
PHF	Trucks %	Trucks	Cars	2353	723	1090	242	23
				12	6	7	10	Ped. ↕
				↔	1%	1%	4%	
				↔				

TMC 15 Min Report

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

TMC Tabular Report

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

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

AM Peak 08:15		Ped.		Ped.		Ped.	
0.66	0.84	0.86	0.86	0	0	0	0
0%	3%	4%	4%	0	0	0	0
0	16	3	17	0	0	0	0
69	611	73	414	0	0	0	0
				Cars	Trucks	Trucks %	PHF
←	7	271	56	2	3%	0.56	
0.77	4%	2	47	87	3	3%	0.63
0.64	6%	9	138	72	2	3%	0.84
0.89	2%	5	255	243	17		
PHF	Trucks %	Trucks	Cars	8 Ped.			
			938	115	311	32	
			23	4	13	5	
				3%	4%	14%	
				0.80	0.76	0.84	
				Ped. 0			

MD Peak 12:00		Ped.		Ped.		Ped.	
0.75	0.81	0.63	0.63	0	0	0	0
0%	1%	0%	0%	0	0	0	0
0	4	0	11	0	0	0	0
21	271	38	298	0	0	0	0
				Cars	Trucks	Trucks %	PHF
←	4	257	37	2	5%	0.81	
0.67	0%	0	72	1	1%	0.73	
0.64	2%	1	55	0	0%	0.81	
0.91	2%	2	124	3			
PHF	Trucks %	Trucks	Cars	6 Ped.			
			429	164	237	41	
			6	3	9	2	
				2%	4%	5%	
				0.89	0.85	0.72	
				Ped. 0			

PM Peak 17:15		Ped.		Ped.		Ped.	
0.38	0.75	0.73	0.73	0	0	0	0
0%	0%	0%	0%	0	0	0	0
0	1	0	4	0	0	0	0
30	304	67	655	0	0	0	0
				Cars	Trucks	Trucks %	PHF
←	5	526	44	1	2%	0.70	
0.75	0%	0	145	1	1%	0.76	
0.58	3%	2	55	0	0%	0.72	
0.80	0%	0	212	6			
PHF	Trucks %	Trucks	Cars	11 Ped.			
			474	351	566	73	
			1	4	3	4	
				1%	1%	5%	
				0.88	0.97	0.74	
				Ped. 0			

Total Count -2 hours*		Ped.		Ped.		Ped.	
1%	2%	3%	3%	2	2	2	2
2	47	12	66	0	0	0	0
284	2828	332	2909	0	0	0	0
				Cars	Trucks	Trucks %	PHF
←	47	2440	304	8	3%		
3%	6	232	763	11	1%		
4%	20	488	523	9	2%		
1%	14	1226	1147	61			
PHF	Trucks %	Trucks	Cars	69 Ped.			
			4577	1393	2373	327	
			70	34	52	29	
				2%	2%	8%	
				Ped. 2			

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

# LEA CONSULTING LTD

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

Project No.: 19225  
Location: Liverpool Rd & Site Access - N  
Weather: Raining, Cloudy  
Surveyor(s): May Yue & Michael Loo

File Name : SiteNorth-AM  
Site Code : 19225035  
Start Date : 11/8/2018  
Page No : 1

### Groups Printed- Cars - Trucks - Buses

Start Time	Liverpool Road Southbound					Liverpool Plaza Access Westbound					Liverpool Road Northbound					Site North Access Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
07:00	21	174	2	0	197	23	0	16	5	44	2	61	29	0	92	1	0	1	3	5	338
07:15	14	207	1	0	222	21	1	26	4	52	2	71	27	0	100	0	0	1	0	1	375
07:30	20	190	4	2	216	25	0	16	2	43	2	94	26	0	122	0	0	5	0	5	386
07:45	15	197	3	1	216	30	0	24	5	59	4	103	39	0	146	1	0	1	0	2	423
Total	70	768	10	3	851	99	1	82	16	198	10	329	121	0	460	2	0	8	3	13	1522
08:00	22	235	6	1	264	26	0	13	3	42	4	82	26	0	112	1	0	6	3	10	428
08:15	16	180	7	1	204	27	0	11	0	38	5	70	43	0	118	1	0	1	3	5	365
08:30	14	186	2	0	202	25	0	13	1	39	4	90	33	0	127	3	0	3	0	6	374
08:45	42	190	4	1	237	28	1	22	7	58	5	76	61	0	142	2	0	4	4	10	447
Total	94	791	19	3	907	106	1	59	11	177	18	318	163	0	499	7	0	14	10	31	1614
09:00	41	176	2	1	220	35	0	9	2	46	3	49	58	2	112	1	0	2	2	5	383
09:15	15	120	2	0	137	37	0	24	3	64	2	50	48	0	100	1	0	0	1	2	303
Grand Total	220	1855	33	7	2115	277	2	174	32	485	33	746	390	2	1171	11	0	24	16	51	3822
Apprch %	10.4	87.7	1.6	0.3		57.1	0.4	35.9	6.6		2.8	63.7	33.3	0.2		21.6	0	47.1	31.4		
Total %	5.8	48.5	0.9	0.2	55.3	7.2	0.1	4.6	0.8	12.7	0.9	19.5	10.2	0.1	30.6	0.3	0	0.6	0.4	1.3	
Cars	218	1826	30	2	2076	275	2	173	32	482	32	710	387	0	1129	11	0	22	16	49	3736
% Cars	99.1	98.4	90.9	28.6	98.2	99.3	100	99.4	100	99.4	97	95.2	99.2	0	96.4	100	0	91.7	100	96.1	97.7
Trucks	2	29	3	5	39	2	0	1	0	3	1	27	3	2	33	0	0	2	0	2	77
% Trucks	0.9	1.6	9.1	71.4	1.8	0.7	0	0.6	0	0.6	3	3.6	0.8	100	2.8	0	0	8.3	0	3.9	2
Buses	0	0	0	0	0	0	0	0	0	0	0	9	0	0	9	0	0	0	0	0	9
% Buses	0	0	0	0	0	0	0	0	0	0	0	1.2	0	0	0.8	0	0	0	0	0	0.2

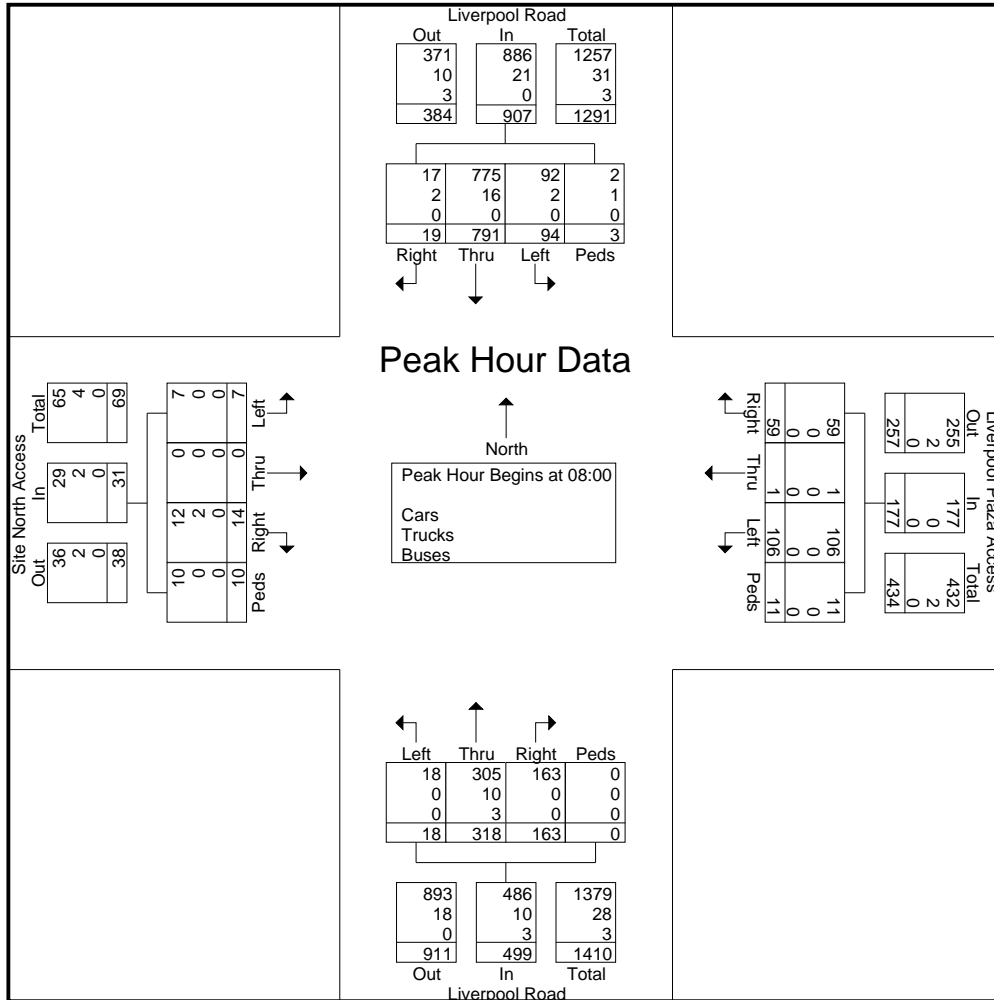


# LEA CONSULTING LTD

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

File Name : SiteNorth-AM  
Site Code : 19225035  
Start Date : 11/8/2018  
Page No : 3

Start Time	Liverpool Road Southbound					Liverpool Plaza Access Westbound					Liverpool Road Northbound					Site North Access Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 07:00 to 09:15 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 08:00																					
08:00	22	235	6	1	264	26	0	13	3	42	4	82	26	0	112	1	0	6	3	10	428
08:15	16	180	7	1	204	27	0	11	0	38	5	70	43	0	118	1	0	1	3	5	365
08:30	14	186	2	0	202	25	0	13	1	39	4	90	33	0	127	3	0	3	0	6	374
08:45	42	190	4	1	237	28	1	22	7	58	5	76	61	0	142	2	0	4	4	10	447
Total Volume	94	791	19	3	907	106	1	59	11	177	18	318	163	0	499	7	0	14	10	31	1614
% App. Total	10.4	87.2	2.1	0.3		59.9	0.6	33.3	6.2		3.6	63.7	32.7	0		22.6	0	45.2	32.3		
PHF	.560	.841	.679	.750	.859	.946	.250	.670	.393	.763	.900	.883	.668	.000	.879	.583	.000	.583	.625	.775	.903
Cars	92	775	17	2	886	106	1	59	11	177	18	305	163	0	486	7	0	12	10	29	1578
% Cars	97.9	98.0	89.5	66.7	97.7	100	100	100	100	100	100	95.9	100	0	97.4	100	0	85.7	100	93.5	97.8
Trucks	2	16	2	1	21	0	0	0	0	0	0	10	0	0	10	0	0	2	0	2	33
% Trucks	2.1	2.0	10.5	33.3	2.3	0	0	0	0	0	0	3.1	0	0	2.0	0	0	14.3	0	6.5	2.0
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	0.9	0	0	0.6	0	0	0	0	0	0.2



# LEA Consulting Ltd

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

Project No.: 19225  
Location: Liverpool Rd & Site Access - N  
Weather: Raining, Cloudy  
Surveyor(s): May Yue & Michael Loo

File Name : SiteNorth-AM  
Site Code : 19225035  
Start Date : 2018-11-08  
Page No : 1

## Groups Printed- Cars - Trucks - Buses

Start Time	Liverpool Road Southbound					Liverpool Plaza Access Westbound					Liverpool Road Northbound					Site North Access Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
08:00	22	235	6	1	264	26	0	13	3	42	4	82	26	0	112	1	0	6	3	10	428
08:15	16	180	7	1	204	27	0	11	0	38	5	70	43	0	118	1	0	1	3	5	365
08:30	14	186	2	0	202	25	0	13	1	39	4	90	33	0	127	3	0	3	0	6	374
08:45	42	190	4	1	237	28	1	22	7	58	5	76	61	0	142	2	0	4	4	10	447
Total	94	791	19	3	907	106	1	59	11	177	18	318	163	0	499	7	0	14	10	31	1614
Grand Total	94	791	19	3	907	106	1	59	11	177	18	318	163	0	499	7	0	14	10	31	1614
Apprch %	10.4	87.2	2.1	0.3		59.9	0.6	33.3	6.2		3.6	63.7	32.7	0		22.6	0	45.2	32.3		
Total %	5.8	49	1.2	0.2	56.2	6.6	0.1	3.7	0.7	11	1.1	19.7	10.1	0	30.9	0.4	0	0.9	0.6	1.9	
Cars	92	775	17	2	886	106	1	59	11	177	18	305	163	0	486	7	0	12	10	29	1578
% Cars	97.9	98	89.5	66.7	97.7	100	100	100	100	100	100	95.9	100	0	97.4	100	0	85.7	100	93.5	97.8
Trucks	2	16	2	1	21	0	0	0	0	0	0	10	0	0	10	0	0	2	0	2	33
% Trucks	2.1	2	10.5	33.3	2.3	0	0	0	0	0	0	3.1	0	0	2	0	0	14.3	0	6.5	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	0.9	0	0	0.6	0	0	0	0	0	0.2

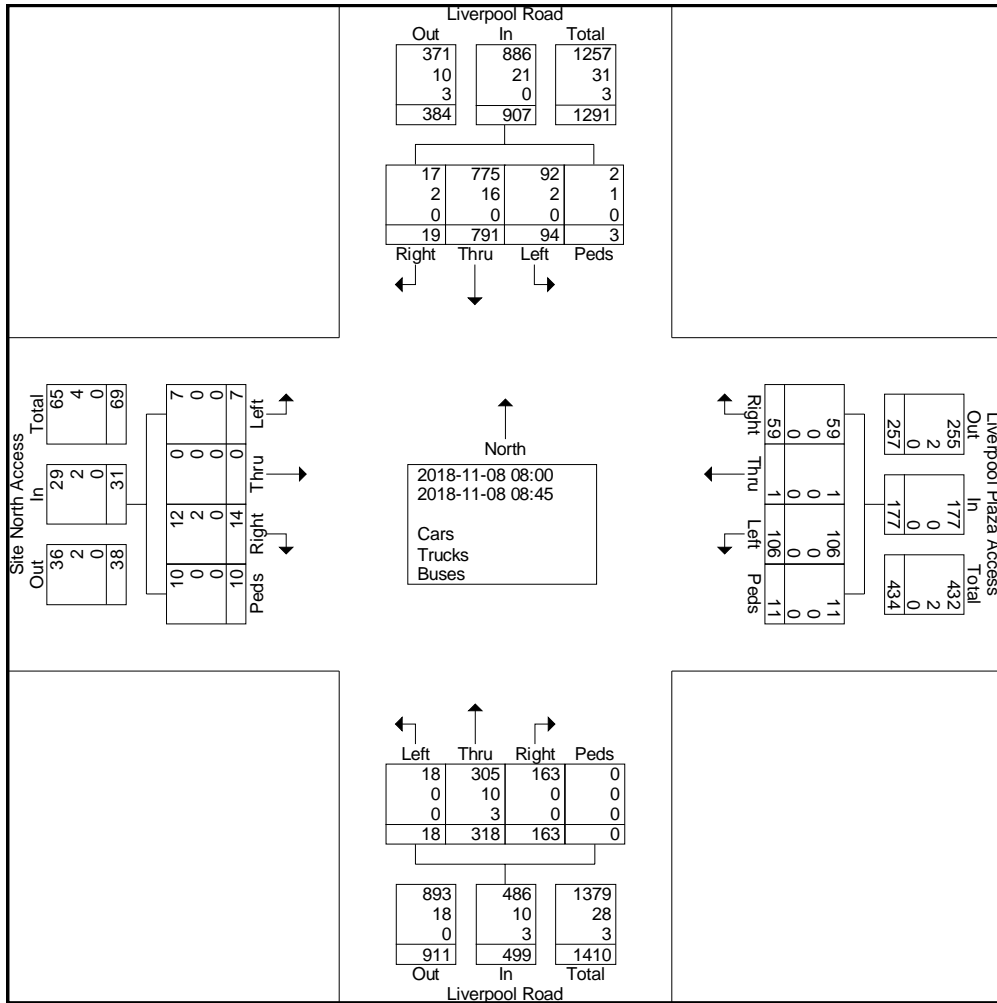
Common Peak Hour



# LEA Consulting Ltd

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

File Name : SiteNorth-AM  
Site Code : 19225035  
Start Date : 2018-11-08  
Page No : 2



# LEA CONSULTING LTD

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

Project No.: 19225  
Location: Liverpool Rd & Site Access - S  
Weather: Raining, Cloudy  
Surveyor(s): Jeff Tang

File Name : SiteSouth-AM  
Site Code : 19225016  
Start Date : 11/8/2018  
Page No : 1

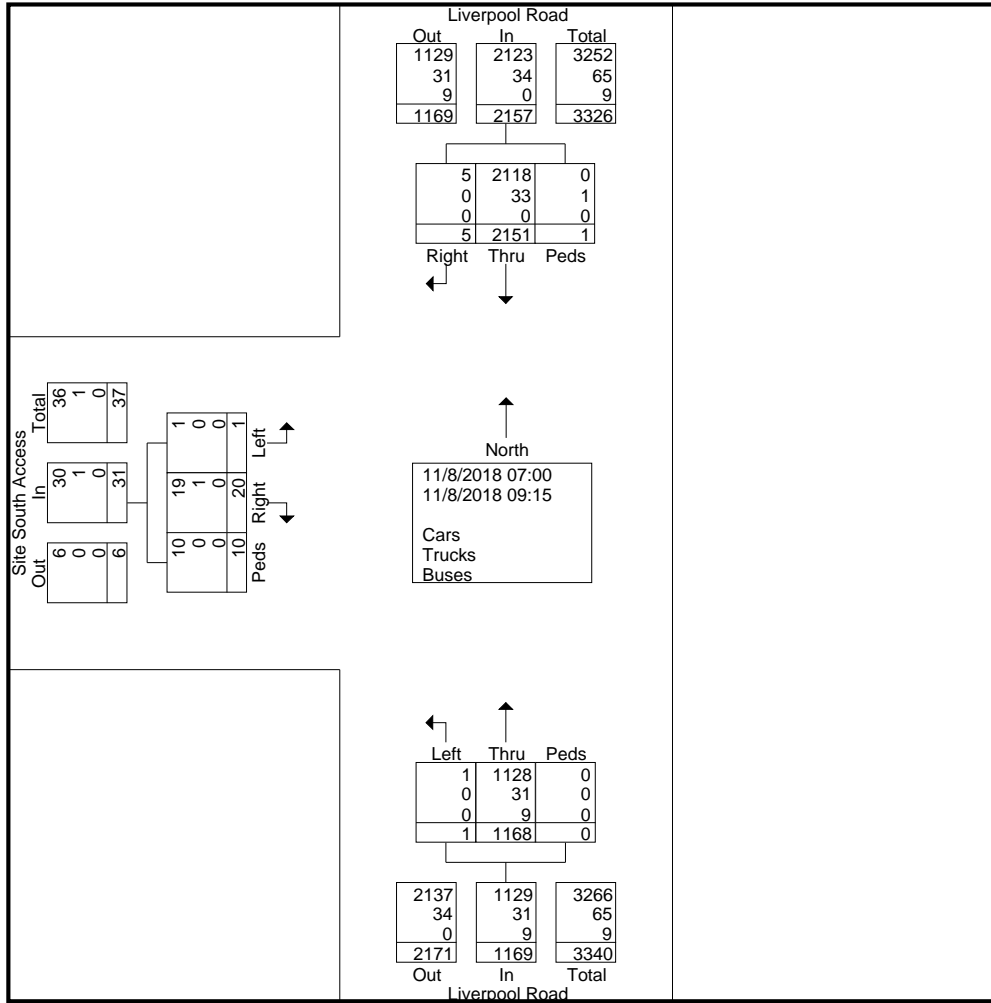
### Groups Printed- Cars - Trucks - Buses

Start Time	Liverpool Road Southbound				Liverpool Road Northbound				Site South Access Eastbound				Int. Total
	Thru	Right	Peds	App. Total	Left	Thru	Peds	App. Total	Left	Right	Peds	App. Total	
07:00	198	0	0	198	1	92	0	93	0	2	4	6	297
07:15	229	0	0	229	0	100	0	100	0	2	0	2	331
07:30	220	0	0	220	0	122	0	122	0	1	1	2	344
07:45	228	0	0	228	0	146	0	146	0	3	0	3	377
Total	875	0	0	875	1	460	0	461	0	8	5	13	1349
08:00	267	0	0	267	0	112	0	112	0	1	0	1	380
08:15	208	0	1	209	0	118	0	118	0	4	1	5	332
08:30	212	2	0	214	0	126	0	126	1	3	2	6	346
08:45	221	1	0	222	0	142	0	142	0	3	1	4	368
Total	908	3	1	912	0	498	0	498	1	11	4	16	1426
09:00	212	1	0	213	0	110	0	110	0	0	0	0	323
09:15	156	1	0	157	0	100	0	100	0	1	1	2	259
Grand Total	2151	5	1	2157	1	1168	0	1169	1	20	10	31	3357
Apprch %	99.7	0.2	0		0.1	99.9	0		3.2	64.5	32.3		
Total %	64.1	0.1	0	64.3	0	34.8	0	34.8	0	0.6	0.3	0.9	
Cars	2118	5	0	2123	1	1128	0	1129	1	19	10	30	3282
% Cars	98.5	100	0	98.4	100	96.6	0	96.6	100	95	100	96.8	97.8
Trucks	33	0	1	34	0	31	0	31	0	1	0	1	66
% Trucks	1.5	0	100	1.6	0	2.7	0	2.7	0	5	0	3.2	2
Buses	0	0	0	0	0	9	0	9	0	0	0	0	9
% Buses	0	0	0	0	0	0.8	0	0.8	0	0	0	0	0.3

# LEA CONSULTING LTD

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

File Name : SiteSouth-AM  
Site Code : 19225016  
Start Date : 11/8/2018  
Page No : 2

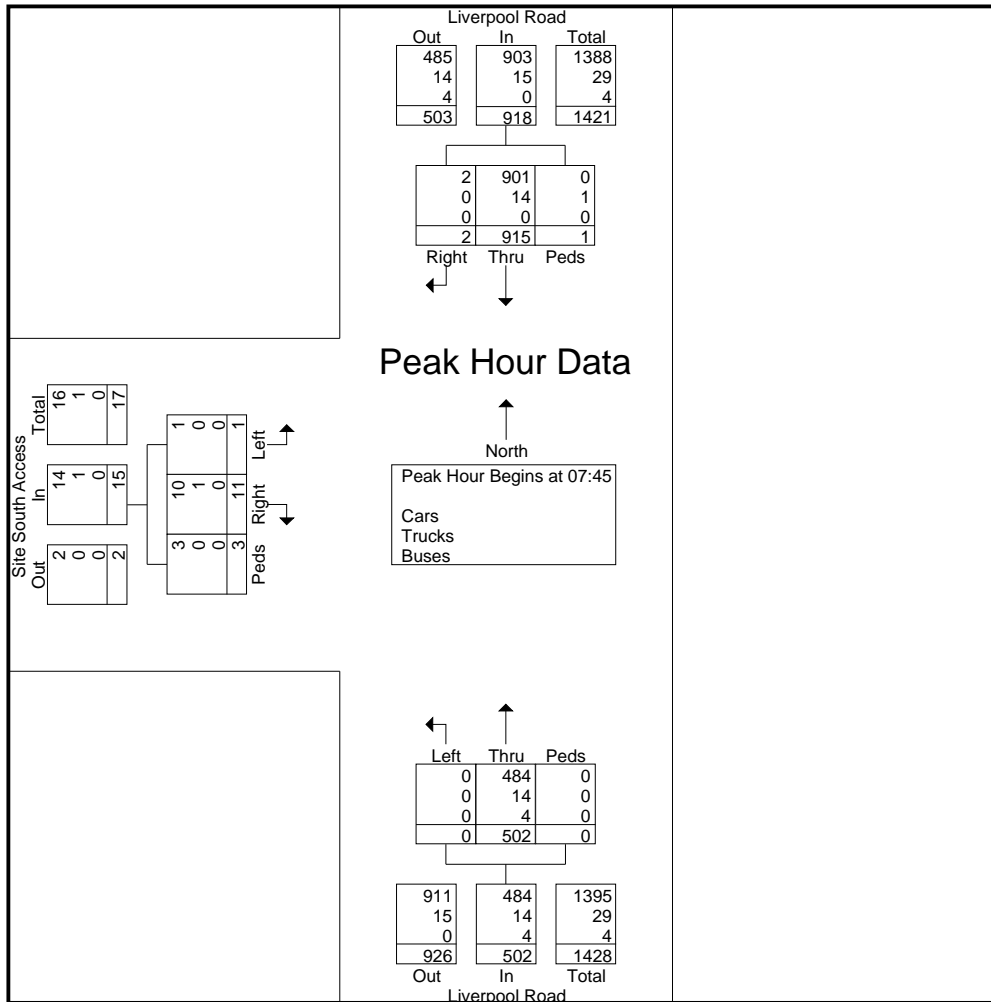


# LEA CONSULTING LTD

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

File Name : SiteSouth-AM  
Site Code : 19225016  
Start Date : 11/8/2018  
Page No : 3

Start Time	Liverpool Road Southbound				Liverpool Road Northbound				Site South Access Eastbound				Int. Total
	Thru	Right	Peds	App. Total	Left	Thru	Peds	App. Total	Left	Right	Peds	App. Total	
Peak Hour Analysis From 07:00 to 09:15 - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:45													
07:45	228	0	0	228	0	<b>146</b>	0	<b>146</b>	0	3	0	3	377
08:00	<b>267</b>	0	0	<b>267</b>	0	112	0	112	0	1	0	1	<b>380</b>
08:15	208	0	1	209	0	118	0	118	0	4	1	5	332
08:30	212	2	0	214	0	126	0	126	1	3	2	6	346
Total Volume	915	2	1	918	0	502	0	502	1	11	3	15	1435
% App. Total	99.7	0.2	0.1		0	100	0		6.7	73.3	20		
PHF	.857	.250	.250	.860	.000	.860	.000	.860	.250	.688	.375	.625	.944
Cars	901	2	0	903	0	484	0	484	1	10	3	14	1401
% Cars	98.5	100	0	98.4	0	96.4	0	96.4	100	90.9	100	93.3	97.6
Trucks	14	0	1	15	0	14	0	14	0	1	0	1	30
% Trucks	1.5	0	100	1.6	0	2.8	0	2.8	0	9.1	0	6.7	2.1
Buses	0	0	0	0	0	4	0	4	0	0	0	0	4
% Buses	0	0	0	0	0	0.8	0	0.8	0	0	0	0	0.3



# LEA Consulting Ltd

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

Project No.: 19225  
Location: Liverpool Rd & Site Access - S  
Weather: Raining, Cloudy  
Surveyor(s): Jeff Tang

File Name : SiteSouth-AM  
Site Code : 19225016  
Start Date : 2018-11-08  
Page No : 1

## Groups Printed- Cars - Trucks - Buses

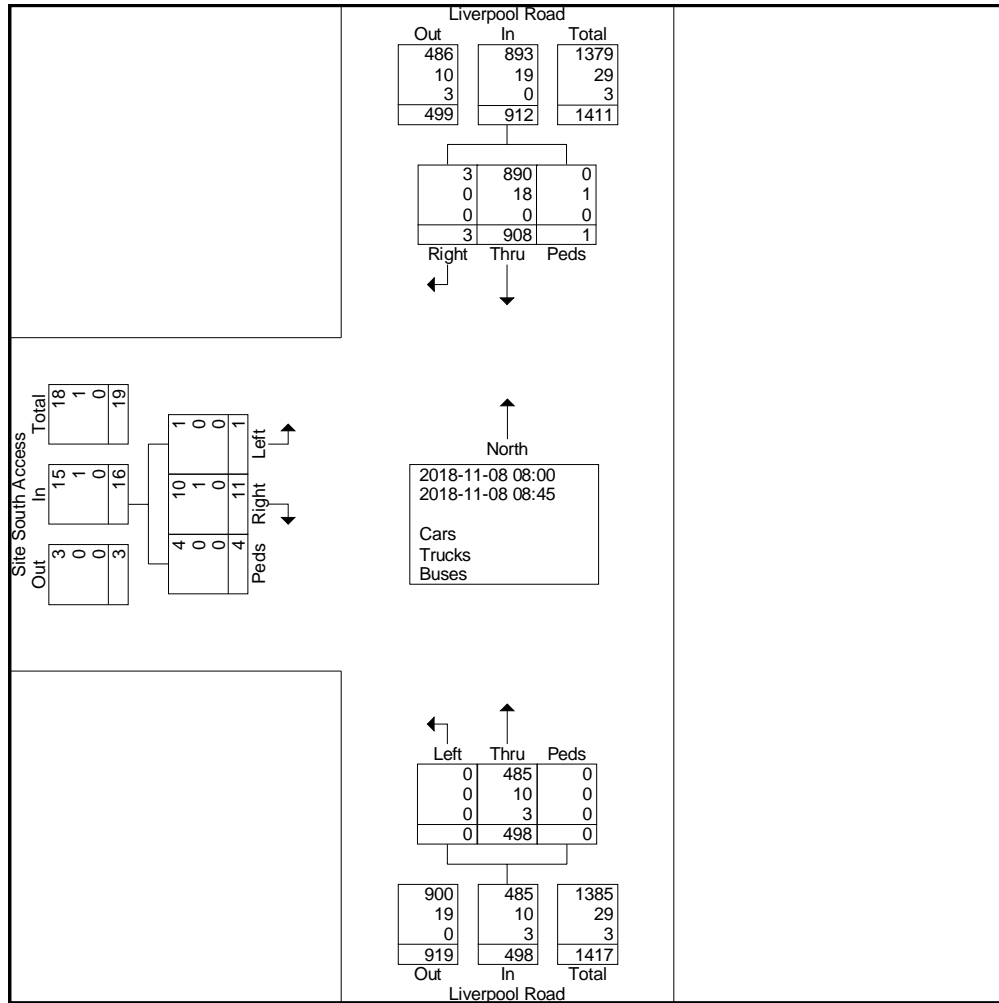
Start Time	Liverpool Road Southbound				Liverpool Road Northbound				Site South Access Eastbound				Int. Total
	Thru	Right	Peds	App. Total	Left	Thru	Peds	App. Total	Left	Right	Peds	App. Total	
08:00	267	0	0	267	0	112	0	112	0	1	0	1	380
08:15	208	0	1	209	0	118	0	118	0	4	1	5	332
08:30	212	2	0	214	0	126	0	126	1	3	2	6	346
08:45	221	1	0	222	0	142	0	142	0	3	1	4	368
Total	908	3	1	912	0	498	0	498	1	11	4	16	1426
Grand Total	908	3	1	912	0	498	0	498	1	11	4	16	1426
Apprch %	99.6	0.3	0.1		0	100	0		6.2	68.8	25		
Total %	63.7	0.2	0.1	64	0	34.9	0	34.9	0.1	0.8	0.3	1.1	
Cars	890	3	0	893	0	485	0	485	1	10	4	15	1393
% Cars	98	100	0	97.9	0	97.4	0	97.4	100	90.9	100	93.8	97.7
Trucks	18	0	1	19	0	10	0	10	0	1	0	1	30
% Trucks	2	0	100	2.1	0	2	0	2	0	9.1	0	6.2	2.1
Buses	0	0	0	0	0	3	0	3	0	0	0	0	3
% Buses	0	0	0	0	0	0.6	0	0.6	0	0	0	0	0.2

Common Peak Hour

# LEA Consulting Ltd

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

File Name : SiteSouth-AM  
 Site Code : 19225016  
 Start Date : 2018-11-08  
 Page No : 2



# LEA CONSULTING LTD

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

Project No.: 19225  
Location: Liverpool Rd & Site Access - S  
Weather: Raining, Cloudy  
Surveyor(s): Jeff Tang

File Name : SiteSouth-PM  
Site Code : 19225016  
Start Date : 11/8/2018  
Page No : 1

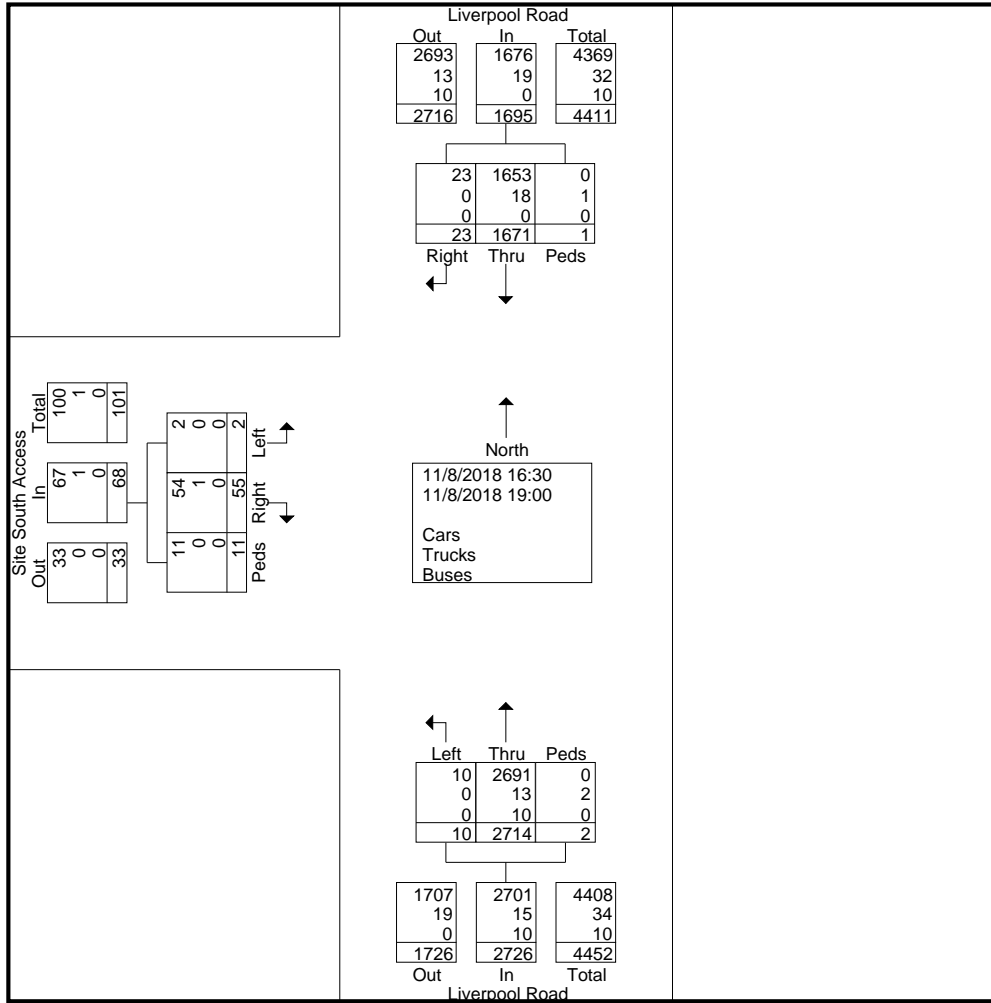
## Groups Printed- Cars - Trucks - Buses

Start Time	Liverpool Road Southbound				Liverpool Road Northbound				Site South Access Eastbound				Int. Total
	Thru	Right	Peds	App. Total	Left	Thru	Peds	App. Total	Left	Right	Peds	App. Total	
16:30	150	1	0	151	2	309	0	311	0	8	1	9	471
16:45	185	4	1	190	1	252	0	253	0	7	3	10	453
Total	335	5	1	341	3	561	0	564	0	15	4	19	924
17:00	150	3	0	153	2	339	0	341	0	5	1	6	500
17:15	168	2	0	170	1	270	0	271	0	6	0	6	447
17:30	190	1	0	191	2	289	0	291	1	6	1	8	490
17:45	178	1	0	179	0	307	1	308	0	4	2	6	493
Total	686	7	0	693	5	1205	1	1211	1	21	4	26	1930
18:00	155	2	0	157	0	248	0	248	0	2	0	2	407
18:15	143	6	0	149	1	279	0	280	0	6	2	8	437
18:30	186	2	0	188	1	219	0	220	0	4	0	4	412
18:45	166	1	0	167	0	202	1	203	1	7	1	9	379
Total	650	11	0	661	2	948	1	951	1	19	3	23	1635
*** BREAK ***													
Grand Total	1671	23	1	1695	10	2714	2	2726	2	55	11	68	4489
Apprch %	98.6	1.4	0.1		0.4	99.6	0.1		2.9	80.9	16.2		
Total %	37.2	0.5	0	37.8	0.2	60.5	0	60.7	0	1.2	0.2	1.5	
Cars	1653	23	0	1676	10	2691	0	2701	2	54	11	67	4444
% Cars	98.9	100	0	98.9	100	99.2	0	99.1	100	98.2	100	98.5	99
Trucks	18	0	1	19	0	13	2	15	0	1	0	1	35
% Trucks	1.1	0	100	1.1	0	0.5	100	0.6	0	1.8	0	1.5	0.8
Buses	0	0	0	0	0	10	0	10	0	0	0	0	10
% Buses	0	0	0	0	0	0.4	0	0.4	0	0	0	0	0.2

# LEA CONSULTING LTD

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

File Name : SiteSouth-PM  
Site Code : 19225016  
Start Date : 11/8/2018  
Page No : 2



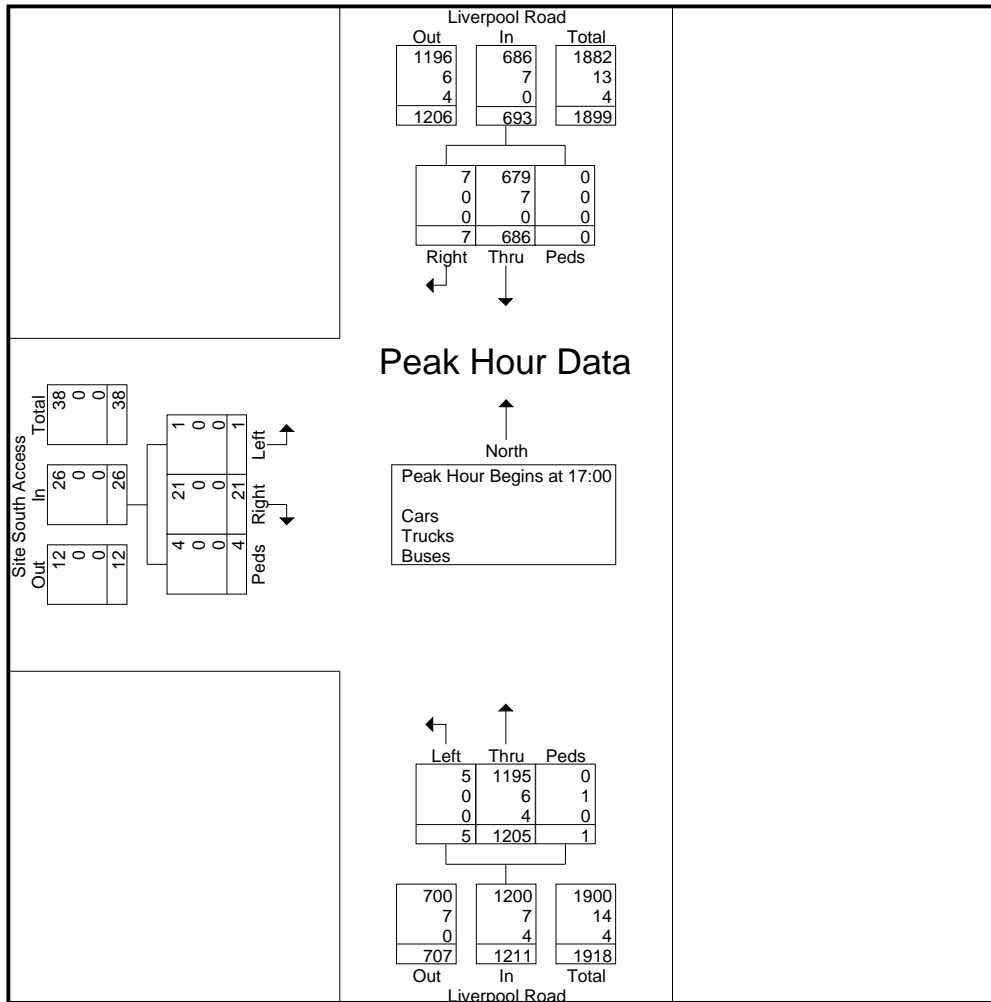


# LEA CONSULTING LTD

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

File Name : SiteSouth-PM  
Site Code : 19225016  
Start Date : 11/8/2018  
Page No : 3

Start Time	Liverpool Road Southbound				Liverpool Road Northbound				Site South Access Eastbound				Int. Total
	Thru	Right	Peds	App. Total	Left	Thru	Peds	App. Total	Left	Right	Peds	App. Total	
Peak Hour Analysis From 16:30 to 19:00 - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 17:00													
17:00	150	3	0	153	2	339	0	341	0	5	1	6	500
17:15	168	2	0	170	1	270	0	271	0	6	0	6	447
17:30	190	1	0	191	2	289	0	291	1	6	1	8	490
17:45	178	1	0	179	0	307	1	308	0	4	2	6	493
Total Volume	686	7	0	693	5	1205	1	1211	1	21	4	26	1930
% App. Total	99	1	0		0.4	99.5	0.1		3.8	80.8	15.4		
PHF	.903	.583	.000	.907	.625	.889	.250	.888	.250	.875	.500	.813	.965
Cars	679	7	0	686	5	1195	0	1200	1	21	4	26	1912
% Cars	99.0	100	0	99.0	100	99.2	0	99.1	100	100	100	100	99.1
Trucks	7	0	0	7	0	6	1	7	0	0	0	0	14
% Trucks	1.0	0	0	1.0	0	0.5	100	0.6	0	0	0	0	0.7
Buses	0	0	0	0	0	4	0	4	0	0	0	0	4
% Buses	0	0	0	0	0	0.3	0	0.3	0	0	0	0	0.2



# LEA Consulting Ltd

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

Project No.: 19225  
Location: Liverpool Rd & Site Access - S  
Weather: Raining, Cloudy  
Surveyor(s): Jeff Tang

File Name : SiteSouth-PM  
Site Code : 19225016  
Start Date : 2018-11-08  
Page No : 1

## Groups Printed- Cars - Trucks - Buses

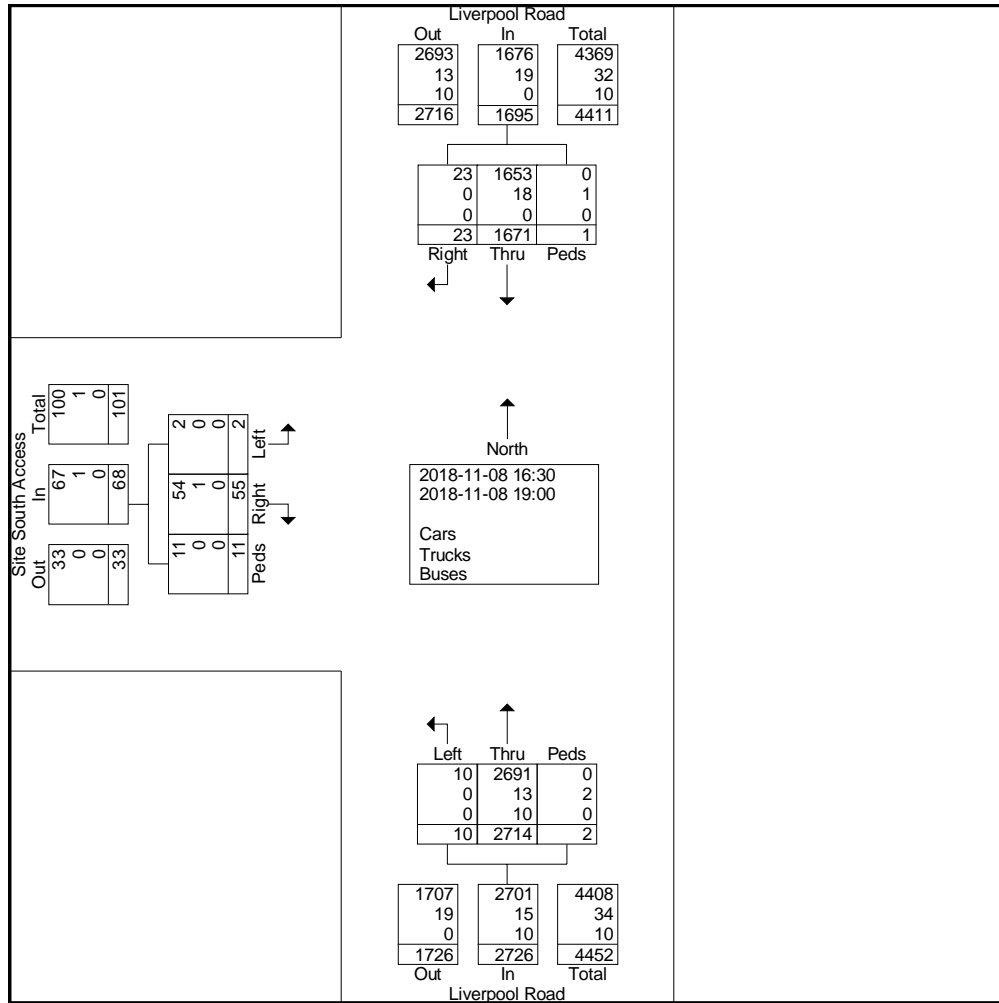
Start Time	Liverpool Road Southbound				Liverpool Road Northbound				Site South Access Eastbound				Int. Total
	Thru	Right	Peds	App. Total	Left	Thru	Peds	App. Total	Left	Right	Peds	App. Total	
16:30	150	1	0	151	2	309	0	311	0	8	1	9	471
16:45	185	4	1	190	1	252	0	253	0	7	3	10	453
Total	335	5	1	341	3	561	0	564	0	15	4	19	924
17:00	150	3	0	153	2	339	0	341	0	5	1	6	500
17:15	168	2	0	170	1	270	0	271	0	6	0	6	447
17:30	190	1	0	191	2	289	0	291	1	6	1	8	490
17:45	178	1	0	179	0	307	1	308	0	4	2	6	493
Total	686	7	0	693	5	1205	1	1211	1	21	4	26	1930
18:00	155	2	0	157	0	248	0	248	0	2	0	2	407
18:15	143	6	0	149	1	279	0	280	0	6	2	8	437
18:30	186	2	0	188	1	219	0	220	0	4	0	4	412
18:45	166	1	0	167	0	202	1	203	1	7	1	9	379
Total	650	11	0	661	2	948	1	951	1	19	3	23	1635
*** BREAK ***													
Grand Total	1671	23	1	1695	10	2714	2	2726	2	55	11	68	4489
Apprch %	98.6	1.4	0.1		0.4	99.6	0.1		2.9	80.9	16.2		
Total %	37.2	0.5	0	37.8	0.2	60.5	0	60.7	0	1.2	0.2	1.5	
Cars	1653	23	0	1676	10	2691	0	2701	2	54	11	67	4444
% Cars	98.9	100	0	98.9	100	99.2	0	99.1	100	98.2	100	98.5	99
Trucks	18	0	1	19	0	13	2	15	0	1	0	1	35
% Trucks	1.1	0	100	1.1	0	0.5	100	0.6	0	1.8	0	1.5	0.8
Buses	0	0	0	0	0	10	0	10	0	0	0	0	10
% Buses	0	0	0	0	0	0.4	0	0.4	0	0	0	0	0.2

Common Peak Hour

# LEA Consulting Ltd

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

File Name : SiteSouth-PM  
Site Code : 19225016  
Start Date : 2018-11-08  
Page No : 2

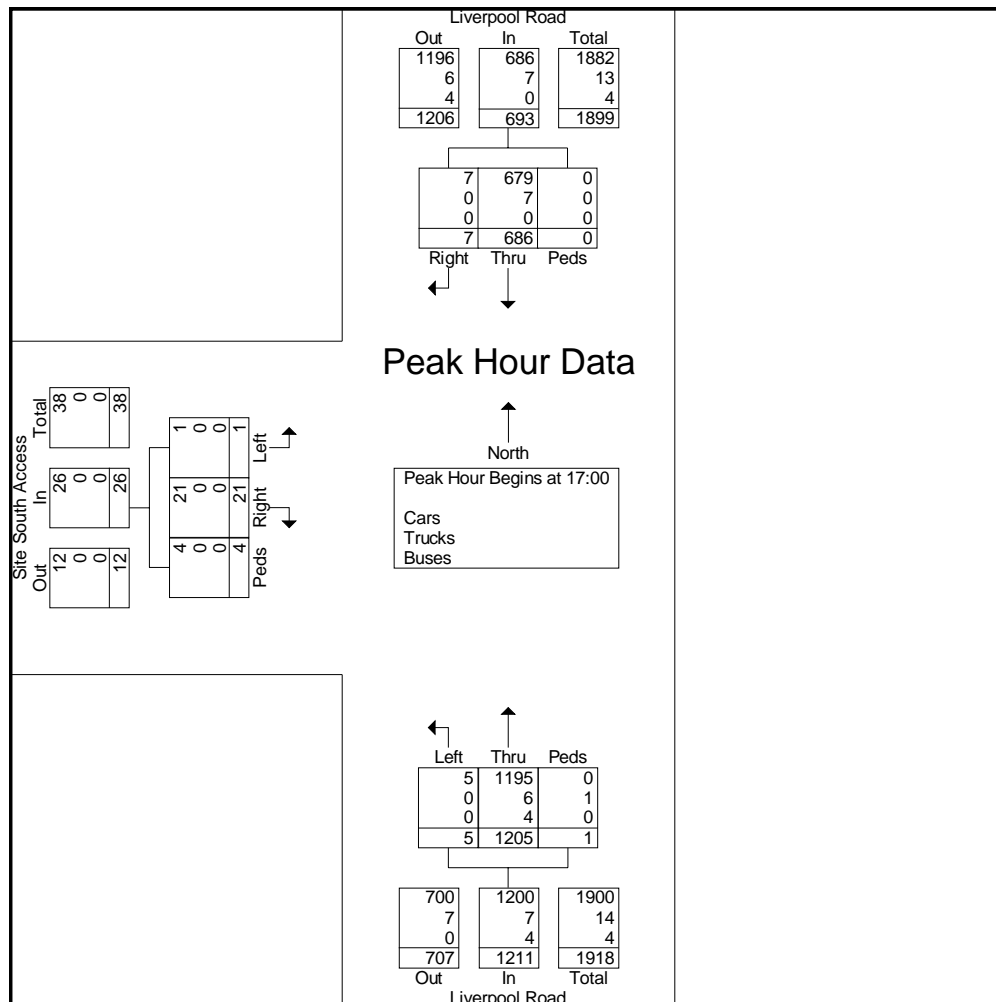


# LEA Consulting Ltd

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

File Name : SiteSouth-PM  
Site Code : 19225016  
Start Date : 2018-11-08  
Page No : 3

Start Time	Liverpool Road Southbound				Liverpool Road Northbound				Site South Access Eastbound				Int. Total
	Thru	Right	Peds	App. Total	Left	Thru	Peds	App. Total	Left	Right	Peds	App. Total	
Peak Hour Analysis From 16:30 to 19:00 - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 17:00													
17:00	150	3	0	153	2	339	0	341	0	5	1	6	500
17:15	168	2	0	170	1	270	0	271	0	6	0	6	447
17:30	190	1	0	191	2	289	0	291	1	6	1	8	490
17:45	178	1	0	179	0	307	1	308	0	4	2	6	493
Total Volume	686	7	0	693	5	1205	1	1211	1	21	4	26	1930
% App. Total	99	1	0		0.4	99.5	0.1		3.8	80.8	15.4		
PHF	.903	.583	.000	.907	.625	.889	.250	.888	.250	.875	.500	.813	.965
Cars	679	7	0	686	5	1195	0	1200	1	21	4	26	1912
% Cars	99.0	100	0	99.0	100	99.2	0	99.1	100	100	100	100	99.1
Trucks	7	0	0	7	0	6	1	7	0	0	0	0	14
% Trucks	1.0	0	0	1.0	0	0.5	100	0.6	0	0	0	0	0.7
Buses	0	0	0	0	0	4	0	4	0	0	0	0	4
% Buses	0	0	0	0	0	0.3	0	0.3	0	0	0	0	0.2



# LEA CONSULTING LTD

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

Project No.: 19225  
Location: Liverpool Rd & Site Access - N  
Weather: Raining, Cloudy  
Surveyor(s): May Yue & Michael Loo

File Name : SiteNorth-PM  
Site Code : 19225035  
Start Date : 11/8/2018  
Page No : 1

### Groups Printed- Cars - Trucks - Buses

Start Time	Liverpool Road Southbound					Liverpool Plaza Access Westbound					Liverpool Road Northbound					Site North Access Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
16:30	16	111	6	1	134	36	1	18	3	58	11	224	74	0	309	1	0	4	1	6	507
16:45	19	141	5	2	167	44	1	16	14	75	7	173	72	0	252	4	0	4	2	10	504
<b>Total</b>	<b>35</b>	<b>252</b>	<b>11</b>	<b>3</b>	<b>301</b>	<b>80</b>	<b>2</b>	<b>34</b>	<b>17</b>	<b>133</b>	<b>18</b>	<b>397</b>	<b>146</b>	<b>0</b>	<b>561</b>	<b>5</b>	<b>0</b>	<b>8</b>	<b>3</b>	<b>16</b>	<b>1011</b>
17:00	18	112	4	0	134	33	0	29	1	63	10	273	56	0	339	3	0	8	2	13	549
17:15	14	130	3	0	147	37	0	23	11	71	9	184	77	4	274	5	1	3	2	11	503
17:30	22	160	9	0	191	26	1	21	1	49	9	222	59	1	291	4	0	5	0	9	540
17:45	22	144	3	0	169	27	2	25	4	58	8	244	55	2	309	5	0	8	4	17	553
<b>Total</b>	<b>76</b>	<b>546</b>	<b>19</b>	<b>0</b>	<b>641</b>	<b>123</b>	<b>3</b>	<b>98</b>	<b>17</b>	<b>241</b>	<b>36</b>	<b>923</b>	<b>247</b>	<b>7</b>	<b>1213</b>	<b>17</b>	<b>1</b>	<b>24</b>	<b>8</b>	<b>50</b>	<b>2145</b>
18:00	18	122	2	1	143	32	0	27	9	68	2	187	59	1	249	4	0	3	2	9	469
18:15	16	115	3	1	135	32	3	26	7	68	7	202	70	0	279	0	0	2	3	5	487
18:30	15	150	2	2	169	34	0	22	3	59	5	157	57	1	220	3	1	4	0	8	456
18:45	20	132	2	1	155	32	0	34	10	76	3	136	64	0	203	2	0	3	0	5	439
<b>Total</b>	<b>69</b>	<b>519</b>	<b>9</b>	<b>5</b>	<b>602</b>	<b>130</b>	<b>3</b>	<b>109</b>	<b>29</b>	<b>271</b>	<b>17</b>	<b>682</b>	<b>250</b>	<b>2</b>	<b>951</b>	<b>9</b>	<b>1</b>	<b>12</b>	<b>5</b>	<b>27</b>	<b>1851</b>

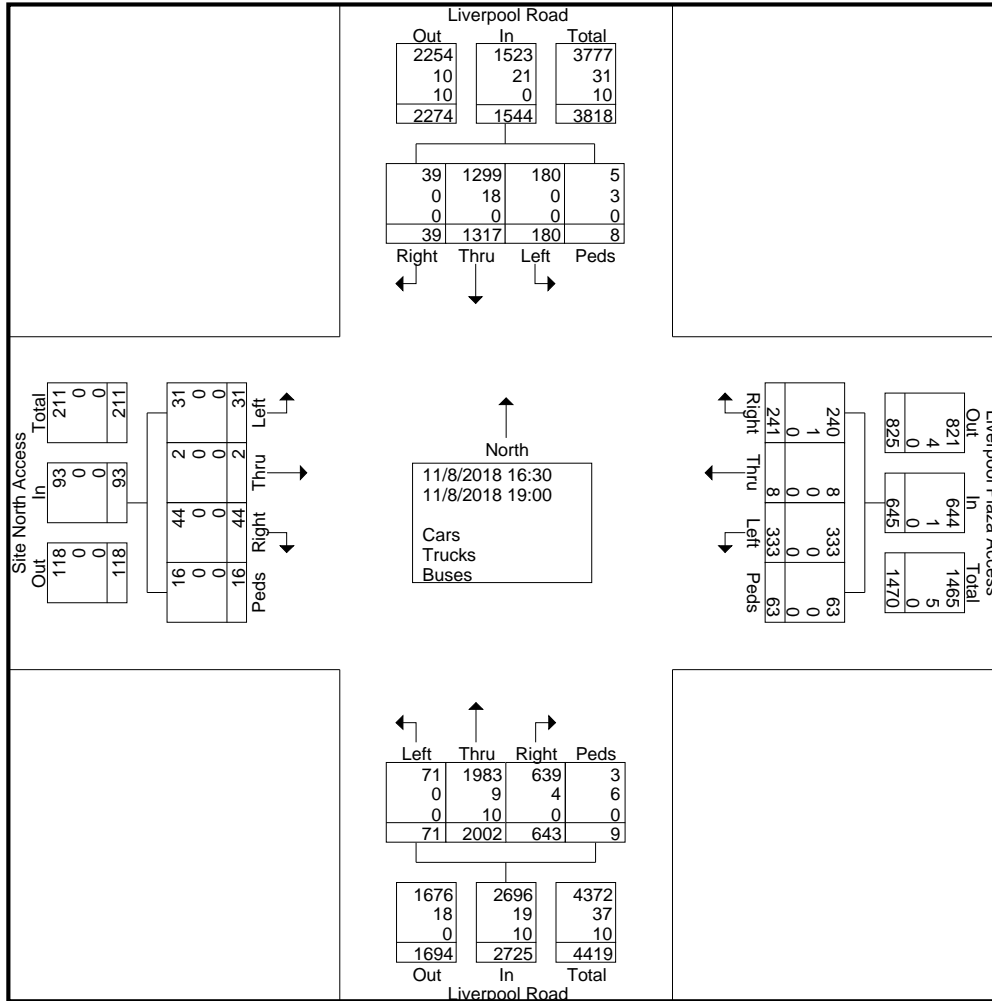
\*\*\* BREAK \*\*\*

Grand Total	180	1317	39	8	1544	333	8	241	63	645	71	2002	643	9	2725	31	2	44	16	93	5007
Apprch %	11.7	85.3	2.5	0.5		51.6	1.2	37.4	9.8		2.6	73.5	23.6	0.3		33.3	2.2	47.3	17.2		
Total %	3.6	26.3	0.8	0.2	30.8	6.7	0.2	4.8	1.3	12.9	1.4	40	12.8	0.2	54.4	0.6	0	0.9	0.3	1.9	
Cars	180	1299	39	5	1523	333	8	240	63	644	71	1983	639	3	2696	31	2	44	16	93	4956
% Cars	100	98.6	100	62.5	98.6	100	100	99.6	100	99.8	100	99.1	99.4	33.3	98.9	100	100	100	100	100	99
Trucks	0	18	0	3	21	0	0	1	0	1	0	9	4	6	19	0	0	0	0	0	41
% Trucks	0	1.4	0	37.5	1.4	0	0	0.4	0	0.2	0	0.4	0.6	66.7	0.7	0	0	0	0	0	0.8
Buses	0	0	0	0	0	0	0	0	0	0	0	10	0	0	10	0	0	0	0	0	10
% 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

# LEA CONSULTING LTD

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

File Name : SiteNorth-PM  
Site Code : 19225035  
Start Date : 11/8/2018  
Page No : 2

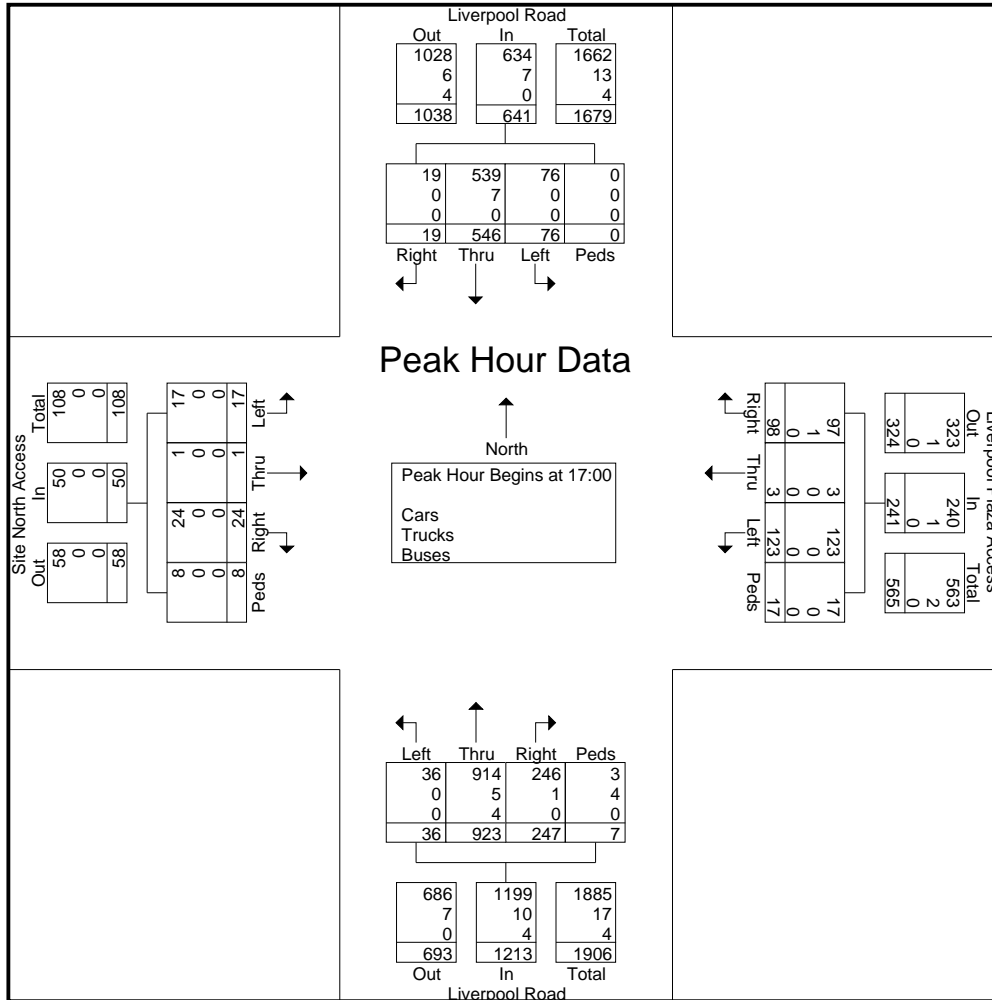


# LEA CONSULTING LTD

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

File Name : SiteNorth-PM  
Site Code : 19225035  
Start Date : 11/8/2018  
Page No : 3

Start Time	Liverpool Road Southbound					Liverpool Plaza Access Westbound					Liverpool Road Northbound					Site North Access Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 16:30 to 19:00 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 17:00																					
17:00	18	112	4	0	134	33	0	29	1	63	10	273	56	0	339	3	0	8	2	13	549
17:15	14	130	3	0	147	37	0	23	11	71	9	184	77	4	274	5	1	3	2	11	503
17:30	22	160	9	0	191	26	1	21	1	49	9	222	59	1	291	4	0	5	0	9	540
17:45	22	144	3	0	169	27	2	25	4	58	8	244	55	2	309	5	0	8	4	17	553
Total Volume	76	546	19	0	641	123	3	98	17	241	36	923	247	7	1213	17	1	24	8	50	2145
% App. Total	11.9	85.2	3	0		51	1.2	40.7	7.1		3	76.1	20.4	0.6		34	2	48	16		
PHF	.864	.853	.528	.000	.839	.831	.375	.845	.386	.849	.900	.845	.802	.438	.895	.850	.250	.750	.500	.735	.970
Cars	76	539	19	0	634	123	3	97	17	240	36	914	246	3	1199	17	1	24	8	50	2123
% Cars	100	98.7	100	0	98.9	100	100	99.0	100	99.6	100	99.0	99.6	42.9	98.8	100	100	100	100	100	99.0
Trucks	0	7	0	0	7	0	0	1	0	1	0	5	1	4	10	0	0	0	0	0	18
% Trucks	0	1.3	0	0	1.1	0	0	1.0	0	0.4	0	0.5	0.4	57.1	0.8	0	0	0	0	0	0.8
Buses	0	0	0	0	0	0	0	0	0	0	0	4	0	0	4	0	0	0	0	0	4
% Buses	0	0	0	0	0	0	0	0	0	0	0	0.4	0	0	0.3	0	0	0	0	0	0.2



Site North Access

Total	Out	In	Total
108	0	0	108
0	0	0	0
0	0	0	0
05	0	0	05
05	0	0	05
85	0	0	85

# LEA Consulting Ltd

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

Project No.: 19225  
Location: Liverpool Rd & Site Access - N  
Weather: Raining, Cloudy  
Surveyor(s): May Yue & Michael Loo

File Name : SiteNorth-PM  
Site Code : 19225035  
Start Date : 2018-11-08  
Page No : 1

## Groups Printed- Cars - Trucks - Buses

Start Time	Liverpool Road Southbound					Liverpool Plaza Access Westbound					Liverpool Road Northbound					Site North Access Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
17:00	18	112	4	0	134	33	0	29	1	63	10	273	56	0	339	3	0	8	2	13	549
17:15	14	130	3	0	147	37	0	23	11	71	9	184	77	4	274	5	1	3	2	11	503
17:30	22	160	9	0	191	26	1	21	1	49	9	222	59	1	291	4	0	5	0	9	540
17:45	22	144	3	0	169	27	2	25	4	58	8	244	55	2	309	5	0	8	4	17	553
Total	76	546	19	0	641	123	3	98	17	241	36	923	247	7	1213	17	1	24	8	50	2145
Grand Total	76	546	19	0	641	123	3	98	17	241	36	923	247	7	1213	17	1	24	8	50	2145
Apprch %	11.9	85.2	3	0		51	1.2	40.7	7.1		3	76.1	20.4	0.6		34	2	48	16		
Total %	3.5	25.5	0.9	0	29.9	5.7	0.1	4.6	0.8	11.2	1.7	43	11.5	0.3	56.6	0.8	0	1.1	0.4	2.3	
Cars	76	539	19	0	634	123	3	97	17	240	36	914	246	3	1199	17	1	24	8	50	2123
% Cars	100	98.7	100	0	98.9	100	100	99	100	99.6	100	99	99.6	42.9	98.8	100	100	100	100	100	99
Trucks	0	7	0	0	7	0	0	1	0	1	0	5	1	4	10	0	0	0	0	0	18
% Trucks	0	1.3	0	0	1.1	0	0	1	0	0.4	0	0.5	0.4	57.1	0.8	0	0	0	0	0	0.8
Buses	0	0	0	0	0	0	0	0	0	0	0	4	0	4	4	0	0	0	0	0	4
% Buses	0	0	0	0	0	0	0	0	0	0	0	0.4	0	0.3	0.3	0	0	0	0	0	0.2

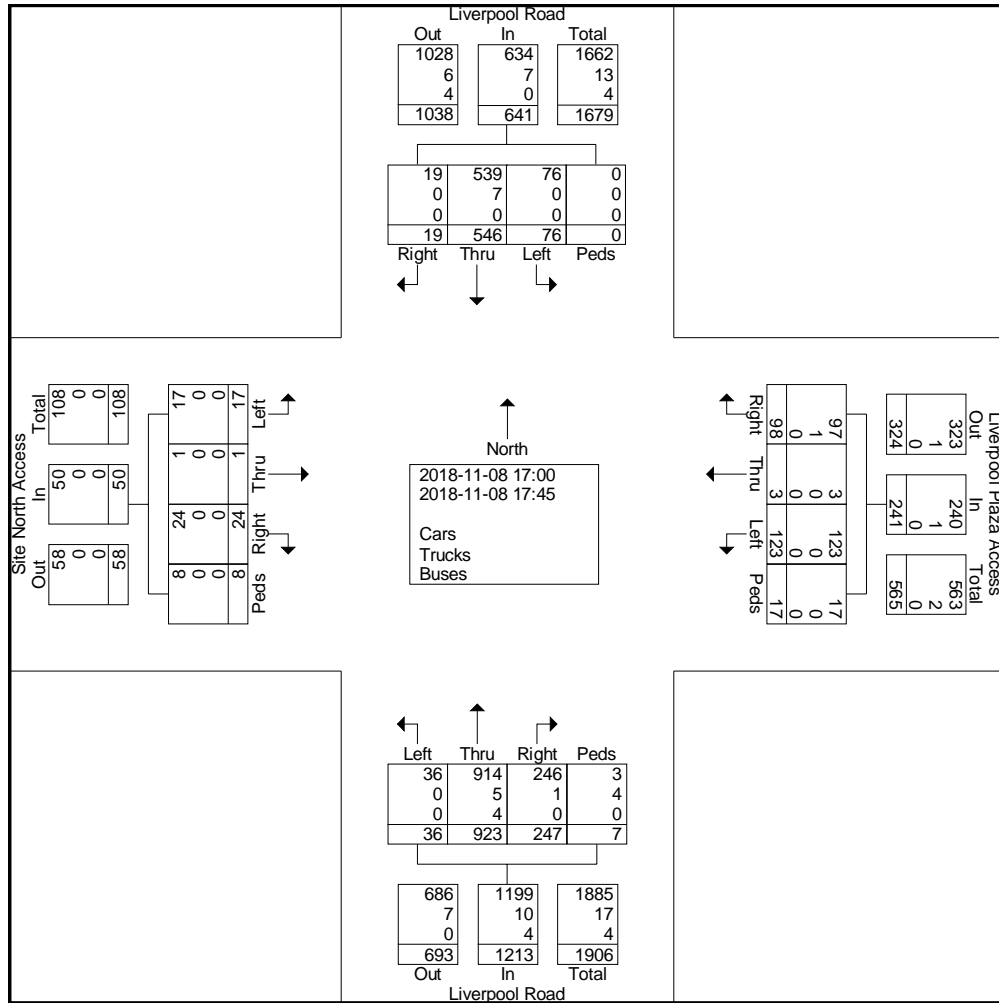
Common Peak Hour



# LEA Consulting Ltd

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

File Name : SiteNorth-PM  
Site Code : 19225035  
Start Date : 2018-11-08  
Page No : 2





## **Collision Data**



November 14, 2019

**The Regional  
Municipality  
of Durham**

Corporate Services  
Department  
Legislative Services

605 Rossland Rd. E.  
Level 1  
PO Box 623  
Whitby, ON L1N 6A3  
Canada

905-668-7711  
1-800-372-1102  
Fax: 905-668-9963

durham.ca

**Don Beaton, BCom, M.P.A.**  
Commissioner of Corporate  
Services

Anatole Kung  
Lea Consulting Ltd.  
9-625 Cochrane Drive  
Markham ON L3R 9R9

**Request for Information under the *Municipal Freedom of  
Information and Protection of Privacy Act (MFIPPA)* -  
Our File: A20-2019-154**

---

Further to your request under the *Municipal Freedom of Information and Protection of Privacy Act*, received in this office on October 28, 2019, I am enclosing all records as listed in the enclosed Index of Records.

I am the person responsible for the decision with respect to your request. You may ask for a review of this decision by contacting the Information and Privacy Commissioner/Ontario at 2 Bloor Street East, Suite 1400, Toronto, Ontario M4W 1A8, Telephone 1-800-387-0073. If you decide to request a review of this decision, the Commissioner's office requests that the following be provided: the file number listed at the beginning of this letter; a copy of this decision letter; and a copy of the original request for information. The request must also be accompanied by a \$25.00 appeal fee either in the form of a cheque or money order payable to the Minister of Finance. Please be advised that you have 30 days from receipt of this letter to request a review, by way of an appeal.

A handwritten signature in blue ink, appearing to read 'R. Walton'.

Ralph Walton  
Regional Clerk/Director of Legislative Services

:ms

enclosure

c: J. Demanuele, Director of Business Services, Works Department





**Collision Detail intersection Kingston Rd @ Liverpool Rd (R.R.29)**

FROM: 10/28/2014

TO: 10/29/2019

Municipality	Traffic Control	Traffic signal ENVIRONMENT	DATE	TIME	LIGHT	CLASS	IMPACT TYPE	DIR	SURFACE CONDITION	VEHICLE MANOEUVRE	VEHICLE TYPE	FIRST EVENT	NO. VEH PER	NO. PED
190143722		Clear	07/05/2019	08:18	Daylight	Non-fatal injury	Turning movement	v1 West v2 South	Dry	Left	Automobile, station wagon	Other motor vehicle	2	2
190135328		Clear	06/25/2019	13:30	Daylight	P.D. only	Sideswipe	v1 East v2 East	Dry	Through	Automobile, station wagon	Other motor vehicle	2	3
190117301		Clear	06/03/2019	14:08	Daylight	P.D. only	SMV other	v1 West	Dry	Overtaking	Motorcycle	Other motor vehicle	1	1
190109170		Clear	05/23/2019	20:45	Dusk	Non-fatal injury	Angle	v1 North v2 East	Dry	Changing lanes	Automobile, station wagon	Other motor vehicle	2	3
190055586		Clear	03/15/2019	10:47	Daylight	P.D. only	SMV other	v1 South	Dry	Left	Automobile, station wagon	Skidding/sliding	1	1
190040374		Clear	02/21/2019	18:42	Dark, artificial	Non-fatal injury	Turning movement	v1 North v2 South	Dry	Through	Automobile, station wagon	Other motor vehicle	1	2
190027715		Rain	02/04/2019	22:23	Dark, artificial	Non-fatal injury	Angle	v1 West v2 North	Dry	Through	Automobile, station wagon	Pole (sign, parking meter)	2	2
190018778		Snow	01/24/2019	09:39	Daylight	P.D. only	Rear end	v1 East v2 East	Wet	Left	Automobile, station wagon	Other motor vehicle	2	2
190011081		Clear	01/14/2019	19:45	Dark, artificial	Non-fatal injury	Turning movement	v1 South v2 North	Wet	Through	Automobile, station wagon	Other motor vehicle	2	2
190007900		Clear	01/10/2019	19:42	Dusk, artificial	Non-fatal injury	Turning movement	v1 East v2 East	Ice	Through	Automobile, station wagon	Other motor vehicle	2	2
180263819		Rain	12/20/2018	22:17	Dark, artificial	Non-fatal injury	SMV other	v1 North v2 North	Ice	Through	Automobile, station wagon	Other motor vehicle	2	3
180247329		Clear	11/29/2018	18:57	Dusk, artificial	P.D. only	Rear end	v1 East v2 West	Dry	Right	Automobile, station wagon	Pedestrian	1	2
180238222		Clear	11/18/2018	11:35	Daylight	P.D. only	Angle	v1 West v2 West	Wet	Through	Automobile, station wagon	Other motor vehicle	2	2
180232152		Rain	11/09/2018	17:27	Dark, artificial	P.D. only	Turning movement	v1 South v2 East	Dry	Stop	Automobile, station wagon	Other motor vehicle	2	2
180210597		Clear	10/11/2018	09:28	Daylight	Non-fatal injury	Rear end	v1 West v2 West	Wet	Through	Automobile, station wagon	Other motor vehicle	2	2
180206456		Clear	10/05/2018	13:27	Daylight	Non-fatal injury	Angle	v1 West v3 West v4 West v5 West	Wet	Left	Automobile, station wagon	Other motor vehicle	5	5
		Clear			Daylight	Non-fatal injury	Angle	v1 South	Dry	Slowing	Automobile, station wagon	Other	2	2
										Slowing	Automobile, station wagon	Skidding/sliding		
										Slowing	Automobile, station wagon	Other motor vehicle		
										Slowing	Automobile, station wagon	Other motor vehicle		
										Through	Automobile, station wagon	Other motor vehicle		
										Stop	Automobile, station wagon	Other motor vehicle		

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180180455	09/02/2018	01:38	Clear	Dark, artificial	P.D. only	SMV other	v2 West	Dry	Through	Motorcycle	Other motor vehicle	1	1	0
180156112	07/30/2018	13:15	Clear	Daylight	Non-fatal injury	Rear end	v1 East	Dry	Through	Motorcycle	Skidding/sliding	2	2	0
180144746	07/14/2018	11:17	Clear	Daylight	P.D. only	Sideswipe	v1 North v2 North	Dry Dry	Through Slowing	Bicycle Automobile, station wagon	Other motor vehicle Cyclist	2	2	0
180136947	07/03/2018	20:58	Clear	Daylight	P.D. only	Rear end	v1 South v2 South	Dry Dry	Changing lanes Through	Automobile, station wagon Automobile, station wagon	Other motor vehicle Other motor vehicle	2	2	0
180131065	06/25/2018	20:35	Clear	Daylight	Non-fatal injury	Sideswipe	v1 South v2 South	Dry Dry	Through Stop	Automobile, station wagon Automobile, station wagon	Other motor vehicle Other motor vehicle	2	2	0
180114452	06/03/2018	18:14	Clear	Dark, artificial	Non-fatal injury	Rear end	v1 North v2 North	Dry Dry	Through Stop	Automobile, station wagon Automobile, station wagon	Other motor vehicle Other motor vehicle	2	2	0
180065186	03/29/2018	21:14	Rain	Dark, artificial	P.D. only	Rear end	v1 North v2 North	Dry Dry	Slowing Slowing	Delivery van Automobile, station wagon	Other motor vehicle Other motor vehicle	2	3	0
180065162	03/29/2018	20:20	Rain	Dark, artificial	P.D. only	Turning movement	v1 North v2 North	Wet Wet	Through Stop	Automobile, station wagon Automobile, station wagon	Other motor vehicle Other motor vehicle	2	3	0
180059052	03/21/2018	22:32	Clear	Dark, artificial	Non-fatal injury	Turning movement	v1 North v2 North	Wet Wet	Left Through	Automobile, station wagon Automobile, station wagon	Other motor vehicle Other motor vehicle	2	2	0
170238657	11/20/2017	16:00	Rain	Daylight	P.D. only	Turning movement	v1 North v2 South	Wet Wet	Left Left	Passenger van Automobile, station wagon	Other motor vehicle Other motor vehicle	2	2	0
170211856	10/14/2017	21:04	Rain	Dark	Non-fatal injury	SMV other	v1 North v2 South	Wet Wet	Left Left	Automobile, station wagon Automobile, station wagon	Other motor vehicle Other motor vehicle	1	6	1
* 170803059	09/18/2017	17:30	Clear	Daylight	P.D. only	Rear end	v1 West	Wet	Left	Automobile, station wagon	Pedestrian	3	3	0
170172658	08/24/2017	05:43	Clear	Dawn, artificial	Non-fatal injury	Angle	v1 East v2 East v3 East	Dry Dry Dry	Through Through Slowing	Automobile, station wagon Automobile, station wagon Automobile, station wagon	Other motor vehicle Other motor vehicle Other motor vehicle	2	2	0
* 170802490	07/29/2017	16:15	Clear	Daylight	P.D. only	Rear end	v1 East v2 South	Dry Dry	Through Through	Automobile, station wagon Automobile, station wagon	Other motor vehicle Other motor vehicle	2	2	0
170146259	07/19/2017	12:36	Clear	Daylight	Non-fatal injury	Turning movement	v1 East v2	Dry Dry	Left Unknown	Automobile, station wagon Automobile, station wagon	Other motor vehicle Other motor vehicle	2	3	0
* 170801851	06/07/2017	19:45	Clear	Daylight	P.D. only	Rear end	v1 North v2 South	Dry Dry	Left Through	Passenger van Automobile, station wagon	Other motor vehicle Other motor vehicle	2	2	0
170064130	03/30/2017	21:08	Rain	Dark, artificial	Non-fatal injury	SMV other	v1 North v2 South	Dry Dry	Stop Left	Automobile, station wagon Automobile, station wagon	Other motor vehicle Other motor vehicle	1	2	1
* 170800676	03/02/2017	14:15	Clear	Daylight	P.D. only	Rear end	v1 South	Wet	Left	Automobile, station wagon	Pedestrian	2	2	0
* 170800357	02/06/2017	18:05	Clear	Dark, artificial	P.D. only	Turning movement	v1 West	Dry	Stop	Automobile, station wagon	Other motor vehicle	2	2	0
170019043	01/28/2017	19:01	Snow	Dark, artificial	Non-fatal injury	SMV other	v1 West v2 East	Dry Dry	Right Left	Passenger van Automobile, station wagon	Other motor vehicle Other motor vehicle	1	2	1
170007784	01/12/2017	18:00	Clear	Daylight	Non-fatal injury	Rear end	v1 West	Wet	Left	Automobile, station wagon	Pedestrian	2	4	0

* 160804703	12/20/2016	16:15	Clear	Dusk	PD only	Rear end	Wet v1 West v2 West	Through Stop	Automobile, station wagon Passenger van	Other motor vehicle Other motor vehicle	2	2	0
* 160804574	12/15/2016	16:45	Snow	Daylight	PD only	Turning movement	Dry v1 West v2 West	Unknown	Automobile, station wagon Automobile, station wagon	Other motor vehicle Other motor vehicle	2	2	0
* 160804111	11/21/2016	07:45	Snow	Daylight	PD only	Turning movement	Slush v1 West v2 East	Left Through	Automobile, station wagon Passenger van	Other motor vehicle Other motor vehicle	2	2	0
* 160804118	11/20/2016	16:55	Clear	Daylight	PD only	Turning movement	Wet v1 West v2 East	Left Through	Automobile, station wagon Automobile, station wagon	Other motor vehicle Other motor vehicle	2	2	0
* 160804061	11/17/2016	17:45	Clear	Dark, artificial	PD only	Turning movement	Dry v1 South v2 East	Left Through	Automobile, station wagon Pick-up truck	Other motor vehicle Other motor vehicle	2	2	0
* 160803658	10/18/2016	17:10	Clear	Daylight	PD only	Turning movement	Dry v1 West v2 East	Right Left	Automobile, station wagon Pick-up truck	Other motor vehicle Other motor vehicle	2	2	0
* 160803307	09/20/2016	06:15	Clear	Dark, artificial	PD only	Rear end	Dry v1 West v2 East	Left Through	Automobile, station wagon Automobile, station wagon	Other motor vehicle Other motor vehicle	2	2	0
* 160803137	09/07/2016	17:15	Clear	Daylight	PD only	Rear end	Dry v1 East v2 East	Through Stop	Automobile, station wagon Automobile, station wagon	Other motor vehicle Other motor vehicle	2	2	0
* 160802965	08/23/2016	08:00	Clear	Daylight	PD only	Rear end	Dry v1 South v2 East	Stop Through	Automobile, station wagon Automobile, station wagon	Other motor vehicle Other motor vehicle	2	2	0
160159121	08/08/2016	13:54	Clear	Daylight	Non-fatal injury	Rear end	Dry v1 South v2 South	Through Stop	Automobile, station wagon Automobile, station wagon	Other motor vehicle Other motor vehicle	2	3	0
160154510	08/01/2016	21:53	Clear	Dark, artificial	Non-fatal injury	Turning movement	Dry v1 West v2 West	Through Stop	Automobile, station wagon Automobile, station wagon	Other motor vehicle Other motor vehicle	2	4	0
160139363	07/11/2016	21:38	Clear	Dark, artificial	Non-fatal injury	Rear end	Dry v1 South v2 North	Left Through	Automobile, station wagon Automobile, station wagon	Other motor vehicle Other motor vehicle	2	7	0
160115539	06/09/2016	13:24	Clear	Daylight	Non-fatal injury	Turning movement	Dry v1 East v2 East	Stop Slowing	Automobile, station wagon Automobile, station wagon	Other motor vehicle Other motor vehicle	2	4	0
* 160801814	05/25/2016	20:55	Clear	Daylight	PD only	Rear end	Dry v1 North v2 South	Left Through	Automobile, station wagon Automobile, station wagon	Other motor vehicle Other motor vehicle	2	2	0
* 160801049	03/21/2016	16:00	Clear	Daylight	PD only	Sideswipe	Dry v1 West v2 West	Stop Changing lanes	Automobile, station wagon Automobile, station wagon	Other motor vehicle Other motor vehicle	2	2	0
* 160800691	02/19/2016	06:10	Clear	Dark, artificial	PD only	Turning movement	Dry v1 East v2 East	Stop Changing lanes	Automobile, station wagon Automobile, station wagon	Other motor vehicle Other motor vehicle	2	2	0
* 160800666	02/17/2016	14:20	Clear	Daylight	PD only	Turning movement	Wet v1 East v2 West	Through Left	Automobile, station wagon Automobile, station wagon	Other motor vehicle Other motor vehicle	2	2	0
160029232	02/10/2016	19:57	Clear	Dark, artificial	Non-fatal injury	Rear end	Dry v1 North v2 North	Through Through	Automobile, station wagon Automobile, station wagon	Other motor vehicle Other motor vehicle	2	2	0
* 150802305	02/03/2016	06:40	Clear	Daylight	PD only	Rear end	Dry v1 South v2 South	Stop Through	Pick-up truck Automobile, station wagon	Other motor vehicle Other motor vehicle	2	2	0
			Clear	Daylight	PD only	Rear end	Dry v1 West	Stop	Automobile, station wagon	Other motor vehicle	2	2	0

• 150806363	12/25/2015	22:00	Clear	Daylight	P.D. only	Rear end	v2 West	Dry	Through	Pick-up truck	Other motor vehicle	2	2	0
• 150806330	12/22/2015	17:30	Clear	Dark, artificial	P.D. only	Rear end	v1 West v2 West	Dry Dry	Through Through	Automobile, station wagon Automobile, station wagon	Other motor vehicle	2	2	0
• 150805674	11/15/2015	10:15	Clear	Daylight	P.D. only	Turning movement	v1 East v2 East	Wet Wet	Through Stop	Automobile, station wagon Automobile, station wagon	Other motor vehicle	2	2	0
• 150805200	10/17/2015	12:45	Clear	Daylight	P.D. only	Rear end	v1 South v2 North	Dry Dry	Left Through	Automobile, station wagon Automobile, station wagon	Other motor vehicle	2	2	0
• 150805164	10/15/2015	10:00	Clear	Daylight	P.D. only	Turning movement	v1 South v2 South	Dry Dry	Through Stop	Automobile, station wagon Automobile, station wagon	Other motor vehicle	2	2	0
150195472	10/09/2015	14:37	Clear	Daylight	P.D. only	Rear end	v1 East v2 South	Dry Dry	Right Through	Automobile, station wagon Automobile, station wagon	Other motor vehicle	2	2	0
• 150804384	08/25/2015	14:00	Clear	Daylight	P.D. only	Rear end	v1 North v2 North	Dry Dry	Through Stop	Automobile, station wagon Automobile, station wagon	Other motor vehicle	2	2	0
• 150804114	08/04/2015	10:30	Clear	Daylight	P.D. only	Sideswipe	v1 South v2 South	Dry Dry	Through Slowing	Automobile, station wagon Automobile, station wagon	Other motor vehicle	2	2	0
• 150803865	07/24/2015	15:30	Clear	Daylight	P.D. only	Rear end	v1 East v2 East	Dry Dry	Stop Unknown	Automobile, station wagon Passenger van	Other motor vehicle	2	2	0
150122816	06/29/2015	12:55	Clear	Daylight	Non-fatal injury	Rear end	v1 West v2 West	Dry Dry	Stop Through	Automobile, station wagon Automobile, station wagon	Other motor vehicle	2	5	0
• 150803238	06/17/2015	10:40	Clear	Daylight	P.D. only	Turning movement	v1 West v2 West	Dry Dry	Through Stop	Automobile, station wagon Automobile, station wagon	Other motor vehicle	2	2	0
150106426	06/05/2015	22:08	Clear	Daylight, artificial	Non-fatal injury	Rear end	v1 North v2 East	Dry Dry	Left Through	Automobile, station wagon Automobile, station wagon	Other motor vehicle	2	6	0
• 150802826	05/25/2015	08:40	Clear	Daylight	P.D. only	Rear end	v1 East v2 East	Dry Dry	Slowing Stop	Automobile, station wagon Automobile, station wagon	Other motor vehicle	2	2	0
• 150802814	05/23/2015	13:00	Clear	Daylight	P.D. only	Rear end	v1 North v2	Dry Dry	Stop Unknown	Automobile, station wagon Automobile, station wagon	Other motor vehicle	2	2	0
150090546	05/14/2015	15:28	Clear	Daylight	Non-fatal injury	Turning movement	v1 West v2 West	Dry Dry	Stop Through	Automobile, station wagon Automobile, station wagon	Other motor vehicle	2	2	0
150082254	05/02/2015	14:22	Clear	Daylight	Non-fatal injury	Turning movement	v1 North v2 East	Dry Dry	Through Left	Automobile, station wagon Automobile, station wagon	Other motor vehicle	2	2	0
* 150802006	04/04/2015	12:30	Clear	Daylight	P.D. only	Other	v1 South v2 South	Dry Dry	Right Through	Pick-up truck Bicycle	Cyclist Other motor vehicle	2	2	0
* 150801416	03/01/2015	15:30	Clear	Daylight	P.D. only	Turning movement	v1 East v2 East	Dry Dry	Revers Stop	Automobile, station wagon Automobile, station wagon	Other motor vehicle	2	2	0
• 150801244	02/22/2015	14:00	Clear	Daylight	P.D. only	Rear end	v1 West v2 West	Dry Dry	Left Left	Automobile, station wagon Automobile, station wagon	Other motor vehicle	2	2	0
							v1 East v2 East	Wet Wet	Through Stop	Automobile, station wagon Automobile, station wagon	Other motor vehicle	2	2	0



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• 150800617	01/31/2015	14:45	Clear	Daylight	P.D. only	Turning movement	v1 East v2 North	Unknown Dry	Through Left	Automobile, station wagon Automobile, station wagon	Other motor vehicle Other motor vehicle	2	2	0
• 150800468	01/23/2015	12:30	Clear	Daylight	P.D. only	Rear end	v1 West v2 West	Dry Dry	Stop Slowing	Automobile, station wagon Automobile, station wagon	Other motor vehicle Other motor vehicle	2	2	0
• 150800333	01/17/2015	10:39	Clear	Daylight	P.D. only	Rear end	v1 North v2 North	Wet Wet	Stop Through	Automobile, station wagon Automobile, station wagon	Other motor vehicle Other motor vehicle	2	2	0
• 150800314	01/15/2015	20:30	Clear	Daylight	P.D. only	Rear end	v1 East v2 East	Dry Dry	Stop Through	Automobile, station wagon Automobile, station wagon	Other motor vehicle Other motor vehicle	2	2	0
• 140806552	12/24/2014	06:55	Rain	Dark, artificial	P.D. only	Turning movement	v1 North v2 South	Wet Wet	Left Through	Automobile, station wagon Automobile, station wagon	Other motor vehicle Other motor vehicle	2	2	0
• 140806313	12/13/2014	15:20	Clear	Daylight	P.D. only	Rear end	v1 East v2 East	Dry Unknown	Stop Slowing	Automobile, station wagon Automobile, station wagon	Other motor vehicle Other motor vehicle	2	2	0
• 140806207	12/10/2014	19:00	Clear	Dark, artificial	P.D. only	Rear end	v1 West v2 West	Dry Unknown	Through Stop	Automobile, station wagon Automobile, station wagon	Other motor vehicle Other motor vehicle	2	2	0
• 140806133	12/06/2014	16:30	Clear	Daylight	P.D. only	Turning movement	v1 North v2 West	Dry Unknown	Through Left	Automobile, station wagon Automobile, station wagon	Other motor vehicle Other motor vehicle	2	2	0
• 140805683	11/14/2014	10:00	Clear	Daylight	P.D. only	Rear end	v1 West v2 West	Dry Dry	Stop Unknown	Automobile, station wagon Automobile, station wagon	Other motor vehicle Other motor vehicle	2	2	0
• 140805392	10/31/2014	12:30	Rain	Daylight	P.D. only	Sideswipe	v1 East v2 East	Wet Wet	Through Stop	Automobile, station wagon Automobile, station wagon	Other motor vehicle Other motor vehicle	2	2	0
• 140805328	10/28/2014	18:30	Clear	Daylight	P.D. only	Rear end	v1 East v2 East	Wet Wet	Stop Through	Automobile, station wagon Automobile, station wagon	Other motor vehicle Other motor vehicle	2	2	0
<b>Total:</b>														
86 Collisions														



**Collision Detail intersection Liverpool Rd (R.R.29) @ Glenanna Dr**

FROM: 10/28/2014

TO: 10/29/2019

Municipality REPORT NUMBER	Traffic Control		DATE	TIME	Traffic signal ENVIRONMENT	LIGHT	CLASS	IMPACT TYPE	DIR	SURFACE CONDITION	VEHICLE MANOEUVERE	VEHICLE TYPE	FIRST EVENT	NO. VEH PER	NO. NO. PER PED
	LIVERPOOL RD (R.R.29) @ GLENANNA DR														
190179153			08/16/2019	18:00	Clear	Daylight	Non-fatal injury	SMV other	v1 East	Dry	Right	Automobile, station wagon	Pedestrian	3	1
180230994			11/08/2018	09:57	Clear	Daylight	Non-fatal injury	Angle	v1 North v2 East v3 South	Wet Wet Unknown	Through Through Stop	Automobile, station wagon Automobile, station wagon Automobile, station wagon	Other motor vehicle Other motor vehicle Other motor vehicle	3	0
180205756			10/04/2018	13:30	Clear	Daylight	P.D. only	Rear end	v1 West v2 West	Dry Dry	Through Stop	Automobile, station wagon Automobile, station wagon	Other motor vehicle Other motor vehicle	2	0
180148402			07/19/2018	14:02	Clear	Daylight	P.D. only	Rear end	v1 West v2 West	Dry Dry	Through Slowing	Automobile, station wagon Automobile, station wagon	Other motor vehicle Other motor vehicle	2	0
180045952			03/04/2018	09:12	Clear	Daylight	Non-fatal injury	Angle	v1 South v2 East	Dry Dry	Through Through	Automobile, station wagon Automobile, station wagon	Other motor vehicle Other motor vehicle	2	0
170113747			06/06/2017	21:43	Clear	Dark, artificial	Non-fatal injury	Angle	v1 West v2 South	Dry Dry	Through Through	Automobile, station wagon Automobile, station wagon	Other motor vehicle Other motor vehicle	2	0
• 170800620			02/26/2017	16:30	Clear	Daylight	P.D. only	Angle	v1 East v2 North	Dry Dry	Through Through	Automobile, station wagon Automobile, station wagon	Other motor vehicle Other motor vehicle	2	0
• 160804648			12/19/2016	10:15	Clear	Daylight	P.D. only	Rear end	v1 East v2 East	Ice Ice	Through Stop	Automobile, station wagon Automobile, station wagon	Other motor vehicle Other motor vehicle	2	0
160193359			09/24/2016	20:12	Clear	Dark, artificial	Non-fatal injury	Approaching	v1 North v2 South	Dry Dry	Through Through	Pick-up truck Automobile, station wagon	Other motor vehicle Other motor vehicle	2	0
• 160802934			08/19/2016	15:10	Clear	Daylight	P.D. only	Angle	v1 North v2	Dry Dry	Through Unknown	Automobile, station wagon Automobile, station wagon	Other motor vehicle Other motor vehicle	2	0
• 160802927			08/18/2016	12:30	Clear	Daylight	P.D. only	Rear end	v1 South v2 South	Dry Dry	Through Through	Automobile, station wagon Automobile, station wagon	Other motor vehicle Other motor vehicle	2	0
• 150806115			12/09/2015	18:00	Rain	Dark, artificial	P.D. only	Rear end	v1 West v2 West	Wet Wet	Slowing Unknown	Automobile, station wagon Pick-up truck	Other motor vehicle Other motor vehicle	2	0
150185021			09/24/2015	17:18	Clear	Daylight	P.D. only	Turning movement	v1 South v2 West	Dry Dry	Through Right	Bicycle Automobile, station wagon	Other motor vehicle Other motor vehicle	2	0
• 150803080			06/07/2015	18:00	Clear	Daylight	P.D. only	Rear end	v1 North v2 North	Dry Dry	Stop Through	Automobile, station wagon Automobile, station wagon	Other motor vehicle Other motor vehicle	2	0
• 150800573			01/29/2015	18:20	Snow	Dark	P.D. only	Turning movement	v1 South v2 East	Ice Ice	Right Stop	Automobile, station wagon Automobile, station wagon	Other motor vehicle Other motor vehicle	2	0

Total: 15 Collisions

Grand Total: 101 Collisions

[Note: time of Day = "00:00" represents unknown collision time. \* represents SRC report type]

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**Collision Detail**

FROM: 10/28/2014 TO: 10/29/2019

REPORT NUMBER	DATE	TIME	DISTANCE	ENVIRONMENT	LIGHT	CLASS	IMPACT TYPE	DIR	SURFACE CONDITION	VEHICLE MANOEUVRE	VEHICLE TYPE	FIRST EVENT	NO. NO. NO. VEH PER PED
LIVERPOOL ROAD BETWEEN GLENANNA RD AND ANTON SQ													
0 Collisions													
LIVERPOOL ROAD BETWEEN KINGSTON RD AND GLENANNA RD													
190206384	9/21/2019	14:30	UNAVAILABLE	Clear	Daylight	P.D. only	Turning movement	v1 West v2 North	Dry	Left Through	Automobile, station wagon Automobile, station wagon	Other motor vehicle Other motor vehicle	2 5 0
190150984	7/13/2019	10:49	UNAVAILABLE	Clear	Daylight	P.D. only	SMV unattended vehicle	v1 South v2 North	Dry	Revers Parked	Automobile, station wagon Automobile, station wagon	Unattended vehicle Other motor vehicle	2 2 0
180076361	4/14/2018	10:30	UNAVAILABLE	Rain	Daylight	P.D. only	Turning movement	v1 South v2 South	Wet	Left Through	Automobile, station wagon Automobile, station wagon	Other motor vehicle Other motor vehicle	2 3 0
170803090	9/21/2017	15:10	60m north	Clear	Daylight	P.D. only	Turning movement	v1 West v2 North	Unknown	Left Through	Automobile, station wagon Automobile, station wagon	Other motor vehicle Other motor vehicle	2 2 0
170802547	8/3/2017	12:00	5m north	Clear	Daylight	P.D. only	Rear end	v1 North v2 North	Dry	Stop Through	Automobile, station wagon Automobile, station wagon	Other motor vehicle Other motor vehicle	2 2 0
170097368	5/15/2017	20:28	UNAVAILABLE	Clear	Daylight	Non-fatal injury	SMV other	v1 North	Dry	Left	Automobile, station wagon	Pedestrian	1 2 1
170800817	3/16/2017	18:15	100m north	Clear	Dusk, artificial	P.D. only	Turning movement	v1 West v2 South	Dry	Left Left	Automobile, station wagon Automobile, station wagon	Other motor vehicle Other motor vehicle	2 2 0
170800023	1/4/2017	19:30	125m north	Clear	Dark, artificial	P.D. only	Turning movement	v1 West v2 North	Loose snow Unknown	Left Through	Automobile, station wagon Automobile, station wagon	Other motor vehicle Other motor vehicle	2 2 0
160802075	6/12/2016	13:35	100m north	Clear	Daylight	P.D. only	Turning movement	v1 West v2	Dry	Left Unknown	Automobile, station wagon Automobile, station wagon	Other motor vehicle Other motor vehicle	2 2 0
160800305	1/21/2016	12:22	10m north	Clear	Daylight	P.D. only	Rear end	v1 North v2 North v3 North v4 North	Dry	Through Stop Stop Stop	Automobile, station wagon Automobile, station wagon Automobile, station wagon Pick-up truck	Other motor vehicle Other motor vehicle Other motor vehicle Other motor vehicle	4 4 0
150802332	4/25/2015	15:00	55m north	Clear	Daylight	P.D. only	Turning movement	v1 South v2 West	Dry	Left Left	Automobile, station wagon Automobile, station wagon	Other motor vehicle Other motor vehicle	2 2 0
LIVERPOOL ROAD BETWEEN PICK PKWY AND KINGSTON RD													
190204805	9/17/2019	12:56	UNAVAILABLE	Clear	Daylight	P.D. only	Turning movement	v1 South v2 South	Dry	Left Through	Truck - closed Pick-up truck	Other motor vehicle Other motor vehicle	2 2 0
190180700	8/18/2019	18:34	UNAVAILABLE	Clear	Daylight	P.D. only	Turning movement	v1 West	Dry	Right	Automobile, station wagon	Other motor vehicle	2 2 0

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Collision Detail

FROM: 10/28/2014 TO: 10/29/2019



REPORT NUMBER	DATE	TIME	DISTANCE	ENVIRONMENT	LIGHT	CLASS	IMPACT TYPE	DIR	SURFACE CONDITION	VEHICLE MANOEUVRE	VEHICLE TYPE	FIRST EVENT	NO. NO. VEH PER PED
180023485	1/30/2019	17:42	UNAVAILABLE	Clear	Dark, artificial	Non-fatal injury	Turning movement	v2 North	Dry	Through	Automobile, station wagon	Other motor vehicle	2 2 0
180054905	3/16/2018	15:27	UNAVAILABLE	Clear	Daylight	P.D. only	Rear end	v1 South v2 South	Loose snow Loose snow	Through Right	Automobile, station wagon Automobile, station wagon	Other motor vehicle Other motor vehicle	2 2 0
180803745	10/24/2016	15:50	15m south	Clear	Daylight	P.D. only	Turning movement	v1 South v2 South	Dry Dry	Through Slowing	Automobile, station wagon Bus (other)	Other motor vehicle Other motor vehicle	2 2 0
180802962	8/21/2016	17:30	10-25m south	Clear	Daylight	P.D. only	Turning movement	v1 South v2 North	Dry Unknown	Through	Automobile, station wagon Automobile, station wagon	Other motor vehicle Other motor vehicle	2 2 0
150803139	6/12/2015	14:27	40m south	Rain	Daylight	P.D. only	Turning movement	v1 West v2 South	Dry Unknown	Changing lanes Through	Automobile, station wagon Automobile, station wagon	Other motor vehicle Other motor vehicle	2 2 0
150802966	6/3/2015	13:30	30m south	Clear	Daylight	P.D. only	Turning movement	v1 West v2 North	Wet Unknown	Left Through	Automobile, station wagon Automobile, station wagon	Other motor vehicle Other motor vehicle	2 2 0
150802852	5/27/2015	13:35	40m south	Clear	Daylight	P.D. only	Turning movement	v1 North v2 North	Dry Unknown	Through Through	Automobile, station wagon Automobile, station wagon	Other motor vehicle Other motor vehicle	0 2 0
150802480	5/4/2015	16:10	15-40m south	Rain	Daylight	P.D. only	Turning movement	v1 West v2 North	Dry Unknown	Left Through	Automobile, station wagon Automobile, station wagon	Other motor vehicle Other motor vehicle	2 2 0
150802480	5/4/2015	16:10	15-40m south	Rain	Daylight	P.D. only	Turning movement	v1 East v2 South	Dry Unknown	Left Through	Automobile, station wagon Automobile, station wagon	Other motor vehicle Other motor vehicle	2 2 0
<b>KINGSTON ROAD BETWEEN GLENDALE DR AND LIVERPOOL RD</b>													
180102487	5/14/2019	21:23	UNAVAILABLE	Clear	Dark	P.D. only	Angle	v1 North v2 East	Dry Dry	Merging Through	Automobile, station wagon Automobile, station wagon	Other motor vehicle Other motor vehicle	2 3 0
180048479	3/7/2018	11:21	UNAVAILABLE	Clear	Daylight	P.D. only	Turning movement	v1 North v2 East	Dry Dry	Left Through	Automobile, station wagon Pick-up truck	Other motor vehicle Other motor vehicle	2 2 0
170111548	6/3/2017	20:05	UNAVAILABLE	Clear	Daylight	Non-reportable	Rear end	v1 West v2 West	Dry Dry	Through Through	Automobile, station wagon Automobile, station wagon	Other motor vehicle Other motor vehicle	2 3 0
170800267	1/27/2017	18:35	50m west	Clear	Dark, artificial	P.D. only	Turning movement	v1 East v2 North	Dry Unknown	Through Right	Automobile, station wagon Automobile, station wagon	Other motor vehicle Other motor vehicle	2 2 0
150804742	9/18/2015	16:00	UNAVAILABLE	Clear	Daylight	P.D. only	Turning movement	v1 West v2 North	Dry Unknown	Left Stop	Automobile, station wagon Automobile, station wagon	Other motor vehicle Other motor vehicle	2 2 0
150802402	4/30/2015	16:30	50-100m west	Clear	Daylight	P.D. only	Rear end	v1 East v2 East	Dry Unknown	Stop Slowing	Automobile, station wagon Automobile, station wagon	Other motor vehicle Other motor vehicle	2 2 0
150802150	4/15/2015	14:05	20-50m west	Clear	Daylight	P.D. only	Sideswipe	v1 East v2 East	Dry Unknown	Stop Slowing	Automobile, station wagon Automobile, station wagon	Other motor vehicle Other motor vehicle	2 2 0

DCC 2 pg 2

**Collision Detail**

FROM: 10/28/2014

TO: 10/29/2019



REPORT NUMBER	DATE	TIME	DISTANCE	ENVIRONMENT	LIGHT	CLASS	IMPACT TYPE	DIR	SURFACE CONDITION	VEHICLE MANOEUVRE	VEHICLE TYPE	FIRST EVENT	NO. NO. VEH PER PED
<b>KINGSTON ROAD BETWEEN LIVERPOOL RD AND PIC TOWN CTR ENT</b>													
180015053	1/19/2019	13:25	UNAVAILABLE	Snow	Daylight	Non-fatal injury	Turning movement	v1 West v2 North	Unknown	Through Right	Automobile, station wagon Automobile, station wagon	Other motor vehicle	2 3 0
180159059	8/3/2018	14:56	UNAVAILABLE	Clear	Daylight	Non-fatal injury	Turning movement	v1 South v2 East	Packed snow Packed snow	Left Through	Automobile, station wagon Pick-up truck	Other motor vehicle Other motor vehicle	2 3 0
180143880	7/13/2018	8:31	UNAVAILABLE	Clear	Daylight	P. D. only	Rear end	v1 West v2 West	Dry Dry	Through Through Slowing	Automobile, station wagon Automobile, station wagon Automobile, station wagon	Other motor vehicle Other motor vehicle Other motor vehicle	2 2 0

(Note: time of Day = "00:00" represents unknown collision time. \* represents SRC report type. "UNAVAILABLE": Traffic Dept. does not have a copy of the report - distances are not transmitted electronically from DRFS)

Doc 2-083



# Signal Timing Plans



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  
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traffic@durhamca

[www.durham.ca](http://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**

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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

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### 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
<b>AM Peak 5:30 to 9:00</b>	100	Max Green	59.3	59.3	28.1	28.1
<b>PM Peak 14:30 to 19:00</b>	100	Max Green	57.3	57.3	30.1	30.1
<b>Saturday 8:00 to 21:00</b>	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
<b>AM Peak 5:30 to 9:00</b>	100	Max Green	0.0	6.0	32.6	41.6	6.0	6.0	36.0	36.0
<b>PM Peak 14:30 to 21:00</b>	100	Max Green	0.0	6.0	33.6	42.6	6.0	6.0	35.0	35.0
<b>Saturday 8:00 to 21:00</b>	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
<b>AM Peak 5:30 to 9:00</b>	100	Max Green	11.0	11.0	29.0	29.0	9.0	9.0	31.1	31.1
<b>PM Peak 14:30 to 21:00</b>	100	Max Green	7.0	9.0	33.0	35.0	7.0	6.0	32.1	31.1
<b>Saturday 8:00 to 21:00</b>	100	Max Green	7.0	15.0	28.0	36.0	6.0	6.0	31.1	31.1



# APPENDIX B

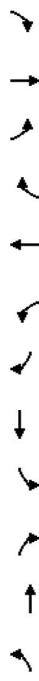
## Existing Intersection Capacity Analysis



**AM Peak Hour**

HCM Signalized Intersection Capacity Analysis  
 1: Glenanna Rd & Kingston Rd

19225 | 1294 Kingston Rd  
 EX AM



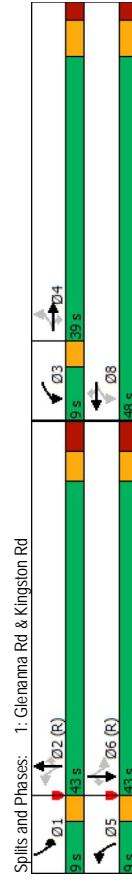
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	10	388	93	96	562	122	52	73	64	190	102	26
Traffic Volume (vph)	10	388	93	96	562	122	52	73	64	190	102	26
Future Volume (vph)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Ideal Flow (vphpl)	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2
Lane Width	6.4	6.4	6.4	3.0	6.4	6.4	3.0	7.0	3.0	7.0	3.0	7.0
Total Lost Time (s)	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Util. Factor	1.00	1.00	0.83	1.00	1.00	0.90	1.00	1.00	0.91	1.00	1.00	0.84
Frbp. ped/bikes	0.96	1.00	1.00	0.98	1.00	1.00	0.91	1.00	1.00	0.96	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)	1663	3500	1220	1628	3500	1373	1575	1879	1385	1649	1824	1295
Flt Permitted	0.42	1.00	1.00	0.32	1.00	1.00	0.69	1.00	1.00	0.66	1.00	1.00
Satd. Flow (perm)	736	3500	1220	541	3500	1373	1136	1879	1385	1143	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)	11	422	101	104	611	133	57	79	70	207	111	28
RTOR Reduction (vph)	0	0	82	0	0	69	0	0	41	0	0	15
Lane Group Flow (vph)	11	422	19	104	611	64	57	79	29	207	111	13
Conf. Peds. (#/hr)	30	55	55	30	91	30	91	50	50	30	91	30
Heavy Vehicles (%)	0%	2%	5%	4%	2%	1%	0%	0%	1%	0%	3%	0%
Turn Type	Perm	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm
Permitted Phases	4	4	4	3	8	8	5	2	2	1	6	6
Actuated Green, G (s)	18.5	18.5	30.2	30.2	30.2	30.2	48.0	42.1	42.1	56.4	47.5	47.5
Effective Green, g (s)	18.5	18.5	30.2	30.2	30.2	48.0	42.1	42.1	42.1	56.4	47.5	47.5
Actuated g/C Ratio	0.18	0.18	0.30	0.30	0.30	0.30	0.48	0.42	0.42	0.56	0.48	0.48
Clearance Time (s)	6.4	6.4	6.4	3.0	6.4	6.4	3.0	7.0	3.0	7.0	3.0	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	3.0
Lane Grp Cap (vph)	136	647	225	257	1057	414	571	791	583	701	866	615
v/s Ratio Prot	0.01	0.12	0.04	0.04	c0.17	0.01	0.04	0.01	0.04	c0.03	0.06	0.06
v/s Ratio Perm	0.01	0.02	0.09	0.05	0.05	0.05	0.04	0.02	0.02	c0.13	0.01	0.01
Uniform Delay, d1	0.08	0.65	0.08	0.40	0.58	0.15	0.10	0.10	0.05	0.30	0.13	0.02
Progression Factor	0.67	0.63	0.18	1.00	1.00	1.00	1.00	1.00	1.00	0.79	0.87	1.00
Incremental Delay, d2	0.2	2.3	0.2	1.0	0.8	0.2	0.1	0.3	0.2	0.2	0.3	0.1
Delay (s)	22.9	26.2	6.2	27.4	30.3	25.7	14.1	17.8	17.3	8.9	13.1	14.0
Level of Service	C	C	A	C	C	C	B	B	B	A	B	B
Approach Delay (s)	22.4			29.2			16.6			10.6		
Approach LOS	C			C			B			B		
<b>Intersection Summary</b>												
HCM 2000 Control Delay	22.7	HCM 2000 Level of Service										
HCM 2000 Volume to Capacity ratio	0.42	C										
Actuated Cycle Length (s)	100.0	Sum of lost time (s)										
Intersection Capacity Utilization	54.3%	ICU Level of Service										
Analysis Period (min)	15	A										
c Critical Lane Group		15										

1: Glenanna Rd & Kingston Rd

19225 | 1294 Kingston Rd  
 EX AM



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	10	388	93	96	562	122	52	73	64	190	102	26
Traffic Volume (vph)	10	388	93	96	562	122	52	73	64	190	102	26
Future Volume (vph)	11	422	101	104	611	133	57	79	70	207	111	28
Lane Group Flow (vph)	11	422	101	104	611	133	57	79	70	207	111	28
Turn Type	Perm	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm
Permitted Phases	4	4	4	3	8	8	5	2	2	1	6	6
Detector Phase	4	4	4	3	8	8	5	2	2	1	6	6
Switch Phase	4	4	4	3	8	8	5	2	2	1	6	6
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)	24.4	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	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%	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	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	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	0.0
Total Lost Time (s)	6.4	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	Lag	Lead	Lead	Lead	Lag	Lag	Lag	Lead	Lag	Lag
Lead/Lag Optimize?	None	None	None	None	None	None	None	None	None	None	None	None
Recall Mode	0.08	0.65	0.32	0.37	0.59	0.28	0.09	0.10	0.11	0.28	0.13	0.04
v/s Ratio	23.0	28.7	3.7	25.4	31.5	9.0	10.9	21.9	2.7	9.1	15.9	2.2
Control 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
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	23.0	28.7	3.7	25.4	31.5	9.0	10.9	21.9	2.7	9.1	15.9	2.2
Queue Length 50th (m)	1.1	24.8	0.0	14.8	54.9	4.9	4.4	9.5	0.0	10.6	17.0	0.2
Queue Length 95th (m)	m2.9	26.4	0.5	23.9	63.5	16.5	12.1	23.9	5.3	48.1	32.5	2.3
Internal Link Dist (m)	393.2											
Turn Bay Length (m)	42.6	60.4	33.0	23.2	25.4	25.4	25.4	25.0	27.3	416.6	16.5	16.5
Base Capacity (vph)	240	1141	471	284	1456	628	640	830	670	744	888	683
Stallion 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	0.05	0.37	0.21	0.37	0.42	0.21	0.09	0.10	0.10	0.28	0.13	0.04
<b>Intersection Summary</b>												
Cycle Length: 100												
Actuated Cycle Length: 100												
Offset: 0 (0%), Referenced to phase 2:NBL and 6:SBTL, Start of Green												
Natural Cycle: 70												
Control Type: Actuated-Coordinated												
m Volume for 95th percentile queue is metered by upstream signal.												



HCM Signalized Intersection Capacity Analysis  
 2: Liverpool Rd & Kingston Rd

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 EX AM



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	3.5	3.2	3.5	3.2	3.5	3.2
Total Lost Time (s)	3.0	7.4	7.4	3.0	7.4	3.0	6.9	6.9	3.0	6.9	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
Frbp. ped/bikes	1.00	1.00	0.94	1.00	1.00	0.95	1.00	1.00	0.91	1.00	1.00	0.93
Frbp. ped/bikes	0.99	1.00	1.00	0.99	1.00	1.00	1.00	1.00	0.98	1.00	1.00	0.85
Flt	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	0.95	1.00	1.00	0.95
Satd. Flow (prot)	1693	3500	1416	1690	3500	1431	1691	3535	1363	1643	3570	1397
Flt Permitted	0.45	1.00	1.00	0.43	1.00	1.00	0.13	1.00	0.48	1.00	1.00	0.48
Satd. Flow (perm)	797	3500	1416	764	3500	1431	231	3535	1363	831	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)	100	400	276	193	512	51	234	475	133	86	851	108
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	100	410	276	193	512	51	234	475	46	86	851	31
Conf. Peds. (#/hr)	26	32	32	32	32	26	34	48	48	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
Permitted Phases	7	4	3	8	8	5	2	2	1	6	6	6
Actuated Green, G (s)	35.4	29.5	29.5	41.8	32.9	32.9	43.9	34.7	34.7	35.3	29.1	29.1
Effective Green, g (s)	35.4	29.5	29.5	41.8	32.9	32.9	43.9	34.7	34.7	35.3	29.1	29.1
Actuated g/C Ratio	0.35	0.29	0.29	0.42	0.33	0.33	0.44	0.35	0.35	0.35	0.29	0.29
Clearance Time (s)	3.0	7.4	7.4	3.0	7.4	3.0	6.9	6.9	3.0	6.9	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)	335	1032	417	405	1151	470	273	1226	472	343	1038	406
v/s Ratio Prot	0.02	0.12	0.04	0.15	0.04	0.13	0.02	0.13	0.02	0.24	0.02	0.24
v/s Ratio Perm	0.09	0.19	0.15	0.15	0.04	0.28	0.03	0.28	0.03	0.07	0.03	0.07
Uniform Delay, d1	0.30	0.40	0.66	0.48	0.44	0.11	0.86	0.39	0.10	0.25	0.82	0.08
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.5	1.1	8.0	0.8	1.2	0.4	22.3	0.2	0.1	0.4	5.0	0.1
Delay (s)	22.7	29.3	38.9	46.0	53.1	48.0	44.1	24.8	22.2	19.3	34.1	14.1
Level of Service	C	D	D	D	D	D	D	C	C	C	B	C
Approach Delay (s)	C	31.8	C	50.9	D	29.8	C	30.9	C	30.9	C	C
Approach LOS	C	C	C	D	D	C	C	C	C	C	C	C

Intersection Summary	Value
HCM 2000 Control Delay	35.2
HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.77
Actuated Cycle Length (s)	100.0
Intersection Capacity Utilization	77.0%
Analysis Period (min)	15
Critical Lane Group	C

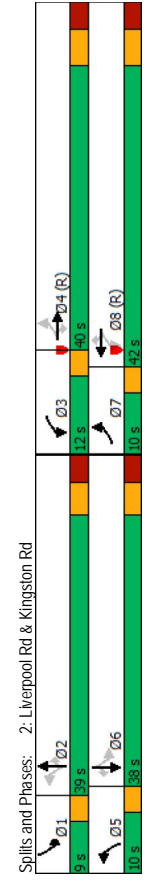
Queues  
 2: Liverpool Rd & Kingston Rd

19225 | 1294 Kingston Rd  
 EX AM



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
Permitted Phases	7	4	4	4	4	3	8	5	2	1	6	6
Detector Phase	7	4	4	4	4	3	8	5	2	2	1	6
Switch Phase	7	4	4	4	4	3	8	5	2	2	1	6
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	8.5	24.9	24.9	24.9	8.0	24.9	24.9
Total Split (s)	10.0	40.0	40.0	12.0	42.0	12.0	39.0	39.0	39.0	9.0	38.0	38.0
Total Spill (%)	10.0%	40.0%	40.0%	12.0%	42.0%	12.0%	39.0%	39.0%	39.0%	9.0%	38.0%	38.0%
Yellow Time (s)	3.0	4.2	4.2	3.0	4.2	3.0	3.7	3.7	3.7	3.0	3.7	3.7
All-Red Time (s)	0.0	3.2	3.2	0.0	3.2	0.0	3.2	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	3.0	6.9	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?	None	C-Min	None	None	C-Min	None	None	C-Min	None	None	C-Min	None
Recall Mode	0.25	0.39	0.65	0.44	0.43	0.10	0.84	0.39	0.24	0.22	0.84	0.23
v/c Ratio	17.3	29.4	39.1	42.1	53.7	51.1	49.8	26.2	5.6	14.1	37.4	3.7
Control 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
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	17.3	29.4	39.1	42.1	53.7	51.1	49.8	26.2	5.6	14.1	37.4	3.7
Queue Length 50th (m)	12.5	38.0	53.5	39.2	58.1	10.7	25.9	36.2	0.0	7.4	85.5	0.4
Queue Length 95th (m)	20.0	46.7	75.0	52.0	71.2	21.8	49.0	54.5	13.1	14.6	81.4	5.3
Internal Link Dist (m)	667.5					393.2						35.5
Turn Bay Length (m)	33.5	49.1	103.2	61.6	46.2	51.8	47.9	51.8	47.9	39.9	47.9	39.9
Base Capacity (vph)	397	1173	474	438	1306	534	277	1227	560	387	1110	512
Stallion 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	0.25	0.35	0.58	0.44	0.39	0.10	0.84	0.39	0.24	0.22	0.77	0.21

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



HCM Unsignalized Intersection Capacity Analysis  
 4: Liverpool Rd & North Dwy/Main Plaza Dwy

HCM Unsignalized Intersection Capacity Analysis  
 3: Liverpool Rd & South Dwy

19225 | 1294 Kingston Rd  
 EX AM

19225 | 1294 Kingston Rd  
 EX AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	8	0	14	106	1	59	18	395	163	94	833	19
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	Stop	Stop	0%	0%	Free	Free	Free	Free	Free	0%
Grade	0%	0%	0%	0%	0%	0%	0%	0%	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	6	0	15	115	1	64	20	429	177	102	905	21
Lane Width (m)	3.5	3.5	3.4	3.4	1.2	1.2	1.2	1.2	1.2	1.2	1.2	3.4
Walking Speed (m/s)	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Percent Blockage	0	0	0	0	0	0	0	0	0	0	0	0
Right turn flare (veh)												
Median type							TW/TLT	TW/TLT	TW/TLT	TW/TLT	TW/TLT	TW/TLT
Median storage (veh)							2	2	2	2	2	2
Upstream signal (m)							140	140	140	140	140	216
pX, platoon unblocked	0.92	0.92	0.98	0.92	0.92	0.91	0.98	0.92	0.91	0.91	0.91	0.91
vC, conflicting volume	1446	1786	470	1245	1708	319	932	1245	1708	319	932	621
vC1, stage 1 conf vol	1126	1126	572	572	572	572	572	572	572	572	572	572
vC2, stage 2 conf vol	320	661	672	672	1136	672	1136	672	1136	672	1136	672
vCu, unblocked vol	1191	1562	408	973	1477	44	881	973	1477	44	881	377
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1	7.5	6.5	6.9	4.1	4.1
tC, 2 stage (s)	6.5	5.5	6.5	6.5	5.5	6.5	5.5	6.5	5.5	6.5	5.5	5.5
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2	3.5	4.0	3.3	2.2	2.2
p0 queue free %	96	100	97	65	100	93	97	65	100	93	97	90
cM capacity (veh/h)	201	229	581	332	224	914	753	332	224	914	753	1069
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	340	332	872	753	1700	1700	1069	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	0.7	0.0	0.0	2.5	0.0	0.0			
Control Delay (s)	16.4	21.5	9.5	9.9	0.0	0.0	8.7	0.0	0.0			
Lane LOS	C	C	A	A	A	A	A	A	A			
Approach Delay (s)	16.4	17.2	0.3	0.3	0.9	0.9	0.9	0.9	0.9			
Approach LOS	C	C	C	C	C	C	C	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	NBR	SBT	SBR
Lane Configurations	0	11	0	576	950	3	3
Traffic Volume (veh/h)	0	11	0	576	950	3	3
Future Volume (Veh/h)	0	11	0	576	950	3	3
Sign Control	Stop	Free	Free	Free	Free	Free	0%
Grade	0%	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	12	0	626	1033	3	3
Pedestrians	4	4	4	4	4	4	4
Lane Width (m)	3.2	3.2	3.2	3.2	3.2	3.2	3.2
Walking Speed (m/s)	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Percent Blockage	0	0	0	0	0	0	0
Right turn flare (veh)							
Median type				None	TW/TLT	2	2
Median storage (veh)						59	297
Upstream signal (m)						1040	1040
pX, platoon unblocked	0.90	0.90	0.90	0.90	0.90	0.90	0.90
vC, conflicting volume	1352	522	1038	1352	522	1038	1038
vC1, stage 1 conf vol	313	313	313	313	313	313	313
vC2, stage 2 conf vol	1170	522	1040	1170	522	1040	1040
vCu, unblocked vol	6.8	6.9	4.1	6.8	6.9	4.1	4.1
tC, single (s)	5.8	5.8	3.3	5.8	5.8	3.3	3.3
tC, 2 stage (s)	3.5	3.3	2.2	3.5	3.3	2.2	2.2
tF (s)	100	98	100	100	98	100	100
p0 queue free %	295	503	674	295	503	674	674
cM capacity (veh/h)	295	503	674	295	503	674	674
Direction, Lane #	EB.1	NB.1	NB.2	SB.1	SB.2		
Volume Total	12	209	417	689	347		
Volume Left	0	0	0	0	0		
Volume Right	12	0	0	0	3		
cSH	503	674	1700	1700	1700		
Volume to Capacity	0.02	0.00	0.25	0.41	0.20		
Queue Length 95th (m)	0.6	0.0	0.0	0.0	0.0		
Control Delay (s)	12.3	0.0	0.0	0.0	0.0		
Lane LOS	B	B	A	A	A		
Approach Delay (s)	12.3	0.0	0.0	0.0	0.0		
Approach LOS	B	B	A	A	A		
Intersection Summary							
Average Delay	0.1						
Intersection Capacity Utilization	36.4%						
ICU Level of Service	A						
Analysis Period (min)	15						

HCM Signalized Intersection Capacity Analysis  
6: Liverpool Rd & Glenanna Rd

19225 | 1294 Kingston Rd  
EX AM

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	1.00	5.9	5.9	5.9	6.7	6.7	6.7	6.7	6.7	6.7	6.7
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frbp. ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frbp. ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Flt Protected	0.95	1.00	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1725	1824	1543	1725	1744	1708	3456	1694	3516	1694	3516	3516
Flt Permitted	0.55	1.00	1.00	0.57	1.00	0.36	1.00	0.53	1.00	0.53	1.00	1.00
Satd. Flow (perm)	995	1824	1543	1031	1744	655	3456	941	3516	941	3516	3516
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	204	0	28	0	0	5	0	0	5	0
Lane Group Flow (vph)	51	150	73	78	128	0	125	372	0	79	743	0
Conf. Ped. (#/hr)	0%	3%	0%	0%	1%	2%	1%	1%	5%	0%	0%	0%
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	Perm	NA	NA
Permitted Phases	4		4	8		2		2		6		6
Actuated Green, G (s)	13.7	13.7	13.7	13.7	13.7	73.7	73.7	73.7	73.7	73.7	73.7	73.7
Effective Green, g (s)	13.7	13.7	13.7	13.7	13.7	73.7	73.7	73.7	73.7	73.7	73.7	73.7
Actuated g/C Ratio	0.14	0.14	0.14	0.14	0.14	0.74	0.74	0.74	0.74	0.74	0.74	0.74
Clearance Time (s)	5.9	5.9	5.9	5.9	5.9	6.7	6.7	6.7	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	3.0	3.0	3.0
Lane Grp Cap (vph)	136	249	211	141	238	482	2547	693	2591	693	2591	2591
v/s Ratio Prot	c0.08				0.07			0.11				c0.21
v/s Ratio Perm	0.05		0.05	0.08		0.19		0.15		0.08		0.08
Uniform Delay, d1	0.38	0.60	0.35	0.55	0.54	0.26	0.15	0.11	0.29	0.11	0.29	0.29
Progression Factor	1.00	1.00	1.00	1.03	1.01	0.71	0.67	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.7	4.1	1.0	4.6	2.3	1.3	0.1	0.3	0.3	0.3	0.3	0.3
Delay (s)	41.0	44.7	40.1	46.0	43.1	4.3	2.7	4.1	4.7	4.1	4.7	4.7
Level of Service	D	D	D	D	D	A	A	A	A	A	A	A
Approach Delay (s)	41.6		41.6	44.0		4.0	3.1	4.6		4.6		4.6
Approach LOS	D		D	D		A	A	A		A		A

Intersection Summary	Value	Level of Service
HCM 2000 Control Delay	17.4	HCM 2000 Level of Service B
HCM 2000 Volume to Capacity ratio	0.34	
Actuated Cycle Length (s)	100.0	Sum of lost time (s) 12.6
Intersection Capacity Utilization	61.3%	ICU Level of Service B
Analysis Period (min)	15	
Critical Lane Group		

Queues  
6: Liverpool Rd & Glenanna Rd

19225 | 1294 Kingston Rd  
EX AM

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Configurations	←	↑	↘	←	↑	↘	←	↑	↘	↑
Traffic Volume (vph)	47	138	255	72	87	56	115	315	73	619
Future Volume (vph)	47	138	255	72	87	56	115	315	73	619
Lane Group Flow (vph)	51	150	277	78	156	125	377	79	748	NA
Turn Type	Perm	NA	Perm	Perm	NA	Perm	NA	Perm	NA	Perm
Protected Phases	4		4	8		2		2		6
Permitted Phases	4		4	8		2		2		6
Switch Phase	4		4	8		2		2		6
Minimum Initial (s)	8.0	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	24.7
Total Split (s)	36.0	36.0	36.0	36.0	36.0	64.0	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%	64.0%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	4.6	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	2.1
Lost Time Adjust (s)	0.0	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	6.7
LeadLag										
LeadLag Optimize?										
Recall Mode	None	None	None	None	None	None	C-Min	C-Min	C-Min	C-Min
v/c Ratio	0.38	0.60	0.67	0.55	0.58	0.26	0.15	0.11	0.29	0.29
Control Delay	45.5	49.9	16.5	54.9	40.2	5.1	2.9	5.0	5.0	5.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	45.5	49.9	16.5	54.9	40.2	5.1	2.9	5.0	5.0	5.0
Queue Length 50th (m)	9.6	29.2	7.5	15.7	24.8	4.7	6.5	3.9	21.6	21.6
Queue Length 95th (m)	20.2	46.6	31.6	30.8	45.6	10.2	11.6	10.4	36.8	36.8
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)	299	549	629	310	548	481	2550	693	2595	2595
Stallion Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.17	0.27	0.44	0.25	0.28	0.26	0.15	0.11	0.29	0.29

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

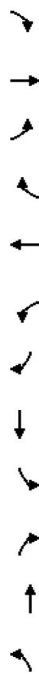




**PM Peak Hour**

HCM Signalized Intersection Capacity Analysis  
 1: Glenanna Rd & Kingston Rd

19225 | 1294 Kingston Rd  
 EX PM



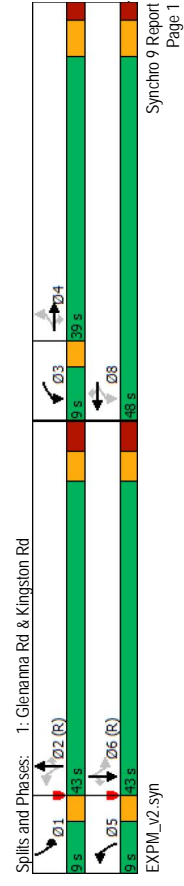
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	24	1158	143	156	581	132	102	177	194	178	199	36
Future Volume (vph)	24	1158	143	156	581	132	102	177	194	178	199	36
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	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	6.4	3.0	6.4	3.0	7.0	7.0	3.0	7.0	3.0	7.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frbp. ped/bikes	1.00	1.00	0.83	1.00	1.00	0.90	1.00	1.00	0.91	1.00	1.00	0.84
Frbp. ped/bikes	0.97	1.00	1.00	1.00	1.00	0.96	1.00	1.00	0.97	1.00	1.00	0.85
Flt	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	0.95	1.00	1.00	0.85
Satd. Flow (prot)	1665	3500	1220	1658	3500	1373	1649	1879	1385	1673	1824	1295
Flt Permitted	0.41	1.00	1.00	0.09	1.00	1.00	0.47	1.00	1.00	0.53	1.00	1.00
Satd. Flow (perm)	722	3500	1220	151	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	0	60	0	0	41	0	0	171	0	0	32
Lane Group Flow (vph)	26	1259	95	170	632	102	111	192	40	193	216	7
Conf. Peds. (#/hr)	30	55	55	30	91	30	91	50	50	50	50	91
Heavy Vehicles (%)	0%	2%	5%	4%	2%	1%	0%	0%	0%	1%	0%	3%
Turn Type	Perm	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm
Permitted Phases	4	4	4	8	8	8	5	2	2	2	6	6
Actuated Green, G (s)	44.5	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	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	0.44	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	6.4	3.0	6.4	3.0	7.0	7.0	3.0	7.0	3.0	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	3.0
Lane Grp Cap (vph)	321	1557	542	283	2110	827	239	325	239	262	315	224
v/s Ratio Prot	c0.36	c0.08	c0.08	0.18	0.03	0.10	0.03	0.10	0.03	0.04	0.12	0.12
v/s Ratio Perm	0.04	0.08	0.08	0.28	0.07	0.08	0.03	0.08	0.03	0.13	0.03	0.01
Uniform Delay, d1	0.08	0.81	0.17	0.60	0.30	0.12	0.46	0.59	0.17	0.74	0.69	0.03
Progression Factor	0.46	0.49	0.16	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.04	1.05
Incremental Delay, d2	0.1	1.6	0.1	3.6	0.1	0.1	1.4	7.7	1.5	10.3	11.5	0.2
Delay (s)	7.4	13.4	2.7	22.1	9.7	8.6	33.1	45.8	36.7	46.4	52.3	34.6
Level of Service	A	B	A	C	A	A	C	D	D	D	D	C
Approach Delay (s)	12.1			11.8			39.3				48.2	
Approach LOS	B			B			D				D	
Intersection Summary												
HCM 2000 Control Delay	21.0 HCM 2000 Level of Service C											
HCM 2000 Volume to Capacity ratio	0.75											
Actuated Cycle Length (s)	100.0 Sum of lost time (s) 19.4											
Intersection Capacity Utilization	83.3% ICU Level of Service E											
Analysis Period (min)	15											
Critical Lane Group	c Critical Lane Group											

Queues  
 1: Glenanna Rd & Kingston Rd

19225 | 1294 Kingston Rd  
 EX PM

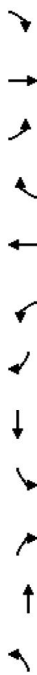


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	24	1158	143	156	581	132	102	177	194	178	199	36
Future Volume (vph)	24	1158	143	156	581	132	102	177	194	178	199	36
Lane Group Flow (vph)	26	1259	155	170	632	143	111	192	211	193	216	39
Turn Type	Perm	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm
Permitted Phases	4	4	4	8	8	8	5	2	2	2	6	6
Detector Phase	4	4	4	3	3	3	8	2	2	2	1	6
Switch Phase	4	4	4	3	3	3	8	2	2	2	1	6
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)	24.4	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	39.0	9.0	48.0	48.0	9.0	43.0	43.0	9.0	43.0	43.0
Total Spill (%)	39.0%	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	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	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	0.0
Total Lost Time (s)	6.4	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	Lag	Lead	Lead	Lead	Lag	Lag	Lag	Lead	Lag	Lag
Lead/Lag Optimize?	None	None	None	None	None	None	None	None	None	None	None	None
Recall Mode	0.08	0.81	0.26	0.59	0.30	0.16	0.42	0.59	0.51	0.65	0.69	0.13
v/s Ratio	9.1	16.5	1.7	24.5	10.7	4.1	30.0	44.9	9.8	40.2	51.5	1.5
Control 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
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	9.1	16.5	1.7	24.5	10.7	4.1	30.0	44.9	9.8	40.2	51.5	1.5
Queue Length 50th (m)	0.9	68.8	0.0	15.3	30.4	3.1	16.8	36.5	0.7	34.6	44.0	0.1
Queue Length 95th (m)	m2.4m#16.28 m4.8 39.4 47.9 13.0 27.9 55.0 19.2 44.4 62.9 0.3 393.2											
Internal Link Dist (m)	523.9											
Turn Bay Length (m)	42.6	60.4	33.0	23.2	25.4	25.4	25.0	27.3	25.0	27.3	25.0	16.5
Base Capacity (vph)	321	1557	603	288	2110	868	265	676	631	296	656	532
Stallion Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillover 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	0.08	0.81	0.26	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:NBL and 6:SBTL, Start of Green												
Natural Cycle: 80												
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.												



HCM Signalized Intersection Capacity Analysis  
 2: Liverpool Rd & Kingston Rd

19225 | 1294 Kingston Rd  
 EX PM



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	217	1022	330	226	502	79	302	875	278	114	345	84
Traffic Volume (vph)	217	1022	330	226	502	79	302	875	278	114	345	84
Future Volume (vph)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Ideal Flow (vphpl)	3.2	3.5	3.2	3.2	3.5	3.2	3.5	3.2	3.5	3.2	3.5	3.2
Lane Width	3.0	7.4	7.4	3.0	7.4	7.4	3.0	6.9	6.9	3.0	6.9	6.9
Total Lost Time (s)	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Lane Util. Factor	0.99	1.00	1.00	1.00	1.00	0.99	1.00	1.00	1.00	1.00	0.99	1.00
Frbp. ped/bikes	0.95	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.95	1.00
Flt	1.00	1.00	1.00	0.95	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00
Flt Protected	1695	3500	1416	1708	3500	1431	1667	3535	1363	1675	3570	1397
Satd. Flow (prot)	0.42	1.00	1.00	0.11	1.00	1.00	0.48	1.00	0.13	1.00	1.00	1.00
Flt Permitted	746	3500	1416	204	3500	1431	846	3535	1363	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
Conf. Peds. (#/hr)	26	32	32	32	32	26	34	48	48	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
Permitted Phases	4	4	4	8	8	8	5	2	2	6	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	419	171	1063	416
v/s Ratio Prot	0.05	0.32	0.10	0.16	0.16	0.06	c0.06	c0.27	0.12	0.22	0.11	0.11
v/s Ratio Perm	0.21	0.25	0.25	c0.35	0.06	0.27	0.12	0.22	0.12	0.22	0.11	0.11
Uniform Delay, d1	0.63	0.97	0.78	1.00	0.44	0.17	0.87	0.38	0.73	0.35	0.07	0.07
Progression Factor	21.4	33.3	30.4	26.3	24.8	22.3	27.3	32.8	27.1	24.4	27.5	25.1
Incremental Delay, d2	3.5	21.0	12.2	55.1	1.1	0.7	19.1	8.0	0.6	14.1	0.2	0.1
Delay (s)	24.9	54.3	42.7	98.9	38.0	34.4	46.4	40.7	27.7	41.4	27.3	35.9
Level of Service	C	D	D	F	D	C	D	D	D	C	D	D
Approach Delay (s)	47.8	54.7	54.7	54.7	54.7	54.7	39.4	39.4	39.4	31.5	31.5	31.5
Approach LOS	D	D	D	D	D	D	D	D	D	C	C	C

Intersection Summary	Value
HCM 2000 Control Delay	44.3
HCM 2000 Volume to Capacity ratio	0.98
Actuated Cycle Length (s)	100.0
Intersection Capacity Utilization	89.9%
Analysis Period (min)	15
Critical Lane Group	D

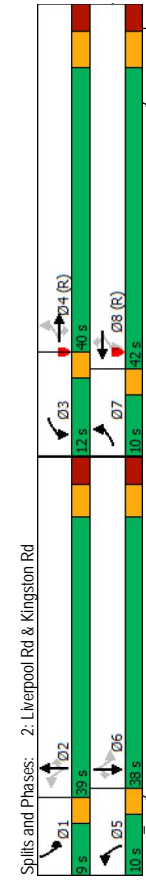
Queues  
 2: Liverpool Rd & Kingston Rd

19225 | 1294 Kingston Rd  
 EX PM



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	217	1022	330	226	502	79	302	875	278	114	345	84
Traffic Volume (vph)	217	1022	330	226	502	79	302	875	278	114	345	84
Future Volume (vph)	236	1111	359	246	546	86	328	951	302	124	375	91
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
Permitted Phases	7	4	4	4	4	4	8	2	2	6	6	6
Detector Phase	7	4	4	4	4	4	8	2	2	6	6	6
Switch Phase	7	4	4	4	4	4	8	2	2	6	6	6
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 Spill (%)	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?	None	C-Min	C-Min	None	C-Min	C-Min	None	C-Min	C-Min	None	C-Min	C-Min
Recall Mode	0.59	0.97	0.78	0.96	0.44	0.17	0.81	0.87	0.54	0.69	0.35	0.18
v/s Ratio	23.3	55.2	43.9	81.6	38.6	35.8	39.5	42.9	13.0	40.8	27.9	5.4
Control 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
Queue Delay	23.3	55.2	43.9	81.6	38.6	35.8	39.5	42.9	13.0	40.8	27.9	5.4
Total Delay	27.4	116.8	65.6	-46.2	57.3	15.6	44.4	94.1	14.2	13.5	28.9	0.0
Queue Length 50th (m)	43.9	#163.0	#111.1	#88.4	74.7	29.4	#78.5	120.3	40.3	#33.5	42.0	8.6
Queue Length 95th (m)	667.5						242.2					
Internal Link Dist (m)	33.5	49.1	103.2	61.6	46.2	51.8	47.9	39.9	51.8	47.9	39.9	39.9
Turn Bay Length (m)	402	1141	461	255	1237	506	406	1134	577	180	1110	512
Base Capacity (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Stallion Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillover 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	0.87	0.52	0.69	0.34	0.18

Intersection Summary	Value
Cycle Length: 100	100
Actuated Cycle Length: 100	100
Offset: 13 (13%), Referenced to phase 4:EBTL and 8:WBTL, Start of Green	13
Natural Cycle: 90	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.	



HCM Unsignalized Intersection Capacity Analysis  
4: Liverpool Rd & North Dwy/Main Plaza Dwy

19225 | 1294 Kingston Rd  
EX PM

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	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
Grade	0%	0%	0%	0%	0%	0%	0%	0%	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	6			15			1				1	
Lane Width (m)	3.5			3.4			3.4				3.4	
Walking Speed (m/s)	1.2			1.2			1.2				1.2	
Percent Blockage	0			1			0				0	
Right turn flare (veh)												
Median type							TW/TLT				TW/TLT	
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	0.75	0.75	0.75	0.75	0.75	0.75
vC, conflicting volume	1277	1930	225	1600	1807	630	442				1243	
vC1, stage 1 conf vol	598	598		1199	1199							
vC2, stage 2 conf vol	680	1333		401	608							
vCu, unblocked vol	693	1568	225	1125	1403	0	442				647	
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	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	52	99	87	96				88	
cM capacity (veh/h)	356	192	780	279	268	802	1123				700	
Direction, Lane #	EB.1	WB.1	NB.2	NB.1	NB.2	NB.3	SB.2	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	496	279	761	1123	1700	1700	700	1700	1700			
Volume to Capacity	0.09	0.48	0.14	0.04	0.38	0.35	0.12	0.16	0.09			
Queue Length 95th (m)	2.5	19.6	4.0	1.0	0.0	0.0	3.2	0.0	0.0			
Control Delay (s)	13.0	29.3	10.5	8.3	0.0	0.0	10.8	0.0	0.0			
Lane LOS	B	D	B	A	B	B	B	B	B			
Approach Delay (s)	13.0	20.8		0.3		1.7						
Approach LOS	B	C										
<b>Intersection Summary</b>												
Average Delay	3.3											
Intersection Capacity Utilization	60.3%											
ICU Level of Service	B											
Analysis Period (min)	15											

HCM Unsignalized Intersection Capacity Analysis  
3: Liverpool Rd & South Dwy

19225 | 1294 Kingston Rd  
EX PM

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	Free	Free	Free
Grade	0%	0%	0%	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	4					
Lane Width (m)	3.2					
Walking Speed (m/s)	1.2					
Percent Blockage	0					
Right turn flare (veh)						
Median type				None	TW/TLT	
Median storage (veh)				59	297	
Upstream signal (m)						
pX, platoon unblocked	0.74					
vC, conflicting volume	1212	292	579			
vC1, stage 1 conf vol	575					
vC2, stage 2 conf vol	636					
vCu, unblocked vol	597	292	579			
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)	492	709	1002			
Direction, Lane #	EB.1	NB.1	NB.2	SB.1	SB.2	
Volume Total	23	424	849	378	197	
Volume Left	0	0	0	0	0	
Volume Right	23	0	0	0	8	
cSH	709	1002	1700	1700	1700	
Volume to Capacity	0.03	0.00	0.50	0.22	0.12	
Queue Length 95th (m)	0.8	0.0	0.0	0.0	0.0	
Control Delay (s)	10.2	0.0	0.0	0.0	0.0	
Lane LOS	B	B	B	B	B	
Approach Delay (s)	10.2	0.0		0.0		
Approach LOS	B					
<b>Intersection Summary</b>						
Average Delay	0.1					
Intersection Capacity Utilization	42.4%					
ICU Level of Service	A					
Analysis Period (min)	15					

HCM Signalized Intersection Capacity Analysis  
6: Liverpool Rd & Glenanna Rd

19225 | 1294 Kingston Rd  
EX PM



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR
Lane Configurations	←	←	←	←	←	←	←	←	←	←	←
Traffic Volume (vph)	45	72	115	55	145	44	351	575	73	67	307
Future Volume (vph)	45	72	115	55	145	44	351	575	73	67	307
Ideal Flow (vphpl)	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
Total Lost time (s)	5.9	5.9	5.9	5.9	5.9	5.9	6.7	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	0.99	1.00	0.95	1.00
Frbp, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.98	1.00	0.99	1.00
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1725	1824	1543	1725	1791	1708	3440	1705	3522	1705	3522
Flt Permitted	0.43	1.00	1.00	0.71	1.00	0.53	1.00	0.38	1.00	0.38	1.00
Satd. Flow (perm)	788	1824	1543	1282	1791	958	3440	682	3522	682	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
Adj. Flow (vph)	49	78	125	60	158	48	382	625	79	73	334
RTOR Reduction (vph)	0	0	105	0	13	0	0	7	0	0	5
Lane Group Flow (vph)	49	78	20	60	193	0	382	697	0	73	362
Confl. Peds. (#/hr)	0%	3%	0%	0%	1%	2%	1%	1%	5%	0%	0%
Heavy Vehicles (%)	0%	3%	0%	0%	1%	2%	1%	1%	5%	0%	0%
Turn Type	Perm	NA	Perm	Perm	NA	Perm	NA	NA	Perm	NA	NA
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	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	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	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	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	3.0	3.0
Lane Grip Cap (vph)	126	291	246	205	286	684	2456	486	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		0.11
Progression Factor	0.39	0.27	0.08	0.29	0.67	0.56	0.28	0.15	0.14	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	4.6	4.6
Incremental Delay, d2	2.0	0.5	0.1	0.8	6.0	2.5	0.2	0.7	0.1	0.7	0.1
Level of Service	D	D	D	C	D	A	A	A	A	A	A
Approach Delay (s)	D	D	D	C	D	A	A	A	A	A	A
Approach LOS	D	D	D	C	D	A	A	A	A	A	A

Metric	Value	Level/Note
Intersections 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	
Critical Lane Group		

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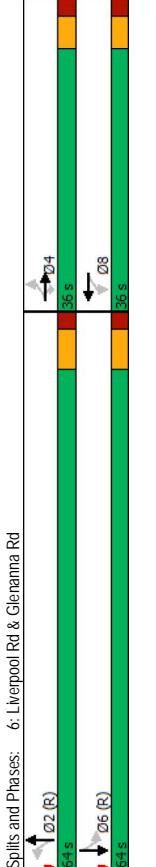
Queues  
6: Liverpool Rd & Glenanna Rd

19225 | 1294 Kingston Rd  
EX PM



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Configurations	←	←	←	←	←	←	←	←	←	←
Traffic Volume (vph)	45	72	115	55	145	44	351	575	67	307
Future Volume (vph)	45	72	115	55	145	44	351	575	67	307
Lane Group Flow (vph)	49	78	125	60	206	382	704	73	367	367
Turn Type	Perm	NA	Perm	Perm	NA	Perm	NA	Perm	NA	Perm
Protected Phases	4		4	8		2			6	
Permitted Phases	4		4	8		2			6	
Switch Phase	4		4	8		2			6	
Minimum Initial (s)	8.0	8.0	8.0	8.0	8.0	5.0	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	24.7
Total Split (s)	36.0	36.0	36.0	36.0	36.0	64.0	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%	64.0%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	4.6	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	2.1
Lost Time Adjust (s)	0.0	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	6.7
LeadLag										
LeadLag Optimize?										
Recall Mode	None	None	None	None	None	None	None	None	None	None
v/c Ratio	0.39	0.27	0.36	0.29	0.69	0.56	0.29	0.15	0.15	0.15
Control Delay	45.0	37.4	9.1	27.9	39.0	8.2	3.3	6.5	5.0	5.0
Queue Delay	0.0	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	8.2	3.3	6.5	5.0	5.0
Queue Length 50h (m)	9.1	14.1	0.0	5.5	16.4	19.6	17.0	4.1	10.2	10.2
Queue Length 95h (m)	19.6	28.9	14.7	21.9	62.7	m85.2	m8.8	11.4	18.8	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			46.2	
Base Capacity (vph)	237	549	551	385	550	683	2461	487	2518	
Stallion Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	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	0.15

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



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# APPENDIX C

**Background Development Site Traffic and  
Corridor Traffic Growth**

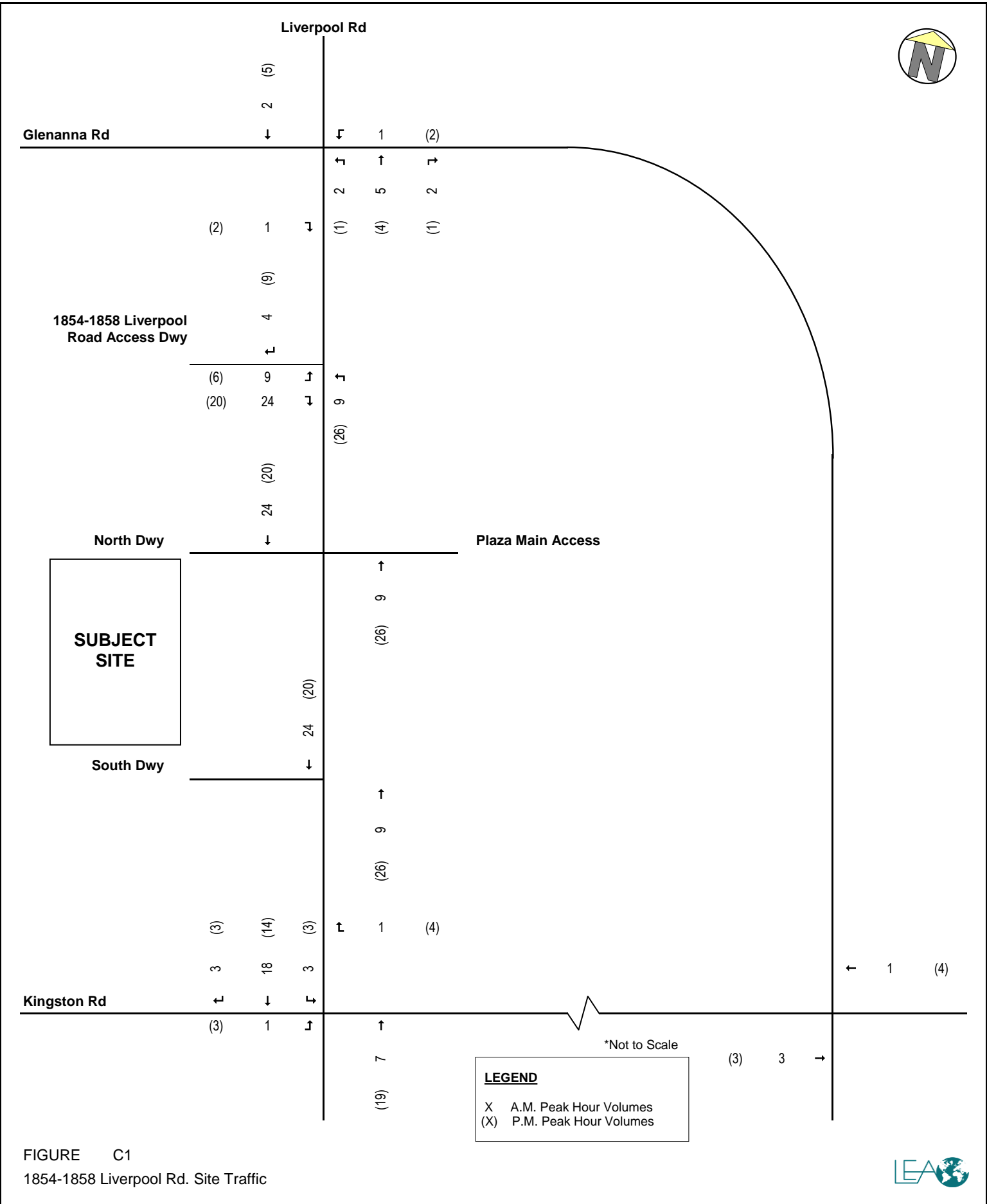


FIGURE C1  
1854-1858 Liverpool Rd. Site Traffic



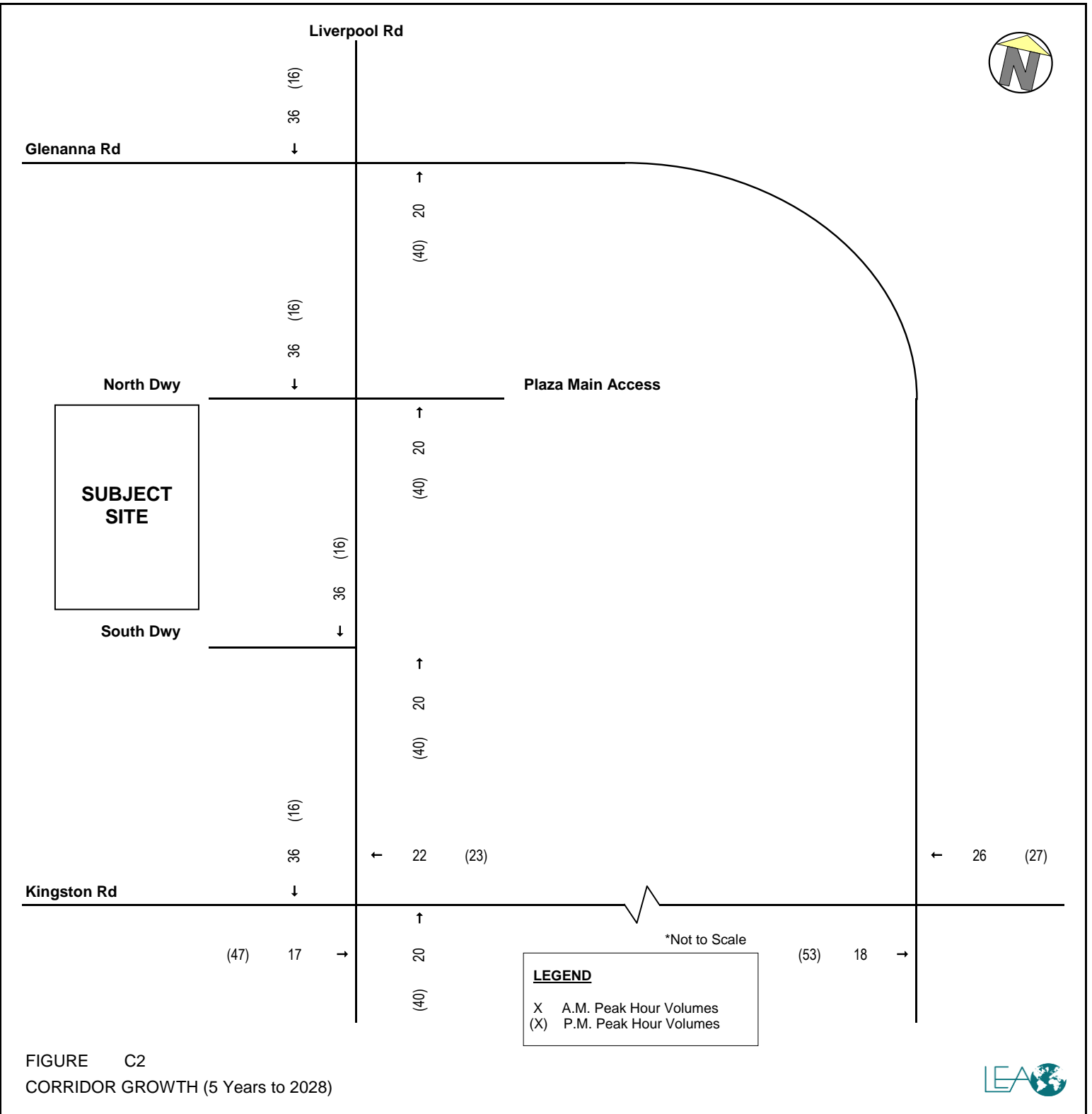


FIGURE C2  
CORRIDOR GROWTH (5 Years to 2028)





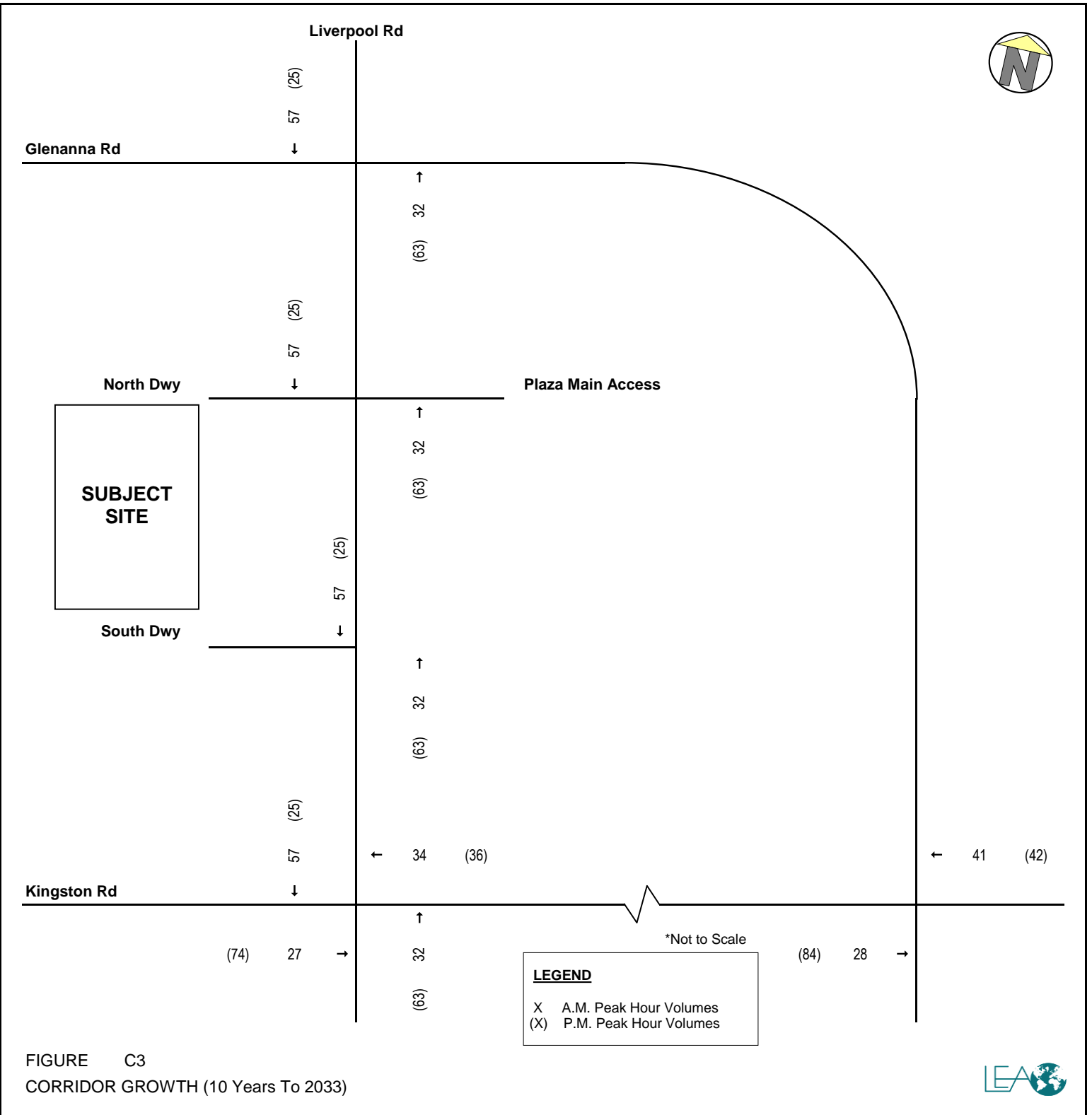


FIGURE C3  
CORRIDOR GROWTH (10 Years To 2033)





# APPENDIX D

## Future Background Capacity Analysis



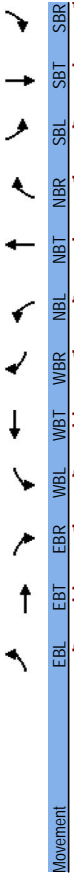
**Year 2028**



**AM Peak Hour**

HCM Signalized Intersection Capacity Analysis  
 1: Glenanna Rd & Kingston Rd

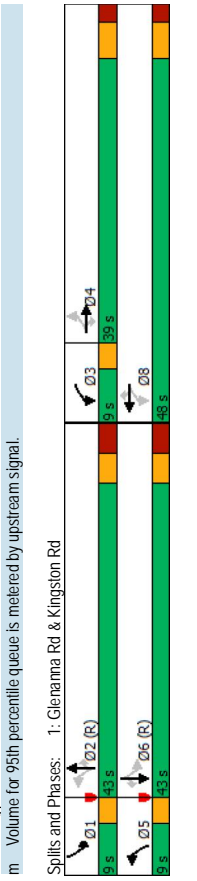
Queues  
 1: Glenanna Rd & Kingston Rd



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR
Lane Configurations	10	409	93	96	589	122	52	73	64	190	102
Traffic Volume (vph)	10	409	93	96	589	122	52	73	64	190	102
Future Volume (vph)	10	409	93	96	589	122	52	73	64	190	102
Ideal Flow (vphpl)	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
Total Lost Time (s)	6.4	6.4	6.4	3.0	6.4	3.0	7.0	3.0	7.0	3.0	7.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frbp, ped/bikes	1.00	1.00	0.91	1.00	1.00	0.96	1.00	1.00	0.93	1.00	0.93
Frbp, ped/bikes	0.99	1.00	1.00	0.99	1.00	1.00	0.97	1.00	1.00	0.97	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	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
Satd. Flow (prot)	1568	3305	1303	1645	3400	1464	1667	1860	1397	1641	1773
Flt Permitted	0.41	1.00	1.00	0.31	1.00	1.00	0.69	1.00	1.00	0.66	1.00
Satd. Flow (perm)	675	3305	1303	537	3400	1464	1203	1860	1397	1134	1773
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
Adj. Flow (vph)	11	445	101	104	640	133	57	79	70	207	111
RTOR Reduction (vph)	0	0	81	0	0	0	0	0	42	0	15
Lane Group Flow (vph)	11	445	20	104	640	133	57	79	28	207	111
Conf. Peds. (#/hr)	8	25	25	25	8	35	34	34	34	34	35
Heavy Vehicles (%)	9%	8%	8%	4%	5%	1%	0%	1%	3%	2%	6%
Turn Type	Perm	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm	pm-pt	NA
Permitted Phases	4	4	4	8	8	8	5	2	2	6	6
Actuated Green, G (s)	20.0	20.0	20.0	31.6	31.6	31.6	46.4	40.4	40.4	55.0	46.0
Effective Green, g (s)	20.0	20.0	20.0	31.6	31.6	31.6	46.4	40.4	40.4	55.0	46.0
Actuated g/C Ratio	0.20	0.20	0.20	0.32	0.32	0.32	0.46	0.40	0.40	0.55	0.46
Clearance Time (s)	6.4	6.4	6.4	3.0	6.4	3.0	7.0	3.0	7.0	3.0	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)	135	661	260	264	1074	462	586	751	564	682	815
v/s Ratio Prot	c0.13	0.03	0.03	c0.19	0.09	0.04	0.01	0.04	0.02	c0.04	0.06
v/s Ratio Perm	0.02	0.02	0.09	0.09	0.09	0.09	0.04	0.02	0.02	c0.13	0.01
Uniform Delay, d1	0.08	0.67	0.08	0.39	0.60	0.29	0.10	0.11	0.05	0.30	0.14
Progression Factor	0.62	0.81	0.19	1.00	1.00	1.00	1.00	1.00	1.00	0.74	0.83
Incremental Delay, d2	0.2	2.6	0.1	1.0	0.9	0.3	0.1	0.3	0.2	0.3	0.3
Delay (s)	20.4	32.7	6.5	26.4	29.7	26.1	14.9	18.8	18.3	8.9	13.3
Level of Service	C	C	A	C	C	C	B	B	B	A	B
Approach Delay (s)	C	27.7	C	C	28.8	C	17.6	B	B	10.8	B
Approach LOS	C	C	A	C	C	C	B	B	B	A	B

Intersection Summary	C		B		
HCM 2000 Control Delay	24.2	HCM 2000 Level of Service			C
HCM 2000 Volume to Capacity ratio	0.44				
Actuated Cycle Length (s)	100.0	Sum of lost time (s)			19.4
Intersection Capacity Utilization	54.1%	ICU Level of Service			A
Analysis Period (min)	15				
c Critical Lane Group					

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR
Lane Configurations	10	409	93	96	589	122	52	73	64	190	102
Traffic Volume (vph)	10	409	93	96	589	122	52	73	64	190	102
Future Volume (vph)	10	409	93	96	589	122	52	73	64	190	102
Lane Group Flow (vph)	11	445	101	104	640	133	57	79	70	207	111
Turn Type	Perm	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm	pm-pt	NA
Permitted Phases	4	4	4	8	8	8	5	2	2	6	6
Detector Phase	4	4	4	8	8	8	5	2	2	6	6
Switch Phase	4	4	4	8	8	8	5	2	2	6	6
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	24.4	8.0	24.4	24.4	8.0	25.4	25.4	8.0	25.4
Total Split (s)	39.0	39.0	39.0	9.0	48.0	48.0	9.0	43.0	43.0	9.0	43.0
Total Split (%)	39.0%	39.0%	39.0%	9.0%	48.0%	48.0%	9.0%	43.0%	43.0%	9.0%	43.0%
Yellow Time (s)	4.2	4.2	4.2	3.0	4.2	4.2	3.0	3.3	3.3	3.0	3.3
All-Red Time (s)	2.2	2.2	2.2	0.0	2.2	2.2	0.0	3.7	3.7	0.0	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	6.4	3.0	6.4	3.0	7.0	3.0	7.0	3.0	7.0
Lead/Lag	Lag	Lag	Lag	Lead	Lead	Lead	Lag	Lag	Lag	Lead	Lag
Lead/Lag Optimize?	None	None	None	None	None	None	None	None	None	None	None
Recall Mode	0.08	0.68	0.29	0.35	0.61	0.29	0.09	0.10	0.11	0.28	0.13
v/c Ratio	20.6	35.2	3.1	24.2	31.0	25.9	11.7	23.3	2.8	9.2	16.0
Control Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Queue Delay	20.6	35.2	3.1	24.2	31.0	25.9	11.7	23.3	2.8	9.2	16.0
Total Delay	1.0	23.2	0.0	14.5	57.1	20.1	4.6	9.8	0.0	11.0	17.4
Queue Length 50th (m)	m2.3	24.2	0.1	23.2	65.6	31.1	12.5	24.6	5.4	20.5	32.7
Queue Length 95th (m)	393.2			523.9			174.6			416.6	
Internal Link Dist (m)	42.6	60.3	33.0	23.2	25.4	25.4	25.0	27.3	25.0	27.3	16.5
Turn Bay Length (m)	220	1077	498	294	1414	609	654	802	661	729	844
Base Capacity (vph)	0	0	0	0	0	0	0	0	0	0	0
Stallion Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillover 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	0.41	0.20	0.35	0.45	0.22	0.09	0.10	0.11	0.28	0.13
Intersection Summary											
Cycle Length: 100											
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBLT, Start of Green											
Natural Cycle: 70											
Control Type: Actuated-Coordinated											
m Volume for 95th percentile queue is metered by upstream signal.											



HCM Signalized Intersection Capacity Analysis  
 2: Liverpool Rd & Kingston Rd

19225 | 1294 Kingston Rd  
 2028 FB AM



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR
Lane Configurations	93	394	254	178	493	48	215	464	122	82	837
Traffic Volume (vph)	93	394	254	178	493	48	215	464	122	82	837
Future Volume (vph)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Ideal Flow (vphpl)	3.2	3.5	3.2	3.2	3.5	3.2	3.5	3.2	3.5	3.2	3.5
Lane Width	6.9	7.0	7.0	3.0	7.0	3.0	6.9	6.9	3.0	4.5	
Total Lost Time (s)	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.91
Lane Util. Factor	1.00	1.00	0.96	1.00	0.96	1.00	1.00	0.95	1.00	0.99	1.00
Frbp. ped/bikes	1.00	1.00	0.85	1.00	0.85	1.00	1.00	0.85	1.00	0.98	1.00
Frt	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Flt Protected	1654	3368	1462	1638	3400	1487	1690	3500	1329	1676	4911
Satd. Flow (prot)	0.34	1.00	1.00	0.40	1.00	0.40	1.00	0.76	1.00	0.47	1.00
Flt Permitted	584	3368	1462	691	3400	1487	283	3500	1329	823	4911
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
Adj. Flow (vph)	101	428	276	193	536	52	234	504	133	89	910
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	15
Lane Group Flow (vph)	101	428	276	193	536	52	234	504	52	89	1006
Conf. Peds. (#/hr)	15	19	9	9	15	22	25	25	25	25	22
Heavy Vehicles (%)	4%	6%	1%	5%	5%	0%	2%	2%	10%	2%	4%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA
Permitted Phases	7	4	4	8	8	8	5	2	2	1	6
Actuated Green, G (s)	29.1	23.4	23.4	35.0	24.4	24.4	49.1	39.4	39.4	43.3	36.6
Effective Green, g (s)	29.1	23.4	23.4	35.0	24.4	24.4	49.1	39.4	39.4	43.3	36.6
Actuated g/C Ratio	0.29	0.23	0.23	0.35	0.24	0.24	0.49	0.39	0.39	0.43	0.37
Clearance Time (s)	6.9	7.0	7.0	3.0	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)	230	788	342	342	829	362	306	1379	523	413	1797
v/s Ratio Prot	0.02	0.13	0.06	0.16	0.16	0.09	0.14	0.09	0.14	0.01	0.20
v/s Ratio Perm	0.10	0.19	0.14	0.14	0.03	0.28	0.04	0.08	0.04	0.08	0.08
Uniform Delay, d1	0.44	0.54	0.81	0.56	0.65	0.14	0.76	0.37	0.10	0.22	0.56
Progression Factor	1.00	1.00	1.00	2.36	1.84	1.93	1.00	1.00	1.00	0.94	0.92
Incremental Delay, d2	1.3	2.7	18.2	2.0	3.7	0.8	10.8	0.7	0.4	0.3	1.2
Delay (s)	28.3	36.3	54.4	58.9	66.2	57.9	28.1	22.2	19.5	16.2	24.4
Level of Service	C	D	D	E	E	E	C	C	B	B	C
Approach Delay (s)	41.5			63.8			23.4				23.7
Approach LOS	D			E			C				C

Intersection Summary	Value
HCM 2000 Control Delay	36.4
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	71.7%
ICU Level of Service	C
Analysis Period (min)	15
Critical Lane Group	

19225 | 1294 Kingston Rd  
 2028 FB AM



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR
Lane Configurations	93	394	254	178	493	48	215	464	122	82	837
Traffic Volume (vph)	93	394	254	178	493	48	215	464	122	82	837
Future Volume (vph)	101	428	276	193	536	52	234	504	133	89	1021
Lane Group Flow (vph)	101	428	276	193	536	52	234	504	133	89	1021
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA
Permitted Phases	7	4	4	8	8	8	5	2	2	1	6
Actuated Green, G (s)	11.9	25.0	25.0	9.5	25.0	25.0	9.5	24.9	24.9	8.0	22.5
Effective Green, g (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?	None	C-Min	None	None	C-Min	None	None	C-Min	None	None	Max
Recall Mode	0.40	0.53	0.79	0.52	0.60	0.13	0.75	0.37	0.22	0.20	0.57
v/s Ratio	24.3	35.0	51.8	49.0	62.5	54.9	34.3	24.5	4.1	14.1	25.0
Control Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Queue Delay	24.3	35.0	51.8	49.0	62.5	54.9	34.3	24.5	4.1	14.1	25.0
Total Delay	13.2	39.6	52.4	39.1	61.1	0.0	25.9	39.8	0.0	7.8	53.5
Queue Length 50th (m)	22.9	52.1	78.5	59.9	78.5	23.5	73.6	59.1	10.3	18.0	75.1
Queue Length 95th (m)	66.75			393.2			242.2				35.5
Internal Link Dist (m)	33.5	49.1	103.2	61.6	46.2		51.8	47.9			
Turn Bay Length (m)	257	976	423	373	987	431	311	1380	616	460	1788
Base Capacity (vph)	0	0	0	0	0	0	0	0	0	0	0
Stallion 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	0.54	0.12	0.75	0.37	0.22	0.19	0.57

Intersection Summary	Value
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.	

HCM Unsignalized Intersection Capacity Analysis  
 4: Liverpool Rd & North Dwy/Main Plaza Dwy

HCM Unsignalized Intersection Capacity Analysis  
 3: Liverpool Rd & South Dwy

19225 | 1294 Kingston Rd  
 2028 FB AM

19225 | 1294 Kingston Rd  
 2028 FB AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (veh/h)	17	0	38	106	1	59	27	415	163	94	869	23
Future Volume (Veh/h)	17	0	38	106	1	59	27	415	163	94	869	23
Sign Control	Stop	Stop	Stop	Stop	0%	0%	Free	Free	Free	Free	Free	0%
Grade	0%	0%	0%	0%	0%	0%	0%	0%	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)	18	0	41	115	1	64	29	451	177	102	945	25
Pedestrians	4			14			1		1		1	
Lane Width (m)	3.5			3.4			3.4		3.4		3.4	
Walking Speed (m/s)	1.2			1.2			1.2		1.2		1.2	
Percent Blockage	0			1			0		0		0	
Right turn flare (veh)												
Median type							TW/TLT		TW/TLT		TW/TLT	
Median storage (veh)							2		2		2	
Upstream signal (m)							140		140		216	
pX, platoon unblocked	0.92	0.92	0.97	0.92	0.92	0.91	0.97		0.91		0.91	
vC, conflicting volume	1514	1866	490	1330	1790	329	974		642		642	
vC1, stage 1 conf vol	1166	1166		612	612							
vC2, stage 2 conf vol	349	700		718	1178							
vCu, unblocked vol	1233	1612	404	1033	1530	59	905		403		403	
tC, single (s)	7.5	6.5	7.2	7.5	6.5	6.9	4.1		4.1		4.1	
tC, 2 stage (s)	6.5	5.5	6.5	6.5	5.5							
tF (s)	3.5	4.0	3.4	3.5	4.0	3.3	2.2		2.2		2.2	
p0 queue free %	91	100	92	60	100	93	96		90		90	
cM capacity (veh/h)	192	218	542	290	207	899	733		1035		1035	
Direction, Lane #	EB.1	WB.1	WB.2	NB.1	NB.2	NB.3	SB.1	SB.2	SB.3			
Volume Total	59	115	65	29	301	327	102	630	340			
Volume Left	18	115	0	29	0	0	102	0	0			
Volume Right	41	0	64	0	0	177	0	0	25			
cSH	348	290	855	733	1700	1700	1085	1700	1700			
Volume to Capacity	0.17	0.40	0.08	0.04	0.18	0.19	0.10	0.37	0.20			
Queue Length 95th (m)	4.8	14.5	2.0	1.0	0.0	0.0	2.6	0.0	0.0			
Control Delay (s)	17.4	25.3	9.6	10.1	0.0	0.0	8.9	0.0	0.0			
Lane LOS	C	D	A	B	A	A	A	A	A			
Approach Delay (s)	17.4	19.6	0.4		0.8							
Approach LOS	C	C	C		C							
Intersection Summary												
Average Delay	2.9											
Intersection Capacity Utilization	50.7%											
ICU Level of Service	A											
Analysis Period (min)	15											

Movement	EBL	EBR	NBL	NBT	SBL	SBR
Lane Configurations		↔	↔	↔	↔	↔
Traffic Volume (veh/h)	0	11	0	605	1010	3
Future Volume (Veh/h)	0	11	0	605	1010	3
Sign Control	Stop	Free	Free	Free	Free	0%
Grade	0%	0%	0%	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	658	1098	3
Pedestrians	4					
Lane Width (m)	3.2					
Walking Speed (m/s)	1.2					
Percent Blockage	0					
Right turn flare (veh)						
Median type				None	TW/TLT	
Median storage (veh)					2	
Upstream signal (m)					59	297
pX, platoon unblocked	0.90	1.00	1.00			
vC, conflicting volume	1432	554	1105			
vC1, stage 1 conf vol	1104					
vC2, stage 2 conf vol	329					
vCu, unblocked vol	1258	554	1104			
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	97	100			
cM capacity (veh/h)	272	457	638			
Direction, Lane #	EB.1	NB.1	NB.2	SB.1	SB.2	
Volume Total	12	219	439	732	369	
Volume Left	0	0	0	0	0	
Volume Right	12	0	0	0	3	
cSH	457	638	1700	1700	1700	
Volume to Capacity	0.03	0.00	0.26	0.43	0.22	
Queue Length 95th (m)	0.6	0.0	0.0	0.0	0.0	
Control Delay (s)	13.1	0.0	0.0	0.0	0.0	
Lane LOS	B	B	B	A	A	
Approach Delay (s)	13.1	0.0		0.0		
Approach LOS	B	B		C		
Intersection Summary						
Average Delay	0.1					
Intersection Capacity Utilization	38.0%					
ICU Level of Service	A					
Analysis Period (min)	15					

HCM Signalized Intersection Capacity Analysis  
 6: Liverpool Rd & Glenanna Rd

Queues  
 6: Liverpool Rd & Glenanna Rd

19225 | 1294 Kingston Rd  
 2028 FB AM

19225 | 1294 Kingston Rd  
 2028 FB AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	4	4	4	8	8	8	2	2	2	2	6	6
Traffic Volume (vph)	47	138	256	73	87	56	117	340	34	73	657	69
Future Volume (vph)	47	138	256	73	87	56	117	340	34	73	657	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	5.9	6.7	6.7	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	0.95	1.00	1.00	0.95	1.00
Frbp, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	0.99	1.00	0.99	1.00
Frbp, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	0.99	1.00	0.99	1.00
Flt Protected	0.95	1.00	1.00	0.95	1.00	0.95	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1658	1773	1513	1675	1717	1658	3344	1637	3410	1637	3410	1637
Flt Permitted	0.55	1.00	1.00	0.57	1.00	0.35	1.00	0.51	1.00	0.51	1.00	0.51
Satd. Flow (perm)	965	1773	1513	1008	1717	605	3344	884	3410	884	3410	884
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	278	79	95	61	127	370	37	79	714	75
RTOR Reduction (vph)	0	0	185	0	27	0	0	5	0	0	5	0
Lane Group Flow (vph)	51	150	93	79	129	0	127	402	0	79	784	0
Conf. Peds. (#/hr)	4%	6%	2%	3%	3%	3%	3%	4%	14%	4%	3%	0%
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	Perm	NA	NA
Permitted Phases	4	4	4	8	8	8	2	2	2	6	6	6
Actuated Green, G (s)	14.1	14.1	14.1	14.1	14.1	73.3	73.3	73.3	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	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	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	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	3.0	3.0	3.0
Lane Grp Cap (vph)	136	249	213	142	242	443	2451	647	2499	647	2499	647
v/s Ratio Prot	c0.08	0.07	0.07	0.07	0.07	0.12	0.12	0.12	0.12	0.12	0.12	0.12
v/s Ratio Perm	0.05	0.06	0.06	0.08	0.08	0.21	0.21	0.21	0.21	0.21	0.21	0.21
Uniform Delay, d1	0.38	0.60	0.44	0.56	0.53	0.29	0.16	0.12	0.12	0.12	0.31	0.31
Progression Factor	1.00	1.00	1.00	1.24	1.33	0.70	0.66	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.7	4.1	1.4	4.6	2.2	1.6	0.1	0.4	0.3	0.4	0.3	0.3
Level of Service	D	D	D	D	D	E	A	A	A	A	A	A
Approach Delay (s)	40.7	44.4	40.8	54.3	55.1	4.7	2.8	4.3	5.0	4.3	5.0	5.0
Approach LOS	D	D	D	D	D	E	A	A	A	A	A	A
Intersection Summary												
HCM 2000 Control Delay	18.4 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	62.6% ICU Level of Service B											
Analysis Period (min)	15											
c Critical Lane Group	15											

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	4	4	4	8	8	8	2	2	2	6	6	6
Traffic Volume (vph)	47	138	256	73	87	56	117	340	34	73	657	69
Future Volume (vph)	47	138	256	73	87	56	117	340	34	73	657	69
Lane Group Flow (vph)	51	150	278	79	129	0	127	402	0	79	784	0
Turn Type	Perm	NA	Perm	Perm	NA	Perm	NA	Perm	NA	Perm	NA	NA
Permitted Phases	4	4	4	8	8	8	2	2	2	6	6	6
Permitted Phases	4	4	4	8	8	8	2	2	2	6	6	6
Switch Phase	4	4	4	8	8	8	2	2	2	6	6	6
Minimum Initial (s)	8.0	8.0	8.0	5.0	5.0	5.0	5.0	5.0	5.0	8.0	8.0	8.0
Minimum Split (s)	23.9	23.9	23.9	23.9	23.9	23.9	24.7	24.7	24.7	24.7	24.7	24.7
Total Split (s)	34.0	34.0	34.0	34.0	34.0	34.0	66.0	66.0	66.0	66.0	66.0	66.0
Total Split (%)	34.0%	34.0%	34.0%	34.0%	34.0%	34.0%	66.0%	66.0%	66.0%	66.0%	66.0%	66.0%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	3.7	4.6	4.6	4.6	4.6	4.6	4.6
All-Red Time (s)	2.2	2.2	2.2	2.2	2.2	2.2	2.1	2.1	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	0.0	0.0	0.0
Total Lost Time (s)	5.9	5.9	5.9	5.9	5.9	5.9	6.7	6.7	6.7	6.7	6.7	6.7
LeadLag												
LeadLag Optimize?												
Recall Mode	None	None	None	None	None	None	None	None	None	None	None	None
v/c Ratio	0.38	0.60	0.70	0.56	0.58	0.58	0.29	0.17	0.12	0.32	0.32	0.32
Control Delay	45.1	49.5	20.1	63.0	49.4	5.6	3.0	5.4	5.4	5.4	5.4	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	45.1	49.5	20.1	63.0	49.4	5.6	3.0	5.4	5.4	5.4	5.4	5.4
Queue Length 50th (m)	9.6	29.2	11.7	16.8	27.0	4.2	6.4	3.9	23.6	3.9	23.6	23.6
Queue Length 95th (m)	20.0	46.1	36.8	28.1	41.0	9.8	11.5	11.0	41.6	11.0	41.6	41.6
Internal Link Dist (m)	107.2											
Turn Bay Length (m)	22.0											
Base Capacity (vph)	271	498	579	283	505	444	2453	647	2504	647	2504	647
Stallion 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	0.19	0.30	0.48	0.28	0.31	0.29	0.17	0.12	0.32	0.32	0.32	0.32
Intersection Summary												
Cycle Length: 100												
Actuated Cycle Length: 100												
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBTL, Start of Green												
Natural Cycle: 55												
Control Type: Actuated-Coordinated												

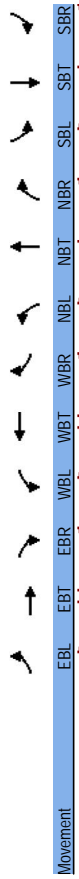




**PM Peak Hour**

HCM Signalized Intersection Capacity Analysis  
 1: Glenanna Rd & Kingston Rd

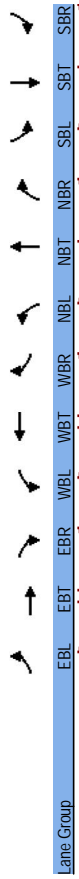
19225 | 1294 Kingston Rd  
 2028 FT PM (Optimized)



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	24	1214	143	156	612	132	120	177	194	178	199	36
Traffic Volume (vph)	24	1214	143	156	612	132	120	177	194	178	199	36
Future Volume (vph)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Ideal Flow (vphpl)	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2
Lane Width	6.4	6.4	6.4	3.0	6.4	6.4	3.0	7.0	3.0	3.0	7.0	7.0
Total Lost Time (s)	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00	0.90	1.00	1.00	0.91	1.00	1.00	0.84
Flpb. ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	0.96	1.00	1.00	0.97	1.00	1.00
Flt	0.95	1.00	1.00	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	1668	3500	1220	1658	3500	1373	1649	1879	1385	1673	1824	1295
Satd. Flow (prot)	0.40	1.00	1.00	0.08	1.00	1.00	0.47	1.00	0.53	1.00	1.00	1.00
Flt Permitted	700	3500	1220	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	1320	155	170	665	143	130	192	211	193	216	39
RTOR Reduction (vph)	0	0	60	0	0	39	0	0	171	0	0	32
Lane Group Flow (vph)	26	1320	95	170	665	104	130	192	40	193	216	7
Conf. Peds. (#/hr)	30	55	55	55	30	91	0%	1%	0%	50	50	0%
Heavy Vehicles (%)	0%	2%	5%	4%	2%	1%	0%	0%	0%	0%	3%	0%
Turn Type	Perm	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm
Permitted Phases	4	4	4	8	8	8	5	2	2	1	6	6
Actuated Green, G (s)	44.5	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	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	0.44	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	6.4	3.0	6.4	6.4	3.0	7.0	3.0	7.0	3.0	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	3.0
Lane Grp Cap (vph)	311	1557	542	282	2110	827	239	325	239	262	315	224
v/s Ratio Prot	c0.38	c0.08	0.19	0.08	0.19	0.08	0.03	0.10	0.03	c0.04	0.12	0.12
v/s Ratio Perm	0.04	0.08	0.29	0.17	0.60	0.32	0.13	0.54	0.17	0.74	0.69	0.03
Uniform Delay, d1	16.0	24.7	16.7	19.6	9.7	8.5	32.4	38.1	35.2	34.7	38.8	34.4
Progression Factor	0.48	0.54	0.19	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.07	1.08
Incremental Delay, d2	0.1	2.1	0.1	3.6	0.1	0.1	2.5	7.7	1.5	10.3	11.5	0.2
Delay (s)	7.8	15.5	3.3	23.2	9.8	8.6	34.9	45.8	36.7	47.6	53.5	34.6
Level of Service	A	B	A	C	A	A	C	D	D	D	D	C
Approach Delay (s)	14.1			12.0			39.5				49.3	
Approach LOS	B			B			D				D	
<b>Intersection Summary</b>												
HCM 2000 Control Delay	22.0	HCM 2000 Level of Service										
HCM 2000 Volume to Capacity ratio	0.78	C										
Actuated Cycle Length (s)	100.0	Sum of lost time (s)										
Intersection Capacity Utilization	84.9%	ICU Level of Service										
Analysis Period (min)	15											
c Critical Lane Group												

Queues  
 1: Glenanna Rd & Kingston Rd

19225 | 1294 Kingston Rd  
 2028 FT PM (Optimized)



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations	24	1214	143	156	612	132	120	177	194	178	199	36	
Traffic Volume (vph)	24	1214	143	156	612	132	120	177	194	178	199	36	
Future Volume (vph)	24	1214	143	156	612	132	120	177	194	178	199	36	
Lane Group Flow (vph)	26	1320	155	170	665	143	130	192	211	193	216	39	
Turn Type	Perm	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm	
Permitted Phases	4	4	4	8	8	8	5	2	2	1	6	6	
Detector Phase	4	4	4	8	8	8	5	2	2	1	6	6	
Switch Phase	4	4	4	8	8	8	5	2	2	1	6	6	
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)	24.4	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	39.0	9.0	48.0	48.0	9.0	43.0	43.0	9.0	43.0	43.0	
Total Spill (%)	39.0%	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	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	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	0.0	
Total Lost Time (s)	6.4	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	Lag	Lead	Lead	Lead	Lag	Lag	Lag	Lead	Lag	Lag	
Lead/Lag Optimize?	None	None	None	None	None	None	None	None	None	None	None	None	
Recall Mode	0.08	0.85	0.26	0.59	0.32	0.17	0.49	0.59	0.51	0.65	0.69	0.13	
v/c Ratio	9.6	18.8	1.9	25.0	10.9	4.4	32.3	44.9	9.8	41.3	52.6	1.9	
Control 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	
Queue Delay	9.6	18.8	1.9	25.0	10.9	4.4	32.3	44.9	9.8	41.3	52.6	1.9	
Total Delay	0.9	142.6	0.0	15.7	32.4	3.5	19.9	36.5	0.7	34.2	44.2	0.0	
Queue Length 50th (m)	m2.8m#180.1	m6.6	39.7	50.7	13.5	32.0	55.0	19.2	41.0	66.6	1.5	174.6	
Queue Length 95th (m)	393.2			523.9								416.6	
Turn Bay Length (m)	42.6	60.3	33.0	23.2	25.4	25.4	25.0	27.3	25.0	27.3	25.0	16.5	
Base Capacity (vph)	311	1557	603	287	2110	866	265	676	631	296	656	532	
Stallion Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0	
Spillover 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	0.08	0.85	0.26	0.59	0.32	0.17	0.49	0.28	0.33	0.65	0.33	0.07	
<b>Intersection Summary</b>													
Cycle Length: 100													
Actuated Cycle Length: 100													
Offset: 0 (0%). Referenced to phase 2:NBL and 6:SBTL, Start of Green													
Natural Cycle: 80													
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.													
<b>Spills and Phases:</b> 1: Glenanna Rd & Kingston Rd													
Ø1	Ø2 (R)	Ø3	Ø4	Ø5	Ø6 (R)	Ø7	Ø8						
9 s	43 s	9 s	59 s	9 s	43 s	9 s	43 s						
9 s	43 s	9 s	59 s	9 s	43 s	9 s	43 s						

HCM Signalized Intersection Capacity Analysis  
 2: Liverpool Rd & Kingston Rd

19225 | 1294 Kingston Rd  
 2028 FT PM (Optimized)



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR
Lane Configurations	←	←	←	←	←	←	←	←	←	←	←
Traffic Volume (vph)	220	1069	330	226	525	83	302	934	278	117	375
Future Volume (vph)	220	1069	330	226	525	83	302	934	278	117	375
Ideal Flow (vphpl)	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	3.5	3.2	3.2	3.5	3.2
Total Lost Time (s)	3.0	7.4	7.4	3.0	7.4	3.0	6.9	6.9	3.0	6.9	3.0
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
Frbp, ped/bikes	1.00	1.00	0.94	1.00	1.00	0.95	1.00	1.00	0.91	1.00	0.99
Frbp, 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	1678	3535	1363	1672	4893
Flt Permitted	0.34	1.00	1.00	0.12	1.00	1.00	0.36	1.00	1.00	0.19	1.00
Satd. Flow (perm)	609	3500	1416	220	3500	1431	638	3535	1363	332	4893
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
Adj. Flow (vph)	239	1162	359	246	571	90	328	1015	302	127	408
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	152	0	39
Lane Group Flow (vph)	239	1162	359	246	571	90	328	1015	150	127	464
Conf. Peds. (#/hr)	26	32	32	32	26	34	26	34	48	48	34
Heavy Vehicles (%)	1%	2%	2%	1%	2%	2%	2%	1%	3%	3%	0%
Turn Type	pm-pt	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm	pm-pt	NA
Permitted Phases	7	4	3	8	8	5	2	2	1	6	6
Actuated Green, G (s)	46.1	34.2	34.2	43.1	32.7	32.7	38.1	30.1	30.1	26.2	21.2
Effective Green, g (s)	46.1	34.2	34.2	43.1	32.7	32.7	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	3.0	6.9	6.9	3.0	6.9	3.0
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)	410	1197	484	249	1144	467	387	1064	410	153	1037
v/s Ratio Prot	c0.07	c0.33	c0.10	0.16	c0.12	c0.29	c0.29	c0.29	0.04	0.09	0.09
v/s Ratio Perm	0.20	0.25	0.32	0.06	0.06	0.20	0.11	0.17	0.11	0.17	0.17
Uniform Delay, d1	0.58	0.97	0.74	0.99	0.50	0.19	0.85	0.95	0.36	0.83	0.45
Progression Factor	1.00	1.00	1.00	1.37	1.44	1.45	1.00	1.00	1.00	1.10	1.05
Incremental Delay, d2	2.1	19.9	9.8	52.2	1.5	0.9	15.7	17.5	0.6	30.0	0.3
Delay (s)	19.4	52.3	38.9	87.2	40.5	36.0	40.1	51.8	28.0	66.0	36.2
Level of Service	B	D	D	F	D	D	D	D	C	E	D
Approach Delay (s)	45.1	52.7	52.7	45.1	52.7	45.1	52.7	45.1	52.7	45.1	52.7
Approach LOS	D	D	D	D	D	D	D	D	D	D	D

Intersection Summary	Value
HCM 2000 Control Delay	46.1
HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.99
Actuated Cycle Length (s)	100.0
Intersection Capacity Utilization	93.0%
Analysis Period (min)	15
Critical Lane Group	

Queues  
 2: Liverpool Rd & Kingston Rd

19225 | 1294 Kingston Rd  
 2028 FT PM (Optimized)



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR
Lane Configurations	←	←	←	←	←	←	←	←	←	←	←
Traffic Volume (vph)	220	1069	330	226	525	83	302	934	278	117	375
Future Volume (vph)	220	1069	330	226	525	83	302	934	278	117	375
Lane Group Flow (vph)	239	1162	359	246	571	90	328	1015	302	127	503
Turn Type	pm-pt	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm	pm-pt	NA
Projected Phases	7	4	4	4	4	3	8	8	5	2	6
Permitted Phases	4	4	4	4	4	3	8	8	5	2	6
Switch Phase	7	4	4	4	4	3	8	8	5	2	6
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	41.6	41.6	13.4	39.0	39.0	17.0	37.0	37.0	8.0	28.0
Total Split (%)	16.0%	41.6%	41.6%	13.4%	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	3.0	6.9	6.9	3.0	6.9	3.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag
Lead/Lag Optimize?	None	C-Min	None	None	C-Min	None	None	C-Min	None	None	C-Min
Recall Mode	0.55	0.97	0.74	0.95	0.50	0.19	0.80	0.95	0.54	0.77	0.47
v/s Ratio	18.6	53.1	40.0	75.2	41.4	37.6	37.8	53.6	12.5	54.4	34.1
Control Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Queue Delay	18.6	53.1	40.0	75.2	41.4	37.6	37.8	53.6	12.5	54.4	34.1
Queue Length 50th (m)	25.9	121.8	63.9	40.8	63.0	16.4	47.1	106.4	12.7	14.6	27.1
Queue Length 95th (m)	41.5	#168.4	#102.0	#83.8	78.1	31.0	#84.2	#149.2	39.1	#38.4	43.8
Internal Link Dist (m)											
Turn Bay Length (m)	33.5	49.1	103.2	61.6	46.2	61.6	46.2	51.8	47.9	47.9	47.9
Base Capacity (vph)	454	1197	484	258	1144	467	412	1064	562	166	1074
Stallion 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	0.53	0.97	0.74	0.95	0.50	0.19	0.80	0.95	0.54	0.77	0.47

Intersection Summary	Value
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.	

HCM Unsignalized Intersection Capacity Analysis  
 4: Liverpool Rd & North Dwy/Main Plaza Dwy

HCM Unsignalized Intersection Capacity Analysis  
 3: Liverpool Rd & South Dwy

19225 | 1294 Kingston Rd  
 2028 FT PM (Optimized)

19225 | 1294 Kingston Rd  
 2028 FT PM (Optimized)

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	24	1	44	123	3	98	67	923	247	76	398	28
Future Volume (Veh/h)	24	1	44	123	3	98	67	923	247	76	398	28
Sign Control	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free	Free	Free
Grade	0%	0%	0%	0%	0%	0%	0%	0%	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)	26	1	48	134	3	107	73	1003	268	83	433	30
Pedestrians	6			15			1				1	
Lane Width (m)	3.5			3.4			3.4				3.4	
Walking Speed (m/s)	1.2			1.2			1.2				1.2	
Percent Blockage	0			1			0				0	
Right turn flare (veh)												
Median type												
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72
vC, conflicting volume	1377	2052	238	1730	1933	652	469			1286		
vC1, stage 1 conf vol	620	620		1298	1298							
vC2, stage 2 conf vol	757	1432		432	635							
vCU, unblocked vol	758	1690	238	1246	1526	0	469			632		
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	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 %	92	99	94	44	99	86	93			88		
cM capacity (veh/h)	334	162	765	238	235	778	1098			687		
Direction, Lane #	EB, 1	WB, 1	WB, 2	NB, 1	NB, 2	NB, 3	SB, 1	SB, 2	SB, 3			
Volume Total	75	134	110	73	669	602	83	289	174			
Volume Left	26	134	0	73	0	0	83	0	0			
Volume Right	48	0	107	0	0	268	0	0	30			
cSH	511	238	732	1098	1700	1700	687	1700	1700			
Volume to Capacity	0.15	0.56	0.15	0.07	0.39	0.35	0.12	0.17	0.10			
Queue Length 95th (m)	4.1	24.9	4.2	1.7	0.0	0.0	3.3	0.0	0.0			
Control Delay (s)	13.3	36.0	10.8	8.5	0.0	0.0	11.0	0.0	0.0			
Lane LOS	B	E	B	A	B	A	B	B	B			
Approach Delay (s)	13.3	25.7	0.5		1.7							
Approach LOS	B	D										
Intersection Summary												
Average Delay	4.0											
Intersection Capacity Utilization	61.4%											
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	1237	558	7
Future Volume (Veh/h)	0	21	0	1237	558	7
Sign Control	Stop	Free	Free	Free	Free	Free
Grade	0%	0%	0%	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	1345	607	8
Pedestrians	4					
Lane Width (m)	3.2					
Walking Speed (m/s)	1.2					
Percent Blockage	0					
Right turn flare (veh)						
Median type						
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked	0.72	0.72	0.72	0.72	0.72	0.72
vC, conflicting volume	1288	312	619			
vC1, stage 1 conf vol	615					
vC2, stage 2 conf vol	672					
vCU, unblocked vol	611	312	619			
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)	469	688	968			
Direction, Lane #	EB, 1	NB, 1	NB, 2	SB, 1	SB, 2	
Volume Total	23	448	897	405	210	
Volume Left	0	0	0	0	0	
Volume Right	23	0	0	0	8	
cSH	688	968	1700	1700	1700	
Volume to Capacity	0.03	0.00	0.53	0.24	0.12	
Queue Length 95th (m)	0.8	0.0	0.0	0.0	0.0	
Control Delay (s)	10.4	0.0	0.0	0.0	0.0	
Lane LOS	B	B	B	B	B	
Approach Delay (s)	10.4	0.0	0.0	0.0	0.0	
Approach LOS	B					
Intersection Summary						
Average Delay	0.1					
Intersection Capacity Utilization	37.5%					
ICU Level of Service	A					
Analysis Period (min)	15					

HCM Signalized Intersection Capacity Analysis

6: Liverpool Rd & Glenanna Rd

19225 | 1294 Kingston Rd

2028 FT PM (Optimized)



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	4	4	4	4	4	4	4	4	4	4	4	4
Traffic Volume (vph)	45	72	117	57	145	44	352	619	74	67	328	30
Future Volume (vph)	45	72	117	57	145	44	352	619	74	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	5.9	6.7	6.7	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	0.99	1.00	0.99	1.00	0.95
Frbp, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	0.99	1.00	1.00
Frbp, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.98	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	0.95	1.00	1.00
Satd. Flow (prot)	1725	1824	1543	1725	1791	1708	3445	1707	3525	1707	3525	1707
Flt Permitted	0.43	1.00	1.00	0.71	1.00	0.52	1.00	0.36	1.00	0.36	1.00	1.00
Satd. Flow (perm)	788	1824	1543	1282	1791	937	3445	645	3525	645	3525	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	127	62	158	48	383	673	80	73	357	33
RTOR Reduction (vph)	0	0	107	0	13	0	6	0	0	0	5	0
Lane Group Flow (vph)	49	78	20	62	193	0	383	747	0	73	385	0
Conf. Ped. (#/hr)	0%	3%	0%	0%	1%	2%	1%	1%	5%	0%	0%	0%
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	Perm	NA	NA
Permitted Phases	4	4	8	8	8	8	2	2	2	6	6	6
Actuated Green, G (s)	16.0	16.0	16.0	16.0	16.0	16.0	71.4	71.4	71.4	71.4	71.4	71.4
Effective Green, g (s)	16.0	16.0	16.0	16.0	16.0	16.0	71.4	71.4	71.4	71.4	71.4	71.4
Actuated g/C Ratio	0.16	0.16	0.16	0.16	0.16	0.16	0.71	0.71	0.71	0.71	0.71	0.71
Clearance Time (s)	5.9	5.9	5.9	5.9	5.9	5.9	6.7	6.7	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	3.0	3.0	3.0
Lane Grp Cap (vph)	126	291	246	205	286	669	2459	460	2516	460	2516	2516
v/s Ratio Prot	0.04	0.04	0.11	0.11	0.11	0.22	0.22	0.11	0.11	0.11	0.11	0.11
v/s Ratio Perm	0.06	0.01	0.05	0.05	0.05	0.41	0.41	0.11	0.11	0.11	0.11	0.11
Uniform Delay, d1	0.39	0.27	0.08	0.30	0.67	0.57	0.30	0.16	0.15	0.16	0.15	0.15
Progression Factor	37.6	36.9	35.8	37.1	39.5	6.9	5.2	4.6	4.6	4.6	4.6	4.6
Incremental Delay, d2	1.00	1.00	1.00	0.70	0.76	0.73	0.52	1.00	1.00	1.00	1.00	1.00
Delay (s)	2.0	0.5	0.1	0.8	6.0	2.4	0.2	0.7	0.1	0.7	0.1	0.1
Level of Service	D	D	D	C	D	A	A	A	A	A	A	A
Approach Delay (s)	37.1	37.1	37.1	37.1	37.1	37.1	37.1	37.1	37.1	37.1	37.1	37.1
Approach LOS	D	D	D	C	D	A	A	A	A	A	A	A
Intersection Summary	<p>Intersecting Phases: 6: Liverpool Rd &amp; Glenanna Rd</p> <p>Cycle Length: 100</p> <p>Actuated Cycle Length: 100</p> <p>Offset: 0 (0%), Referenced to phase 2:NBL and 6:SBLT, Start of Green</p> <p>Natural Cycle: 60</p> <p>Control Type: Actuated-Coordinated</p> <p>m Volume for 95th percentile queue is metered by upstream signal.</p>											
HCM 2000 Control Delay	12.2 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	67.5% ICU Level of Service C											
Analysis Period (min)	15											
c Critical Lane Group	C Critical Lane Group											

Queues

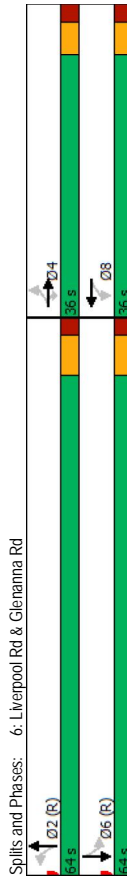
6: Liverpool Rd & Glenanna Rd

19225 | 1294 Kingston Rd

2028 FT PM (Optimized)



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Configurations	4	4	4	4	4	4	4	4	4	4
Traffic Volume (vph)	45	72	117	57	145	44	352	619	67	328
Future Volume (vph)	45	72	117	57	145	44	352	619	67	328
Lane Group Flow (vph)	49	78	127	62	206	383	753	73	390	NA
Turn Type	Perm	NA	Perm	Perm	NA	Perm	NA	Perm	NA	NA
Protected Phases	4	4	4	4	4	4	2	2	6	6
Permitted Phases	4	4	4	4	4	4	2	2	6	6
Switch Phase	4	4	4	4	4	4	2	2	6	6
Minimum Initial (s)	8.0	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	23.9	24.7	24.7	24.7	24.7
Total Split (s)	36.0	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%	36.0%	64.0%	64.0%	64.0%	64.0%
Yellow Time (s)	3.7	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	2.2	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	0.0
Total Lost Time (s)	5.9	5.9	5.9	5.9	5.9	5.9	6.7	6.7	6.7	6.7
LeadLag										
LeadLag Optimize?										
Recall Mode	None	None	None	None	None	None	C-Min	C-Min	C-Min	C-Min
v/c Ratio	0.39	0.27	0.36	0.30	0.69	0.30	0.69	0.57	0.31	0.16
Control Delay	45.0	37.4	9.1	28.4	39.0	8.8	3.2	6.7	5.1	5.1
Queue Delay	0.0	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	39.0	8.8	3.2	6.7	5.1	5.1
Queue Length 50th (m)	9.1	14.1	0.0	5.8	21.1	14.2	13.1	4.1	11.1	11.1
Queue Length 95th (m)	19.6	28.9	14.7	23.9	60.5	m/75.7	m/14.4	11.6	20.1	20.1
Internal Link Dist (m)	107.2									
Turn Bay Length (m)	22.0									
Base Capacity (vph)	237	549	553	385	550	668	2464	461	2518	2518
Stallion Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	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	0.31	0.16	0.15	0.15
Intersection Summary										
Cycle Length: 100										
Actuated Cycle Length: 100										
Offset: 0 (0%), Referenced to phase 2:NBL and 6:SBLT, Start of Green										
Natural Cycle: 60										
Control Type: Actuated-Coordinated										
m Volume for 95th percentile queue is metered by upstream signal.										





**Year 2033**

The background features several thick, overlapping, curved grey lines that sweep across the page from the top and right towards the bottom and left, creating a sense of motion and depth. The lines vary in opacity and thickness, with some appearing more prominent than others.

**AM Peak Hour**



HCM Signalized Intersection Capacity Analysis  
 1: Glenanna Rd & Kingston Rd  
 19225 | 1294 Kingston Rd  
 2033 FT AM



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR
Lane Configurations	10	419	93	96	604	122	52	73	64	190	102
Traffic Volume (vph)	10	419	93	96	604	122	52	73	64	190	102
Future Volume (vph)	10	419	93	96	604	122	52	73	64	190	102
Ideal Flow (vphpl)	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
Total Lost time (s)	6.4	6.4	6.4	3.0	6.4	3.0	7.0	3.0	7.0	3.0	7.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frbp, ped/bikes	1.00	1.00	0.91	1.00	1.00	0.96	1.00	1.00	0.93	1.00	0.93
Frbp, ped/bikes	0.99	1.00	1.00	0.99	1.00	1.00	0.97	1.00	1.00	0.97	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	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
Satd. Flow (prot)	1568	3305	1303	1646	3400	1464	1667	1860	1397	1641	1773
Flt Permitted	0.40	1.00	1.00	0.30	1.00	1.00	0.69	1.00	1.00	0.66	1.00
Satd. Flow (perm)	664	3305	1303	527	3400	1464	1203	1860	1397	1134	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
Adj. Flow (vph)	11	455	101	104	657	133	57	79	70	207	111
RTOR Reduction (vph)	0	0	80	0	0	0	0	0	42	0	15
Lane Group Flow (vph)	11	455	21	104	657	133	57	79	28	207	111
Conf. Peds. (#/hr)	8	25	25	25	8	35	34	34	34	34	35
Heavy Vehicles (%)	9%	8%	8%	4%	5%	1%	0%	1%	3%	2%	6%
Turn Type	Perm	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm	pm-pt	NA
Permitted Phases	4	4	8	8	8	8	5	2	2	6	6
Actuated Green, G (s)	20.3	20.3	20.3	31.9	31.9	31.9	46.0	40.0	40.0	54.7	45.7
Effective Green, g (s)	20.3	20.3	20.3	31.9	31.9	31.9	46.0	40.0	40.0	54.7	45.7
Actuated g/C Ratio	0.20	0.20	0.20	0.32	0.32	0.32	0.46	0.40	0.40	0.55	0.46
Clearance Time (s)	6.4	6.4	6.4	3.0	6.4	3.0	7.0	3.0	7.0	3.0	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)	134	670	264	264	1084	467	581	744	558	679	810
v/s Ratio Prot	0.14	0.02	0.09	0.03	c0.19	0.01	0.04	0.02	c0.13	0.06	0.06
v/s Ratio Perm	0.08	0.68	0.08	0.39	0.61	0.28	0.10	0.11	0.05	0.30	0.14
Uniform Delay, d1	32.3	36.8	32.3	25.2	28.7	25.5	15.1	18.8	18.4	11.8	15.7
Progression Factor	0.61	0.81	0.20	1.00	1.00	1.00	1.00	1.00	1.00	0.73	0.82
Incremental Delay, d2	0.3	2.6	0.1	1.0	1.0	0.3	0.1	0.3	0.2	0.3	0.3
Delay (s)	20.1	32.5	6.5	26.2	29.7	25.8	15.2	19.1	18.5	8.8	13.2
Level of Service	C	C	A	C	C	C	B	B	B	A	B
Approach Delay (s)	C	27.6	C	C	28.7	C	17.8	C	B	10.7	B
Approach LOS	C	C	C	C	C	C	B	C	B	A	B

Intersection Summary	Value
HCM 2000 Control Delay	24.2
HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.45
Actuated Cycle Length (s)	100.0
Sum of lost time (s)	19.4
Intersection Capacity Utilization	54.6%
ICU Level of Service	A
Analysis Period (min)	15
C Critical Lane Group	

Queues  
 1: Glenanna Rd & Kingston Rd  
 19225 | 1294 Kingston Rd  
 2033 FT AM



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR
Lane Configurations	10	419	93	96	604	122	52	73	64	190	102
Traffic Volume (vph)	10	419	93	96	604	122	52	73	64	190	102
Future Volume (vph)	10	419	93	96	604	122	52	73	64	190	102
Lane Group Flow (vph)	11	455	101	104	657	133	57	79	70	207	111
Turn Type	Perm	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm	pm-pt	NA
Permitted Phases	4	4	4	4	4	4	5	2	2	6	6
Detector Phase	4	4	4	4	4	4	5	2	2	1	6
Switch Phase	4	4	4	4	4	4	5	2	2	1	6
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	8.0	8.0	8.0	5.0	8.0
Minimum Split (s)	24.4	24.4	24.4	8.0	24.4	24.4	8.0	25.4	25.4	8.0	25.4
Total Split (s)	39.0	39.0	39.0	9.0	48.0	48.0	9.0	43.0	43.0	9.0	43.0
Total Split (%)	39.0%	39.0%	39.0%	9.0%	48.0%	48.0%	9.0%	43.0%	43.0%	9.0%	43.0%
Yellow Time (s)	4.2	4.2	4.2	3.0	4.2	4.2	3.0	3.3	3.3	3.0	3.3
All-Red Time (s)	2.2	2.2	2.2	0.0	2.2	2.2	0.0	3.7	3.7	0.0	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	6.4	3.0	6.4	6.4	3.0	7.0	7.0	3.0	7.0
Lead/Lag	Lag	Lag	Lag	Lead	Lead	Lead	Lag	Lag	Lag	Lead	Lag
Lead/Lag Optimize?	None	None	None	None	None	None	None	None	None	None	None
Recall Mode	0.08	0.68	0.29	0.36	0.62	0.29	0.09	0.10	0.11	0.29	0.13
v/c Ratio	20.2	34.9	3.1	24.1	31.1	25.7	11.8	23.5	2.9	9.2	16.0
Control Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
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	20.2	34.9	3.1	24.1	31.1	25.7	11.8	23.5	2.9	9.2	16.0
Queue Length 50th (m)	1.0	23.7	0.0	14.4	58.8	20.1	4.7	9.9	0.0	11.1	17.5
Queue Length 95th (m)	m2.1	24.1	0.0	23.0	67.0	30.9	12.6	24.8	5.5	21.0	32.6
Internal Link Dist (m)	393.2			523.9			174.6			416.6	
Turn Bay Length (m)	42.6	60.3	33.0	23.2	25.4	25.4	25.0	27.3	25.0	27.3	16.5
Base Capacity (vph)	216	1077	498	292	1414	609	650	798	658	725	840
Stallion Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillover 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	0.42	0.20	0.36	0.46	0.22	0.09	0.10	0.11	0.29	0.13

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



HCM Signalized Intersection Capacity Analysis  
 2: Liverpool Rd & Kingston Rd  
 19225 | 1294 Kingston Rd  
 2033 FT AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR
Lane Configurations	←	←	←	←	←	←	←	←	←	←	←
Traffic Volume (vph)	93	404	254	178	505	48	215	476	122	82	858
Future Volume (vph)	93	404	254	178	505	48	215	476	122	82	858
Ideal Flow (vphpl)	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	3.5	3.2	3.5	3.2	3.5
Total Lost Time (s)	6.9	7.0	7.0	3.0	7.0	3.0	6.9	6.9	3.0	4.5	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
Frbp, ped/bikes	1.00	1.00	0.96	1.00	1.00	0.96	1.00	1.00	0.95	1.00	0.99
Frbp, ped/bikes	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98
Frbp, ped/bikes	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	0.95
Satd. Flow (prot)	1654	3368	1462	1639	3400	1487	1690	3500	1329	1676	4913
Flt Permitted	0.32	1.00	1.00	0.39	1.00	1.00	0.15	1.00	1.00	0.46	1.00
Satd. Flow (perm)	563	3368	1462	672	3400	1487	268	3500	1329	813	4913
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
Adj. Flow (vph)	101	439	276	193	549	52	234	517	133	89	933
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	14
Lane Group Flow (vph)	101	439	276	193	549	52	234	517	133	89	1030
Conf. Peds. (#/hr)	15	19	19	9	15	22	22	25	25	25	22
Heavy Vehicles (%)	4%	6%	1%	5%	5%	0%	2%	2%	10%	2%	2%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA
Permitted Phases	7	4	4	8	8	8	5	2	2	1	6
Actuated Green, G (s)	29.1	23.4	23.4	35.0	24.4	24.4	49.1	39.4	39.4	43.0	36.3
Effective Green, g (s)	29.1	23.4	23.4	35.0	24.4	24.4	49.1	39.4	39.4	43.0	36.3
Actuated g/C Ratio	0.29	0.23	0.23	0.35	0.24	0.24	0.49	0.39	0.39	0.43	0.36
Clearance Time (s)	6.9	7.0	7.0	3.0	7.0	3.0	6.9	6.9	3.0	4.5	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)	226	788	342	337	829	362	305	1379	523	407	1783
v/s Ratio Prot	0.03	0.13	0.06	0.16	0.16	0.09	0.15	0.09	0.15	0.01	0.21
v/s Ratio Perm	0.10	0.19	0.14	0.14	0.03	0.28	0.04	0.08	0.04	0.08	0.08
Uniform Delay, d1	0.45	0.56	0.81	0.57	0.66	0.14	0.77	0.37	0.10	0.22	0.58
Progression Factor	1.00	1.00	2.37	1.84	1.93	1.00	1.00	1.00	1.00	0.99	0.94
Incremental Delay, d2	1.4	2.8	18.2	2.2	3.9	0.8	11.0	0.8	0.4	0.3	1.3
Delay (s)	28.4	36.6	54.4	59.4	66.6	58.0	28.5	22.3	19.5	17.3	25.5
Level of Service	C	D	D	E	E	E	C	C	B	B	C
Approach Delay (s)	41.6	41.6	64.3	64.3	64.3	23.5	23.5	23.5	23.5	24.9	24.9
Approach LOS	D	D	E	E	E	C	C	C	B	B	C
Intersection Summary											
HCM 2000 Control Delay	36.9 HCM 2000 Level of Service										
HCM 2000 Volume to Capacity ratio	0.82										
Actuated Cycle Length (s)	100.0										
Intersection Capacity Utilization	72.1% ICU Level of Service										
Analysis Period (min)	15										
Critical Lane Group	C										

Queues  
 2: Liverpool Rd & Kingston Rd  
 19225 | 1294 Kingston Rd  
 2033 FT AM

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR
Lane Configurations	←	←	←	←	←	←	←	←	←	←	←
Traffic Volume (vph)	93	404	254	178	505	48	215	476	122	82	858
Future Volume (vph)	93	404	254	178	505	48	215	476	122	82	858
Lane Group Flow (vph)	101	439	276	193	549	52	234	517	133	89	1044
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA
Projected Phases	7	4	4	8	8	8	5	2	2	1	6
Permitted Phases	7	4	4	8	8	8	5	2	2	1	6
Switch Phase	7	4	4	8	8	8	5	2	2	1	6
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	3.0	6.9	6.9	3.0	4.5	4.5
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag
Lead/Lag Optimize?	None	C-Min	None	None	C-Min	None	None	C-Min	None	None	Max
Recall Mode	0.40	0.55	0.79	0.53	0.61	0.13	0.75	0.37	0.22	0.21	0.59
v/s Ratio	24.5	35.3	51.8	49.3	62.9	55.0	35.1	24.6	4.1	14.8	26.2
Control Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
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	24.5	35.3	51.8	49.3	62.9	55.0	35.1	24.6	4.1	14.8	26.2
Queue Length 50th (m)	13.2	40.8	52.4	39.3	62.8	0.0	25.9	41.1	0.0	7.8	54.9
Queue Length 95th (m)	22.9	53.4	78.5	60.1	80.3	23.5	75.8	60.6	10.3	19.4	80.8
Internal Link Dist (m)	667.5										
Turn Bay Length (m)	33.5	49.1	103.2	61.6	46.2	61.6	46.2	51.8	47.9	47.9	47.9
Base Capacity (vph)	252	976	423	368	987	431	310	1380	616	454	1773
Stallion 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	0.40	0.45	0.65	0.52	0.56	0.12	0.75	0.37	0.22	0.20	0.59
Intersection Summary											
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.											
Spills and Phases: 2: Liverpool Rd & Kingston Rd											
Diagram showing lane groups and phasing details.											

HCM Unsignalized Intersection Capacity Analysis  
 4: Liverpool Rd & North Dwy/Main Plaza Dwy

HCM Unsignalized Intersection Capacity Analysis  
 3: Liverpool Rd & South Dwy

19225 | 1294 Kingston Rd  
 2033 FT AM

19225 | 1294 Kingston Rd  
 2033 FT AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (veh/h)	17	0	38	106	1	59	27	427	163	94	890	23
Future Volume (Veh/h)	17	0	38	106	1	59	27	427	163	94	890	23
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
Grade	0%	0%	0%	0%	0%	0%	0%	0%	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)	18	0	41	115	1	64	29	464	177	102	967	25
Pedestrians	4			14			1		1		1	
Lane Width (m)	3.5			3.4			3.4		3.4		3.4	
Walking Speed (m/s)	1.2			1.2			1.2		1.2		1.2	
Percent Blockage	0			1			0		0		0	
Right turn flare (veh)												
Median type							TW/TLT		TW/TLT		TW/TLT	
Median storage (veh)							2		2		2	
Upstream signal (m)							140		140		216	
pX, platoon unblocked	0.92	0.92	0.96	0.92	0.92	0.90	0.96		0.90		0.90	
vC, conflicting volume	1543	1900	501	1354	1824	336	996		655		655	
vC1, stage 1 conf vol	1188	1188		624	624							
vC2, stage 2 conf vol	356	713		730	1200							
vCU, unblocked vol	1235	1622	400	1030	1539	55	915		408		408	
tC, single (s)	7.5	6.5	7.2	7.5	6.5	6.9	4.1		4.1		4.1	
tC, 2 stage (s)	6.5	5.5	6.5	6.5	5.5							
tF (s)	3.5	4.0	3.4	3.5	4.0	3.3	2.2		2.2		2.2	
p0 queue free %	90	100	92	60	100	93	96		90		90	
cM capacity (veh/h)	188	215	543	289	202	900	722		1027		1027	
Direction, Lane #	EB.1	WB.1	WB.2	NB.1	NB.2	NB.3	SB.1	SB.2	SB.3			
Volume Total	59	115	65	29	309	332	102	645	347			
Volume Left	18	115	0	29	0	0	102	0	0			
Volume Right	41	0	64	0	0	177	0	0	25			
cSH	344	289	855	722	1700	1700	1027	1700	1700			
Volume to Capacity	0.17	0.40	0.08	0.04	0.18	0.20	0.10	0.38	0.20			
Queue Length 95th (m)	4.9	14.6	2.0	1.0	0.0	0.0	2.6	0.0	0.0			
Control Delay (s)	17.6	25.4	9.6	10.2	0.0	0.0	8.9	0.0	0.0			
Lane LOS	C	D	A	B	A	A	A	A	A			
Approach Delay (s)	17.6	19.7	0.4		0.8							
Approach LOS	C	C	C		C							
Intersection Summary												
Average Delay	2.9											
Intersection Capacity Utilization	51.2%											
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	617	1031	3
Future Volume (Veh/h)	0	11	0	617	1031	3
Sign Control	Stop	Stop	Free	Free	Free	Free
Grade	0%	0%	0%	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	671	1121	3
Pedestrians	4					
Lane Width (m)	3.2					
Walking Speed (m/s)	1.2					
Percent Blockage	0					
Right turn flare (veh)						
Median type				None	TW/TLT	
Median storage (veh)					2	
Upstream signal (m)				59	297	
pX, platoon unblocked	0.90	0.99	0.99			
vC, conflicting volume	1462	566	1128			
vC1, stage 1 conf vol	1126					
vC2, stage 2 conf vol	336					
vCU, unblocked vol	1256	548	1114			
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	97	100			
cM capacity (veh/h)	268	458	628			
Direction, Lane #	EB.1	NB.1	NB.2	SB.1	SB.2	
Volume Total	12	224	447	747	377	
Volume Left	0	0	0	0	0	
Volume Right	12	0	0	0	3	
cSH	458	628	1700	1700	1700	
Volume to Capacity	0.03	0.00	0.26	0.44	0.22	
Queue Length 95th (m)	0.6	0.0	0.0	0.0	0.0	
Control Delay (s)	13.1	0.0	0.0	0.0	0.0	
Lane LOS	B	B	B	A	A	
Approach Delay (s)	13.1	0.0	0.0			
Approach LOS	B	B	B			
Intersection Summary						
Average Delay	0.1					
Intersection Capacity Utilization	38.6%					
ICU Level of Service	A					
Analysis Period (min)	15					

HCM Signalized Intersection Capacity Analysis  
 6: Liverpool Rd & Glenanna Rd

19225 | 1294 Kingston Rd  
 2033 FT AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	4	4	4	4	4	4	4	4	4	4	4	4
Traffic Volume (vph)	47	138	256	73	87	56	117	352	34	73	678	69
Future Volume (vph)	47	138	256	73	87	56	117	352	34	73	678	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	5.9	6.7	6.7	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	0.95	1.00	1.00	0.95	1.00
Frbp, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	0.99	1.00	0.99	1.00
Frbp, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	0.99	1.00	0.99	1.00
Flt Protected	0.95	1.00	1.00	0.95	1.00	0.95	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1658	1773	1513	1675	1717	1659	3346	1638	3411	1638	3411	1638
Flt Permitted	0.56	1.00	1.00	0.57	1.00	0.34	1.00	0.51	1.00	0.51	1.00	0.51
Satd. Flow (perm)	969	1773	1513	1012	1717	589	3346	873	3411	873	3411	873
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	278	79	95	61	127	383	37	79	737	75
RTOR Reduction (vph)	0	0	175	0	27	0	0	5	0	0	5	0
Lane Group Flow (vph)	51	150	103	79	129	0	127	415	0	79	807	0
Conf. Peds. (#/hr)							11	8	8	8	8	11
Heavy Vehicles (%)	4%	6%	2%	3%	3%	3%	4%	14%	4%	3%	0%	0%
Turn Type	Perm	NA	Perm	Perm	NA	Perm	NA	Perm	NA	Perm	NA	NA
Permitted Phases	4		4	8		8		2		6		6
Actuated Green, G (s)	14.3	14.3	14.3	14.3	14.3	73.1	73.1	73.1	73.1	73.1	73.1	73.1
Effective Green, g (s)	14.3	14.3	14.3	14.3	14.3	73.1	73.1	73.1	73.1	73.1	73.1	73.1
Actuated g/C Ratio	0.14	0.14	0.14	0.14	0.14	0.73	0.73	0.73	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	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	3.0	3.0	3.0
Lane Grp Cap (vph)	138	253	216	144	245	430	2445	638	2493	638	2493	2493
v/s Ratio Prot	c0.08					0.07		0.12				c0.24
v/s Ratio Perm	0.05	0.07	0.08	0.08	0.08	0.22	0.22	0.09	0.09	0.09	0.09	0.09
Uniform Delay, d1	38.8	40.1	39.4	39.8	39.7	4.6	4.1	4.0	4.7	4.0	4.7	4.7
Progression Factor	1.00	1.00	1.00	1.19	1.27	0.66	0.62	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.7	3.7	1.7	4.2	2.0	1.7	0.1	0.4	0.3	0.4	0.3	0.3
Level of Service	D	D	D	D	D	A	A	A	A	A	A	A
Approach Delay (s)	41.9					52.3		3.2		5.0		5.0
Approach LOS	D					D		A		A		A

Intersection Summary	Value	Unit
HCM 2000 Control Delay	17.9	HCM 2000 Level of Service
HCM 2000 Volume to Capacity ratio	0.37	
Actuated Cycle Length (s)	100.0	Sum of lost time (s)
Intersection Capacity Utilization	63.2%	ICU Level of Service
Analysis Period (min)	15	
c Critical Lane Group		

Queues  
 6: Liverpool Rd & Glenanna Rd

19225 | 1294 Kingston Rd  
 2033 FT AM

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	4	4	4	4	4	4	4	4	4	4	4	4
Traffic Volume (vph)	47	138	256	73	87	56	117	352	34	73	678	69
Future Volume (vph)	47	138	256	73	87	56	117	352	34	73	678	69
Lane Group Flow (vph)	51	150	278	79	129	0	127	415	0	79	807	0
Turn Type	Perm	NA	Perm	Perm	NA	Perm	NA	Perm	NA	Perm	NA	NA
Protected Phases	4		4	8		8		2		6		6
Permitted Phases	4		4	8		8		2		6		6
Switch Phase	4		4	8		8		2		6		6
Minimum Initial (s)	8.0	8.0	8.0	5.0	5.0	5.0	5.0	5.0	5.0	8.0	8.0	8.0
Minimum Split (s)	23.9	23.9	23.9	23.9	23.9	23.9	24.7	24.7	24.7	24.7	24.7	24.7
Total Split (s)	34.0	34.0	34.0	34.0	34.0	34.0	66.0	66.0	66.0	66.0	66.0	66.0
Total Split (%)	34.0%	34.0%	34.0%	34.0%	34.0%	34.0%	66.0%	66.0%	66.0%	66.0%	66.0%	66.0%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	3.7	4.6	4.6	4.6	4.6	4.6	4.6
All-Red Time (s)	2.2	2.2	2.2	2.2	2.2	2.2	2.1	2.1	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	0.0	0.0	0.0
Total Lost Time (s)	5.9	5.9	5.9	5.9	5.9	5.9	6.7	6.7	6.7	6.7	6.7	6.7
LeadLag												
LeadLag Optimize?												
Recall Mode	None	None	None	None	None	None	None	None	None	None	None	None
v/s Ratio	0.37	0.59	0.71	0.55	0.57	0.30	0.17	0.12	0.32	0.12	0.32	0.32
Control Delay	44.6	49.0	22.1	60.2	47.3	5.7	2.9	5.5	5.5	5.5	5.5	5.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	44.6	49.0	22.1	60.2	47.3	5.7	2.9	5.5	5.5	5.5	5.5	5.5
Queue Length 50th (m)	9.6	29.2	13.9	16.8	27.0	4.0	6.4	4.0	4.0	24.7	4.0	24.7
Queue Length 95th (m)	19.8	45.6	39.0	25.3	36.4	8.8	10.7	11.3	11.3	44.4	11.3	44.4
Internal Link Dist (m)							416.6			192.1		478.0
Turn Bay Length (m)	22.0		24.3		24.3		24.4		46.2			46.2
Base Capacity (vph)	272	498	571	284	505	430	2452	637	2499	637	2499	2499
Stallion Cap Reductin	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductin	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductin	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.19	0.30	0.49	0.28	0.31	0.30	0.17	0.12	0.32	0.12	0.32	0.32

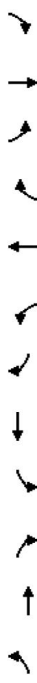
Intersection Summary	Value	Unit
Cycle Length: 100		
Actuated Cycle Length: 100		
Offset: 0 (0%), Referenced to phase 2:NBL and 6:SBTL, Start of Green		
Natural Cycle: 60		
Control Type: Actuated-Coordinated		



**PM Peak Hour**

HCM Signalized Intersection Capacity Analysis  
 1: Glenanna Rd & Kingston Rd

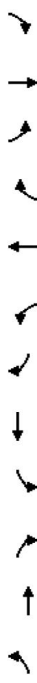
19225 | 1294 Kingston Rd  
 2033 FT PM (Optimized)



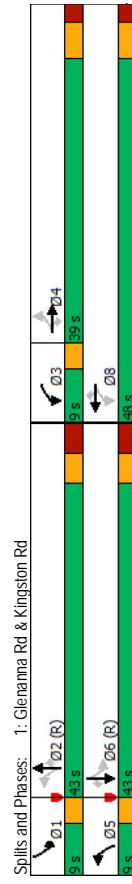
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	24	1245	143	156	627	132	120	177	194	178	199	36
Future Volume (vph)	24	1245	143	156	627	132	120	177	194	178	199	36
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	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	6.4	3.0	6.4	6.4	7.0	7.0	3.0	7.0	3.0	7.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frbp. ped/bikes	1.00	1.00	0.83	1.00	1.00	0.90	1.00	1.00	0.91	1.00	1.00	0.84
Frbp. ped/bikes	0.97	1.00	1.00	1.00	1.00	0.96	1.00	1.00	0.97	1.00	1.00	0.85
Fit	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)	1669	3500	1220	1658	3500	1373	1649	1879	1385	1673	1824	1295
Flt Permitted	0.39	1.00	1.00	0.08	1.00	1.00	0.47	1.00	1.00	0.53	1.00	1.00
Satd. Flow (perm)	689	3500	1220	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	1363	155	170	682	143	130	192	211	193	216	39
RTOR Reduction (vph)	0	0	60	0	0	38	0	0	171	0	0	32
Lane Group Flow (vph)	26	1363	95	170	682	105	130	192	40	193	216	7
Conf. Peds. (#/hr)	30	55	55	55	30	91	0%	1%	0%	50	50	0%
Heavy Vehicles (%)	0%	2%	5%	4%	2%	1%	0%	0%	0%	1%	0%	3%
Turn Type	Perm	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm
Permitted Phases	4	4	4	8	8	8	5	2	2	1	6	6
Actuated Green, G (s)	44.5	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	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	0.44	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	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	3.0
Lane Grp Cap (vph)	306	1557	542	282	2110	827	239	325	239	262	315	224
v/s Ratio Prot	c0.39	c0.08	0.19	0.08	0.19	0.03	0.10	0.03	0.10	c0.04	0.12	0.12
v/s Ratio Perm	0.04	0.08	0.29	0.08	0.29	0.08	0.09	0.08	0.09	0.03	c0.13	0.01
Uniform Delay, d1	16.0	25.1	16.7	19.9	9.8	8.5	32.4	38.1	35.2	34.7	38.8	34.4
Progression Factor	0.48	0.54	0.19	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.07	1.08
Incremental Delay, d2	0.1	2.4	0.1	3.6	0.1	0.1	2.5	7.7	1.5	10.3	11.5	0.2
Delay (s)	7.7	16.0	3.3	23.5	9.9	8.6	34.9	45.8	36.7	47.6	53.4	34.6
Level of Service	A	B	A	C	A	A	C	D	D	D	D	C
Approach Delay (s)	14.5			12.0			39.5			49.3		
Approach LOS	B			B			D			D		
<b>Intersection Summary</b>												
HCM 2000 Control Delay	22.1 HCM 2000 Level of Service C											
HCM 2000 Volume to Capacity ratio	0.79											
Actuated Cycle Length (s)	100.0 Sum of lost time (s) 19.4											
Intersection Capacity Utilization	88.8% ICU Level of Service E											
Analysis Period (min)	15											
c Critical Lane Group												

Queues  
 1: Glenanna Rd & Kingston Rd

19225 | 1294 Kingston Rd  
 2033 FT PM (Optimized)



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	24	1245	143	156	627	132	120	177	194	178	199	36
Future Volume (vph)	24	1245	143	156	627	132	120	177	194	178	199	36
Lane Group Flow (vph)	26	1363	155	170	682	143	130	192	211	193	216	39
Turn Type	Perm	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm
Permitted Phases	4	4	4	8	8	8	5	2	2	1	6	6
Detector Phase	4	4	4	8	8	8	5	2	2	1	6	6
Switch Phase	4	4	4	8	8	8	5	2	2	1	6	6
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)	24.4	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	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%	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	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	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	0.0
Total Lost Time (s)	6.4	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	Lag	Lead	Lead	Lead	Lead	Lag	Lag	Lag	Lead	Lag
Lead/Lag Optimize?	None	None	None	None	None	None	None	C-Min	C-Min	None	C-Min	C-Min
Recall Mode	0.08	0.87	0.26	0.59	0.32	0.17	0.49	0.59	0.51	0.65	0.69	0.13
v/s Ratio	9.6	19.3	1.9	25.0	11.0	4.5	32.3	44.9	9.8	41.2	52.5	1.9
Control 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
Queue Delay	9.6	19.3	1.9	25.0	11.0	4.5	32.3	44.9	9.8	41.2	52.5	1.9
Total Delay	0.9	148.0	0.0	15.7	33.4	3.7	19.9	36.5	0.7	34.2	44.2	0.0
Queue Length 50th (m)	m2.7/m#182.2 m6.6 39.7 52.2 13.8 32.0 55.0 19.2 41.0 66.7 1.5											
Queue Length 95th (m)	393.2 523.9 174.6											
Turn Bay Length (m)	42.6	60.3	33.0	23.2	25.4	25.4	25.0	27.3	25.0	27.3	25.0	16.5
Base Capacity (vph)	306	1557	603	287	2110	866	265	676	631	296	656	532
Stallion Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillover 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	0.08	0.87	0.26	0.59	0.32	0.17	0.49	0.28	0.33	0.65	0.33	0.07
<b>Intersection Summary</b>												
Cycle Length: 100												
Actuated Cycle Length: 100												
Offset: 0 (0%). Referenced to phase 2:NBL and 6:SBTL, Start of Green												
Natural Cycle: 80												
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.												



HCM Signalized Intersection Capacity Analysis  
 2: Liverpool Rd & Kingston Rd

19225 | 1294 Kingston Rd  
 2033 FT PM (Optimized)

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR
Lane Configurations	→	→	→	←	←	←	←	←	←	←	←
Traffic Volume (vph)	220	1096	330	226	538	83	302	957	278	117	384
Future Volume (vph)	220	1096	330	226	538	83	302	957	278	117	384
Ideal Flow (vphpl)	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	3.5	3.2	3.5	3.2	3.5
Total Lost Time (s)	3.0	7.4	7.4	3.0	7.4	7.4	3.0	6.9	3.0	6.9	3.2
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
Frbp. ped/bikes	1.00	1.00	0.94	1.00	1.00	0.95	1.00	1.00	0.91	1.00	0.99
Frbp. 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	1678	3535	1363	1672	4897
Flt Permitted	0.33	1.00	1.00	0.12	1.00	1.00	0.35	1.00	1.00	0.19	1.00
Satd. Flow (perm)	592	3500	1416	220	3500	1431	626	3535	1363	332	4897
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
Adj. Flow (vph)	239	1191	359	246	585	90	328	1040	302	127	417
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	149	0
Lane Group Flow (vph)	239	1191	359	246	585	90	328	1040	153	127	475
Conf. Peds. (#/hr)	26	32	32	32	32	26	34	48	48	48	34
Heavy Vehicles (%)	1%	2%	2%	1%	2%	2%	2%	1%	3%	3%	0%
Turn Type	pm-pt	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm	pm-pt	NA
Permitted Phases	7	4	4	3	8	8	5	2	2	1	6
Actuated Green, G (s)	46.1	34.2	34.2	43.1	32.7	32.7	38.1	30.1	30.1	26.2	21.2
Effective Green, g (s)	46.1	34.2	34.2	43.1	32.7	32.7	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)	404	1197	484	249	1144	467	384	1064	410	153	1038
v/s Ratio Prot	c0.07	c0.34	c0.10	0.17	c0.12	c0.29	c0.29	c0.29	c0.29	0.04	0.10
v/s Ratio Perm	0.20	0.25	0.32	0.25	0.32	0.21	0.21	0.11	0.11	0.17	0.17
Uniform Delay, d1	0.59	0.99	0.74	0.99	0.51	0.19	0.85	0.98	0.37	0.83	0.46
Progression Factor	1.00	1.00	1.00	1.38	1.45	1.46	1.00	1.00	1.00	1.10	1.04
Incremental Delay, d2	2.3	24.8	9.8	52.2	1.6	0.9	16.6	22.0	0.6	30.0	0.3
Delay (s)	19.7	57.7	38.9	87.6	41.0	36.1	41.2	56.6	28.1	66.2	36.2
Level of Service	B	E	D	F	D	D	D	E	C	E	D
Approach Delay (s)	48.8	48.8	48.8	52.9	48.8	48.8	48.8	48.8	48.8	42.2	42.2
Approach LOS	D	D	D	D	D	D	D	D	D	D	D
<b>Intersection Summary</b>											
HCM 2000 Control Delay	48.6 HCM 2000 Level of Service										
HCM 2000 Volume to Capacity ratio	1.00										
Actuated Cycle Length (s)	100.0										
Intersection Capacity Utilization	94.3% ICU Level of Service										
Analysis Period (min)	15										
c Critical Lane Group											

Queues  
 2: Liverpool Rd & Kingston Rd

19225 | 1294 Kingston Rd  
 2033 FT PM (Optimized)

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR	
Lane Configurations	→	→	→	←	←	←	←	←	←	←	←	
Traffic Volume (vph)	220	1096	330	226	538	83	302	957	278	117	384	
Future Volume (vph)	220	1096	330	226	538	83	302	957	278	117	384	
Lane Group Flow (vph)	239	1191	359	246	585	90	328	1040	302	127	512	
Turn Type	pm-pt	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	
Projected Phases	7	4	4	3	8	8	5	2	2	1	6	
Permitted Phases	7	4	4	3	8	8	5	2	2	1	6	
Switch Phase	7	4	4	3	8	8	5	2	2	1	6	
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	41.6	41.6	13.4	39.0	39.0	17.0	37.0	37.0	8.0	28.0	
Total Split (%)	16.0%	41.6%	41.6%	13.4%	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?	None	C-Min	None	None	C-Min	None	None	C-Min	None	None	C-Min	
Recall Mode	0.56	0.99	0.74	0.95	0.51	0.19	0.80	0.98	0.54	0.77	0.48	
v/s Ratio	18.8	58.5	40.0	75.2	41.8	37.7	38.3	58.2	13.0	54.4	34.3	
Control Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Queue Length	18.8	58.5	40.0	75.2	41.8	37.7	38.3	58.2	13.0	54.4	34.3	
Queue Length 50th (m)	25.9	126.2	63.9	41.0	64.7	16.6	47.1	110.1	13.5	14.6	28.1	
Queue Length 95th (m)	41.5	#175.3	#102.0	#82.9	80.2	31.3	#84.8	#155.0	40.1	#38.1	44.8	
Internal Link Dist (m)	667.5											
Turn Bay Length (m)	33.5	49.1	103.2	61.6	46.2	46.2	51.8	47.9	47.9	47.9	47.9	
Base Capacity (vph)	448	1197	484	258	1144	467	409	1064	559	166	1073	
Stallion 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	0.53	0.99	0.74	0.95	0.51	0.19	0.80	0.98	0.54	0.77	0.48	
<b>Intersection Summary</b>												
Cycle Length: 100												
Offset: 13 (13%), Referenced to phase 4:EBLT and 8:WBT, 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.												
<b>Spills and Phases: 2: Liverpool Rd &amp; Kingston Rd</b>												
Ø1	Ø2	Ø3	Ø4 (R)	Ø5	Ø6	Ø7	Ø8 (R)					
17.5 s	28.5 s	15.5 s	15.5 s	15.5 s	15.5 s	15.5 s	15.5 s	15.5 s	15.5 s	15.5 s	15.5 s	
37.5 s	37.5 s	37.5 s	41.6 s	37.5 s	37.5 s	37.5 s	37.5 s	37.5 s	37.5 s	37.5 s	37.5 s	



HCM Unsignalized Intersection Capacity Analysis  
 4: Liverpool Rd & North Dwy/Main Plaza Dwy

HCM Unsignalized Intersection Capacity Analysis  
 3: Liverpool Rd & South Dwy

19225 | 1294 Kingston Rd  
 2033 FT PM (Optimized)

19225 | 1294 Kingston Rd  
 2033 FT PM (Optimized)

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (veh/h)	24	1	44	123	3	98	67	946	247	76	407	28
Future Volume (Veh/h)	24	1	44	123	3	98	67	946	247	76	407	28
Sign Control	Stop	Stop	Stop	Stop	0%	0%	Free	Free	Free	Free	Free	Free
Grade	0%	0%	0%	0%	0%	0%	0%	0%	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)	26	1	48	134	3	107	73	1028	268	83	442	30
Pedestrians	6			15			1				1	
Lane Width (m)	3.5			3.4			3.4				3.4	
Walking Speed (m/s)	1.2			1.2			1.2				1.2	
Percent Blockage	0			1			0				0	
Right turn flare (veh)												
Median type												
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	216
vC, conflicting volume	1398	2086	243	1760	1967	664	478	664	478	1311	1311	
vC1, stage 1 conf vol	629	629		1323	1323							
vC2, stage 2 conf vol	770	1457		436	644							
vCu, unblocked vol	769	1727	243	1272	1561	0	478	1561	0	647	647	
IC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1	6.9	4.1	4.1	4.1	
IC, 2 stage (s)	6.5	5.5	6.5	6.5	5.5							
p0 queue free %	3.5	4.0	3.3	3.5	4.0	3.3	2.2	3.3	2.2	2.2	2.2	
p0 queue free %	92	99	94	42	99	86	93	88	93	88	88	
cM capacity (veh/h)	329	156	760	232	230	771	1089	1089	771	1089	673	
Direction, Lane #	EB.1	WB.1	WB.2	NB.1	NB.2	NB.3	NB.3	SB.1	SB.2	SB.3		
Volume Total	75	134	110	73	685	611	83	295	177	177		
Volume Left	26	134	0	73	0	0	83	0	0	0		
Volume Right	48	0	107	0	0	268	0	0	0	30		
cSH	504	232	724	1089	1700	1700	673	1700	1700	1700		
Volume to Capacity	0.15	0.58	0.15	0.07	0.40	0.36	0.12	0.17	0.10	0.10		
Queue Length 95th (m)	4.2	26.0	4.3	1.7	0.0	0.0	3.4	0.0	0.0	0.0		
Control Delay (s)	13.4	39.8	10.9	8.5	0.0	0.0	11.1	0.0	0.0	0.0		
Lane LOS	B	E	B	A	A	B	B	B	B	B		
Approach Delay (s)	13.4	26.8	0.5			1.7						
Approach LOS	B	D										
<b>Intersection Summary</b>												
Average Delay	4.0											
Intersection Capacity Utilization	62.0%											
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	1260	567	7
Future Volume (Veh/h)	0	21	0	1260	567	7
Sign Control	Stop	Free	Free	Free	Free	Free
Grade	0%	0%	0%	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	1370	616	8
Pedestrians	4					
Lane Width (m)	3.2					
Walking Speed (m/s)	1.2					
Percent Blockage	0					
Right turn flare (veh)						
Median type						
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked	0.71	0.71	0.71	0.71	0.71	0.71
vC, conflicting volume	1309	316	628	628	628	628
vC1, stage 1 conf vol	685					
vC2, stage 2 conf vol	616	316	628	628	628	628
vCu, unblocked vol	6.8	6.9	4.1	4.1	4.1	4.1
IC, single (s)	5.8	5.8	3.3	2.2	2.2	2.2
IC, 2 stage (s)	3.5	3.3	2.2	2.2	2.2	2.2
p0 queue free %	100	97	100	100	100	100
cM capacity (veh/h)	464	684	961	961	961	961
Direction, Lane #	EB.1	NB.1	NB.2	SB.1	SB.2	
Volume Total	23	457	913	411	213	
Volume Left	0	0	0	0	0	
Volume Right	23	0	0	0	8	
cSH	684	961	1700	1700	1700	
Volume to Capacity	0.03	0.00	0.54	0.24	0.13	
Queue Length 95th (m)	0.8	0.0	0.0	0.0	0.0	
Control Delay (s)	10.4	0.0	0.0	0.0	0.0	
Lane LOS	B	B	B	B	B	
Approach Delay (s)	10.4	0.0	0.0	0.0	0.0	
Approach LOS	B					
<b>Intersection Summary</b>						
Average Delay	0.1					
Intersection Capacity Utilization	38.2%					
ICU Level of Service	A					
Analysis Period (min)	15					

HCM Signalized Intersection Capacity Analysis  
 6: Liverpool Rd & Glenanna Rd

Queues  
 6: Liverpool Rd & Glenanna Rd

19225 | 1294 Kingston Rd  
 2033 FT PM (Optimized)

19225 | 1294 Kingston Rd  
 2033 FT PM (Optimized)



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR
Lane Configurations	45	72	117	57	145	44	352	642	74	67	337
Traffic Volume (vph)	45	72	117	57	145	44	352	642	74	67	337
Future Volume (vph)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Ideal Flow (vphpl)	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5
Lane Width	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5
Total Lost Time (s)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00	0.95
Frbp. ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frbp. ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Flt Protected	0.95	1.00	1.00	0.95	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1725	1824	1543	1725	1791	1708	3448	1708	3448	1708	3526
Flt Permitted	0.43	1.00	1.00	0.71	1.00	0.52	1.00	0.35	1.00	0.35	1.00
Satd. Flow (perm)	788	1824	1543	1282	1791	929	3448	626	3526	626	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
Adj. Flow (vph)	49	78	127	62	158	48	383	698	80	73	366
RTOR Reduction (vph)	0	0	107	0	13	0	0	6	0	0	5
Lane Group Flow (vph)	49	78	20	62	193	0	383	772	0	73	394
Conf. Peds. (#/hr)	0%	3%	0%	0%	1%	2%	1%	1%	5%	0%	0%
Heavy Vehicles (%)	0%	3%	0%	0%	1%	2%	1%	1%	5%	0%	0%
Turn Type	Perm	NA	Perm	Perm	NA	Perm	NA	NA	Perm	NA	NA
Permitted Phases	4	4	8	8	8	8	2	2	6	6	6
Actuated Green, G (s)	16.0	16.0	16.0	16.0	16.0	16.0	71.4	71.4	71.4	71.4	71.4
Effective Green, g (s)	16.0	16.0	16.0	16.0	16.0	16.0	71.4	71.4	71.4	71.4	71.4
Actuated g/C Ratio	0.16	0.16	0.16	0.16	0.16	0.16	0.71	0.71	0.71	0.71	0.71
Clearance Time (s)	5.9	5.9	5.9	5.9	5.9	5.9	6.7	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	3.0	3.0
Lane Grp Cap (vph)	126	291	246	205	286	663	2461	446	2517	446	2517
v/s Ratio Prot	0.04	0.04	0.11	0.11	0.11	0.22	0.22	0.11	0.11	0.11	0.11
v/s Ratio Perm	0.06	0.01	0.05	0.05	0.05	0.41	0.41	0.12	0.12	0.12	0.12
Uniform Delay, d1	0.39	0.27	0.08	0.30	0.67	0.58	0.31	0.16	0.16	0.16	0.16
Progression Factor	37.6	36.9	35.8	37.1	39.5	7.0	5.3	4.6	4.6	4.6	4.6
Incremental Delay, d2	1.00	1.00	1.00	0.71	0.77	0.73	0.51	1.00	1.00	1.00	1.00
Delay (s)	2.0	0.5	0.1	0.8	6.0	2.3	0.2	0.8	0.1	0.8	0.1
Level of Service	D	D	D	C	D	A	A	A	A	A	A
Approach Delay (s)	D	D	D	C	D	A	A	A	A	A	A
Approach LOS	D	D	D	C	D	A	A	A	A	A	A

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBR
Lane Configurations	45	72	117	57	145	44	352	642	67	337
Traffic Volume (vph)	45	72	117	57	145	44	352	642	67	337
Future Volume (vph)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Group Flow (vph)	49	78	127	62	206	383	778	73	399	NA
Turn Type	Perm	NA	Perm	Perm	NA	Perm	NA	Perm	NA	NA
Protected Phases	4	4	8	8	8	8	2	2	6	6
Permitted Phases	4	4	8	8	8	8	2	2	6	6
Switch Phase	4	4	8	8	8	8	2	2	6	6
Minimum Initial (s)	8.0	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	23.9	24.7	24.7	24.7	24.7
Total Split (s)	36.0	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%	36.0%	64.0%	64.0%	64.0%	64.0%
Yellow Time (s)	3.7	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	2.2	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	0.0
Total Lost Time (s)	5.9	5.9	5.9	5.9	5.9	5.9	6.7	6.7	6.7	6.7
LeadLag										
LeadLag Optimize?										
Recall Mode	None	None	None	None	None	None	C-Min	C-Min	C-Min	C-Min
v/c Ratio	0.39	0.27	0.36	0.30	0.69	0.30	0.58	0.32	0.16	0.16
Control Delay	45.0	37.4	9.1	28.8	39.5	8.8	3.1	6.8	5.1	5.1
Queue Delay	0.0	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	28.8	39.5	8.8	3.1	6.8	5.1	5.1
Queue Length 50th (m)	9.1	14.1	0.0	6.3	33.4	12.2	11.6	4.1	11.4	11.4
Queue Length 95th (m)	19.6	28.9	14.7	23.9	60.5	m/4.8	m/5.0	11.7	20.5	20.5
Internal Link Dist (m)							416.6	192.1	478.0	478.0
Turn Bay Length (m)	22.0		24.3		24.3		24.4	46.2		
Base Capacity (vph)	237	549	553	385	550	662	2468	446	2521	2521
Stallion Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillover Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	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	0.32	0.16	0.16	0.16

**Intersection Summary**

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

**Spills and Phases:** 6: Liverpool Rd & Glenanna Rd

**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  
 Critical Lane Group: C





# APPENDIX E

## Site Traffic Information

## EXHIBIT E1

### 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 E2**  
**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

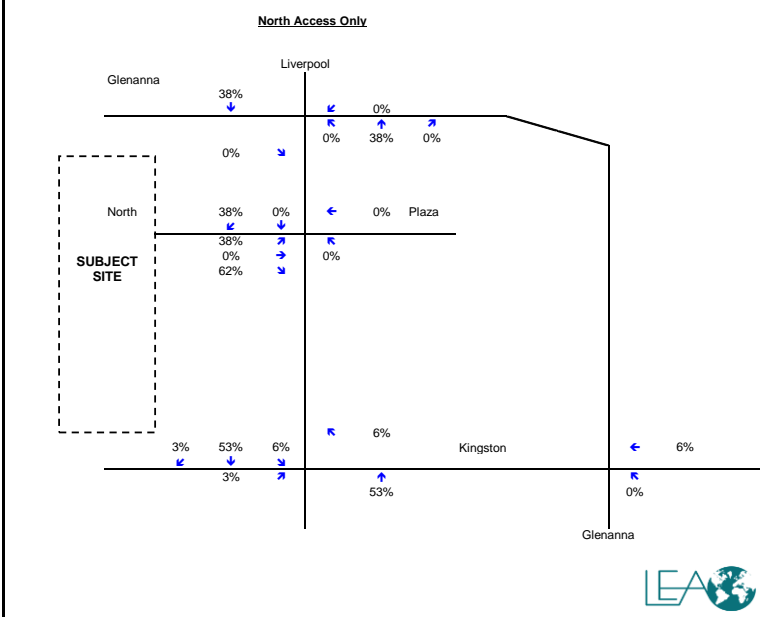
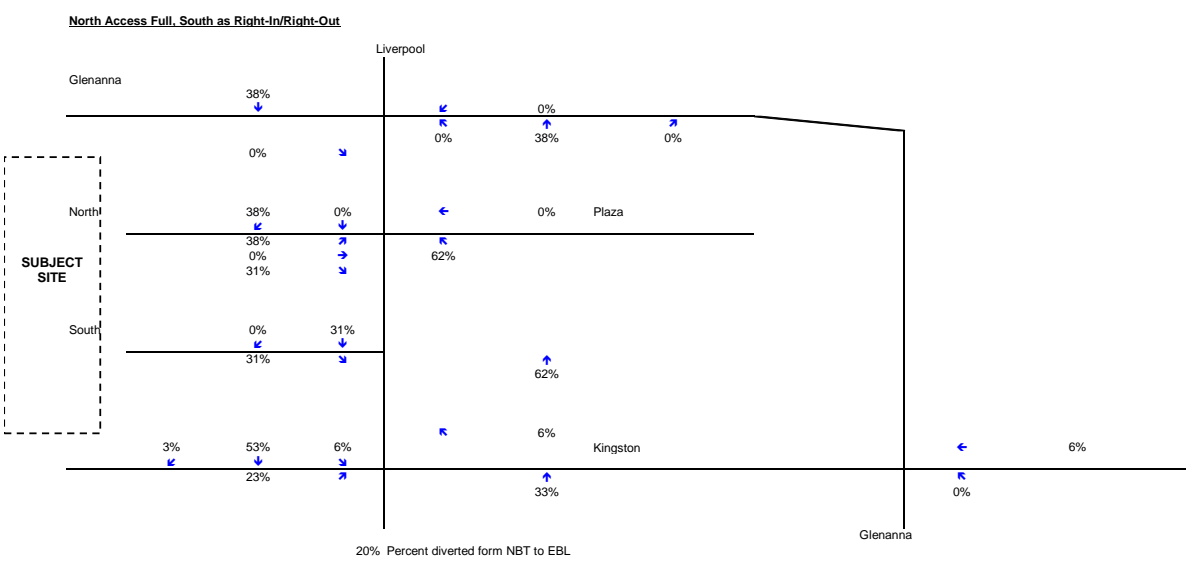
(Start time of trip - start\_time In 700-900  
 and  
 Primary travel mode of trip - mode\_prime In D,M,T,P  
 and  
 Trip purpose - trip\_purp In 1, 2  
 and  
 2006 GTA zone of origin - gta06\_orig In 1040  
 and  
 2006 GTA zone of destination - gta06\_dest In 1-9999)

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/Wellesley	SB Liverpool, WB Hwy 401 / SB DVP
491	40	Toronto	West	SE McCowan/Hwy 401	SB Liverpool, WB Hwy 401
560	9	Toronto	West	N Morningside/Kingston	SB Liverpool, WB On Kingston
623	10	Toronto	West	NE Morningside/Sheppard	SB Liverpool, WB Hwy 401
1051	21	Durham	South	SE Liverpool/Hwy 401	SB Liverpool, EB Bayly
1053	8	Durham	South	SE Sandy Beach/Bayly	SB Liverpool, EB Bayly
1088	62	Durham	Southeast	SE Church/Bayly	SB Liverpool, EB Bayly
1152	13	Durham	East	NW Brock St/Bayly	SBT Kingston, EB Pickering Pkwy, SB Brock Rd., EB Hwy 401 (25%) and SBL Kingston, EB to SB Brock (75%)
1199	19	Durham	East	NE Simcoe/King St. E.	SBT Kingston, EB Pickering Pkwy, SB Brock Rd., EB Hwy 401 (25%) and SBL Kingston, EB to SB Brock (75%)
2072	71	York	Northwest	NW Hwy 400/Rutherford	NB Liverpool, WB Hwy 407, WB Rutherford
2371	54	York	Northwest	NE Hwy 404/Steeles	SB Liverpool, WB Hwy 401, NB Hwy 404
2387	44	York	Northwest	NE Rodick/Apple Creek	NB Liverpool, WB Hwy 407, NB Warden
2401	17	York	Northwest	NE Birchmount/Denison	NB Liverpool, WB Hwy 407, SB Kennedy
2715	33	York	Northwest	NE Hwy 48/Bethesda Sdrd	NB Liverpool, WB Hwy 407, NB Markham
9998	30	External, Undefined	North, East West	33% N, 33% W, 33% E	33% NB, 17% WB Hwy 401, 16% WB Kingston, 17% EB Hwy 401,
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
75%	25%					10	3	0	0	0	0
75%	25%					14	5	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
						28	246	13	0	175	0
						462					
						6%	53%	3%	0%	38%	0%



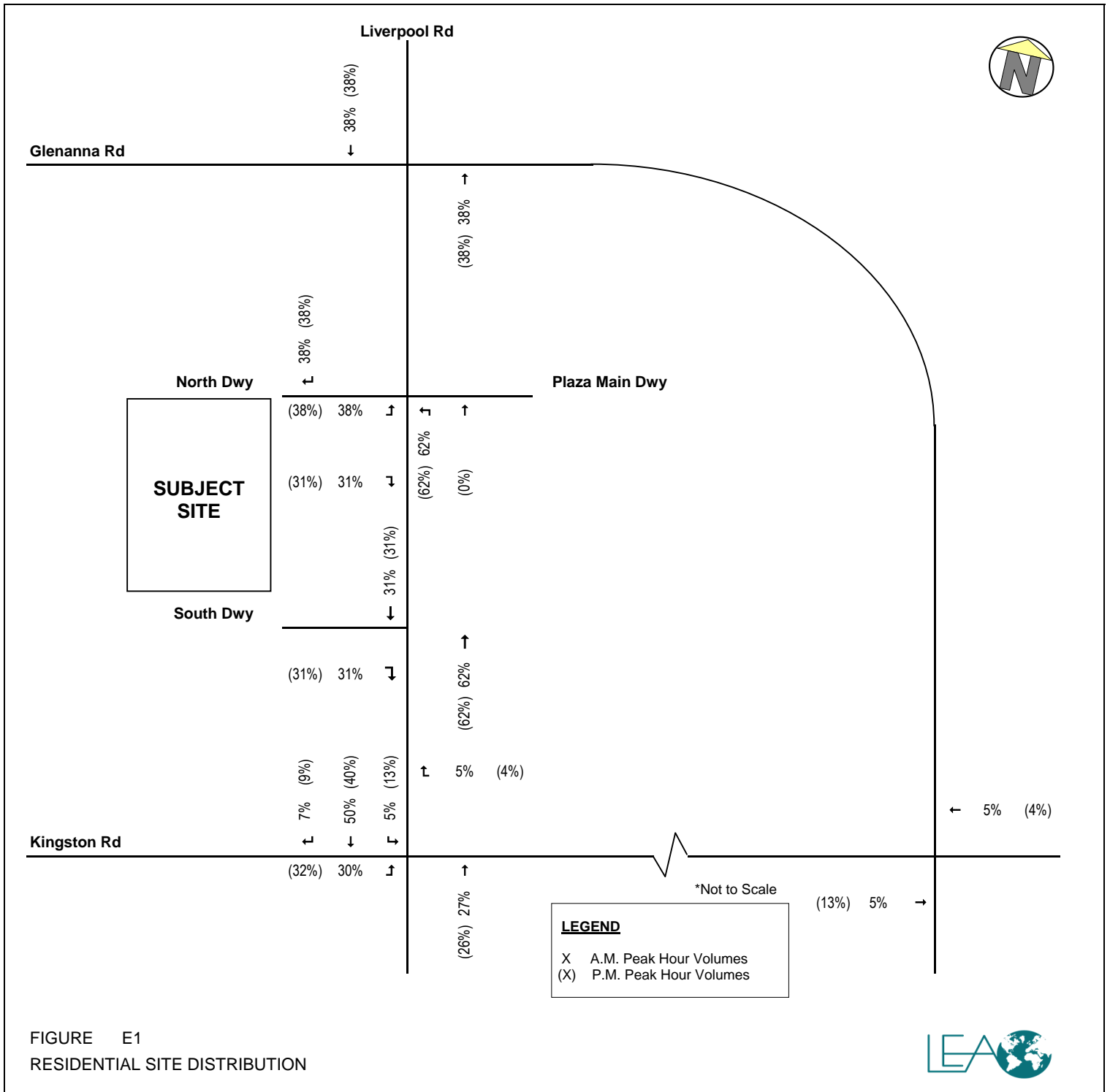


FIGURE E1  
RESIDENTIAL SITE DISTRIBUTION



#### Step 4. Estimate Anticipated Internal Capture Rate Between Each Pair of Land Uses

Tables 7.1 and 7.2 present unconstrained internal capture rates that have been estimated on the basis of a series of studies conducted in Florida. These are the only data available to ITE prior to publication that are detailed enough for credible use. Readers are encouraged to collect and submit additional data to ITE using procedures described in Section 7.7. As the best available applicable data, it is recommended that these internal capture rates be used unless local data are collected.

#### SAMPLE PROBLEM (continued)

#### Step 4. The sample worksheet in Figure 7.3 shows the recorded "internal capture" rates for each pair of land uses.

Estimate the interaction between each pair of land uses for the selected time period.

◆ Use Tables 7.1 and 7.2 (or local data) as the basis for the estimate. (Note: there are no data provided for the weekday morning peak period or for the Saturday midday peak period.)

◆ Table 7.1 presents estimated unconstrained internal capture

rates for trip origins within a multi-use development. For example, during the weekday midday peak period, of all the vehicle-trips exiting an on-site office use, 2 percent of the trips could be destined for another on-site office use and 20 percent destined for on-site retail use.

◆ Table 7.2 presents estimated unconstrained internal capture rates for trip destinations within a multi-use development. For example, during the weekday midday peak period, of all the vehicle-trips entering an on-site retail use, 4 percent of the trips could originate at an on-site office use and 5 percent at an on-site residential use.

Record the estimated capture rates on the worksheet (in the boxes marked "demand").

◆ For each land use pairing, record four values; for example, for the pairing of retail and office uses, the following four values should be recorded:

- Percent of trips from on-site office destined to an internal retail destination
- Percent of trips to on-site retail originating from an internal office use
- Percent of trips from on-site retail destined to an internal office destination
- Percent of trips to on-site office originating from an internal retail use

◆ Each value represents the unconstrained demand (or maximum potential trip interaction between the two land uses), by direction.

Because of the limited database on trip characteristics at multi-use sites, the analyst is cautioned to review the particular characteristics of the multi-use development under analysis before using the factors presented in Tables 7.1 and 7.2. Specifically, the analyst must *assess whether each set of internal trip capture rates makes sense considering the particular individual land uses within the multi-use development.*

**If local data on internal capture rates by land use pair can be obtained, the local data should be given preference.**

The data in Table 7.1 are limited to trip interaction among the three land uses for which sufficient data were available. *If an on-site land use does not match a land use category in Table 7.1, either (1) collect local data to establish an internal capture rate, according to procedures described in Section 7.7 of this chapter; or (2) assume no internal capture.* (Note: although this assumption of no internal capture may be unrealistic, in the absence of any data it is better to overestimate off-site vehicle-trips.)

**Table 7.1 Unconstrained Internal Capture Rates for Trip Origins within a Multi-Use Development**

		WEEKDAY		
		MIDDAY PEAK HOUR	p.m. PEAK HOUR OF ADJACENT STREET TRAFFIC	DAILY
from OFFICE	to Office	2%	1%	2%
	to Retail	20%	23%	22%
	to Residential	0%	2%	2%
from RETAIL	to Office	3%	3%	3%
	to Retail	29%	20%	30%
	to Residential	7%	12%	11%
from RESIDENTIAL	to Office	N/A	N/A	N/A
	to Retail	34%	53%	38%
	to Residential	N/A	N/A	N/A

Caution: The estimated typical internal capture rates presented in this table rely directly on data collected at a limited number of multi-use sites in Florida. While ITE recognizes the limitations of these data, they represent the only known credible data on multi-use internal capture rates and are provided as illustrative of typical rates. **If local data on internal capture rates by paired land uses can be obtained, the local data may be given preference.**

N/A—Not Available; logic indicates there is some interaction between these two land uses; however, the limited data sample on which this table is based did not record any interaction.

**Table 7.2 Unconstrained Internal Capture Rates for Trip Destinations Within a Multi-Use Development**

		WEEKDAY		
		MIDDAY PEAK HOUR	p.m. PEAK HOUR OF ADJACENT STREET TRAFFIC	DAILY
to OFFICE	from Office	6%	6%	2%
	from Retail	38%	31%	15%
	from Residential	0%	0%	N/A
to RETAIL	from Office	4%	2%	4%
	from Retail	31%	20%	28%
	from Residential	5%	9%	9%
to RESIDENTIAL	from Office	0%	2%	3%
	from Retail	37%	31%	33%
	from Residential	N/A	N/A	N/A

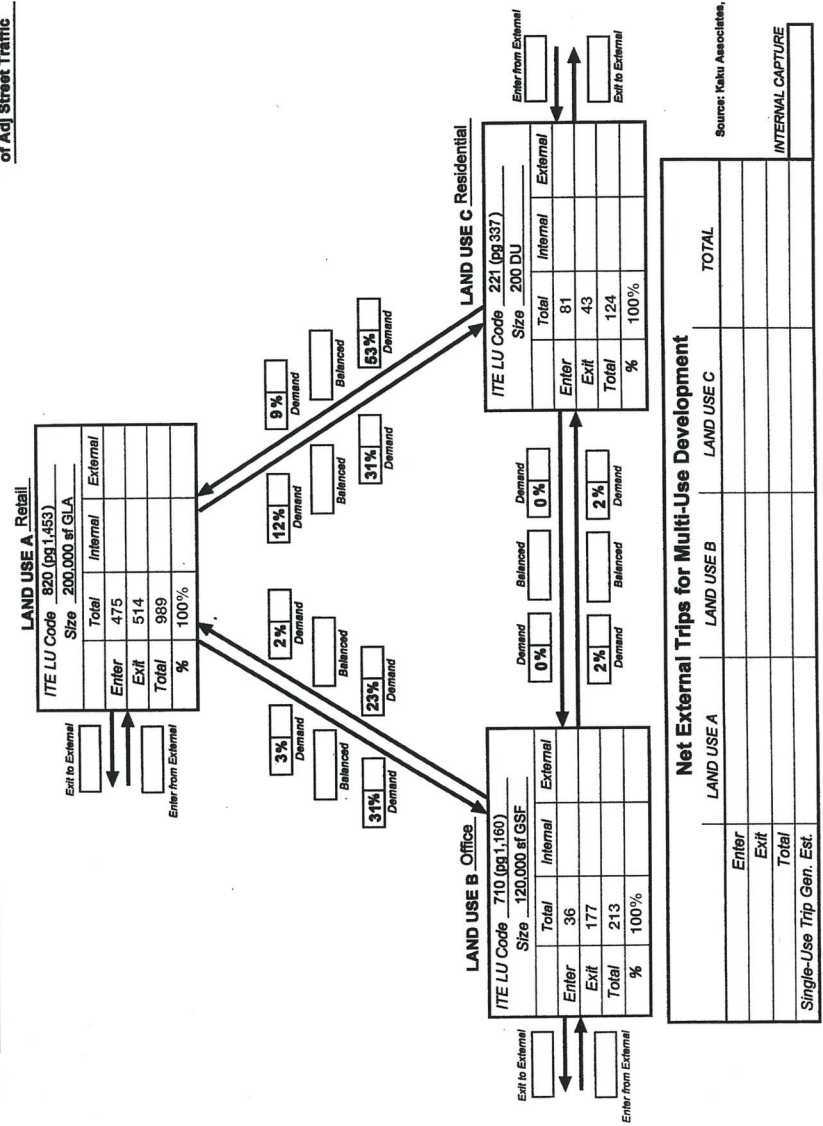
Caution: The estimated typical internal capture rates presented in this table rely directly on data collected at a limited number of multi-use sites in Florida. While ITE recognizes the limitations of these data, they represent the only known credible data on multi-use internal capture rates and are provided as illustrative of typical rates. **If local data on internal capture rates by paired land uses can be obtained, the local data may be given preference.**

N/A—Not Available; logic indicates there is some interaction between these two land uses; however, the limited data sample on which this table is based did not record any interaction.

Analyst: \_\_\_\_\_  
Date: \_\_\_\_\_

Name of Project: \_\_\_\_\_  
Time Period: PM Peak Hour  
of Adj Street Traffic: \_\_\_\_\_

**Figure 7.3 Step 4 for Multi-Use Trip Generation Calculation Sample Problem**



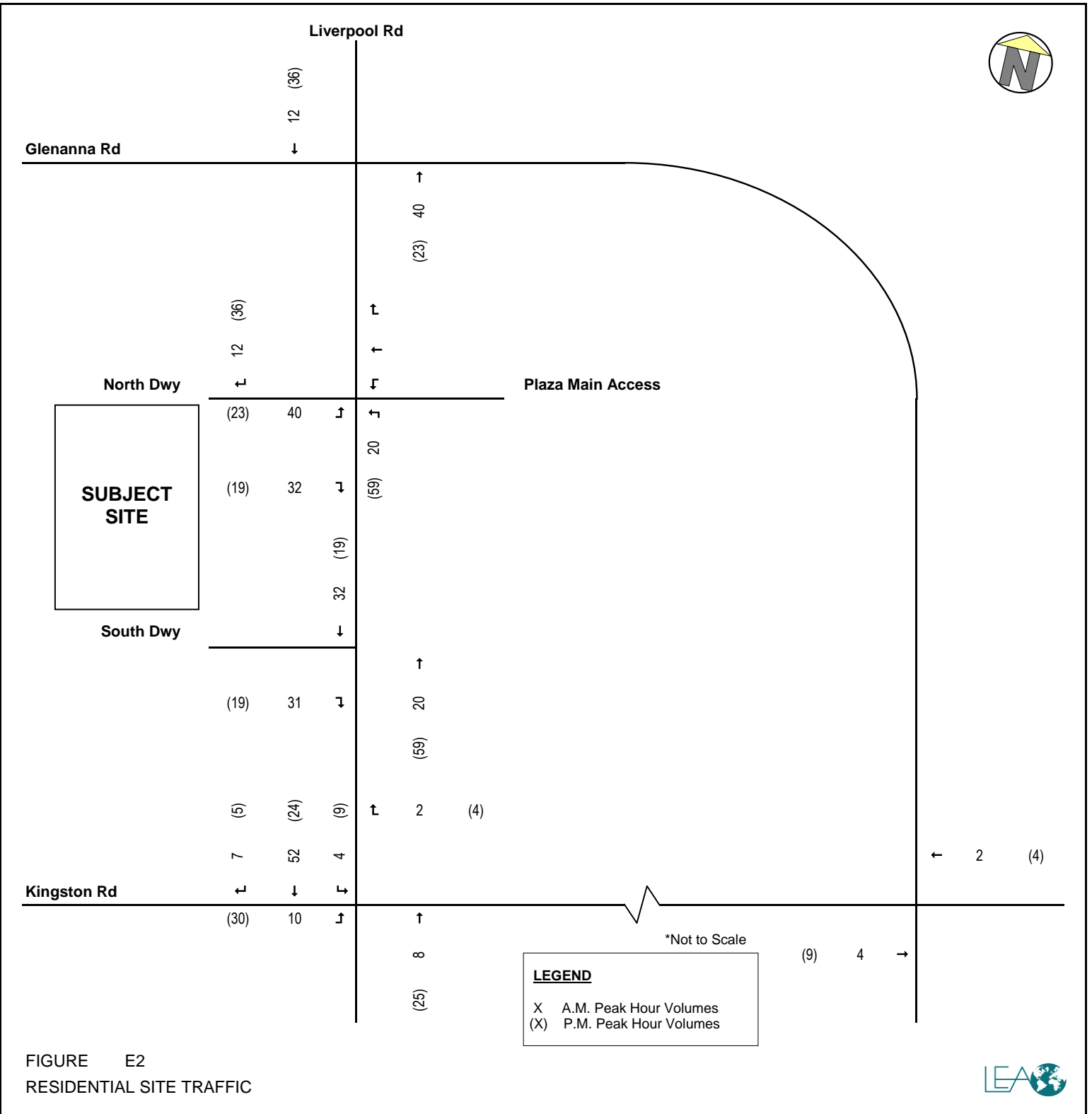


FIGURE E2  
RESIDENTIAL SITE TRAFFIC



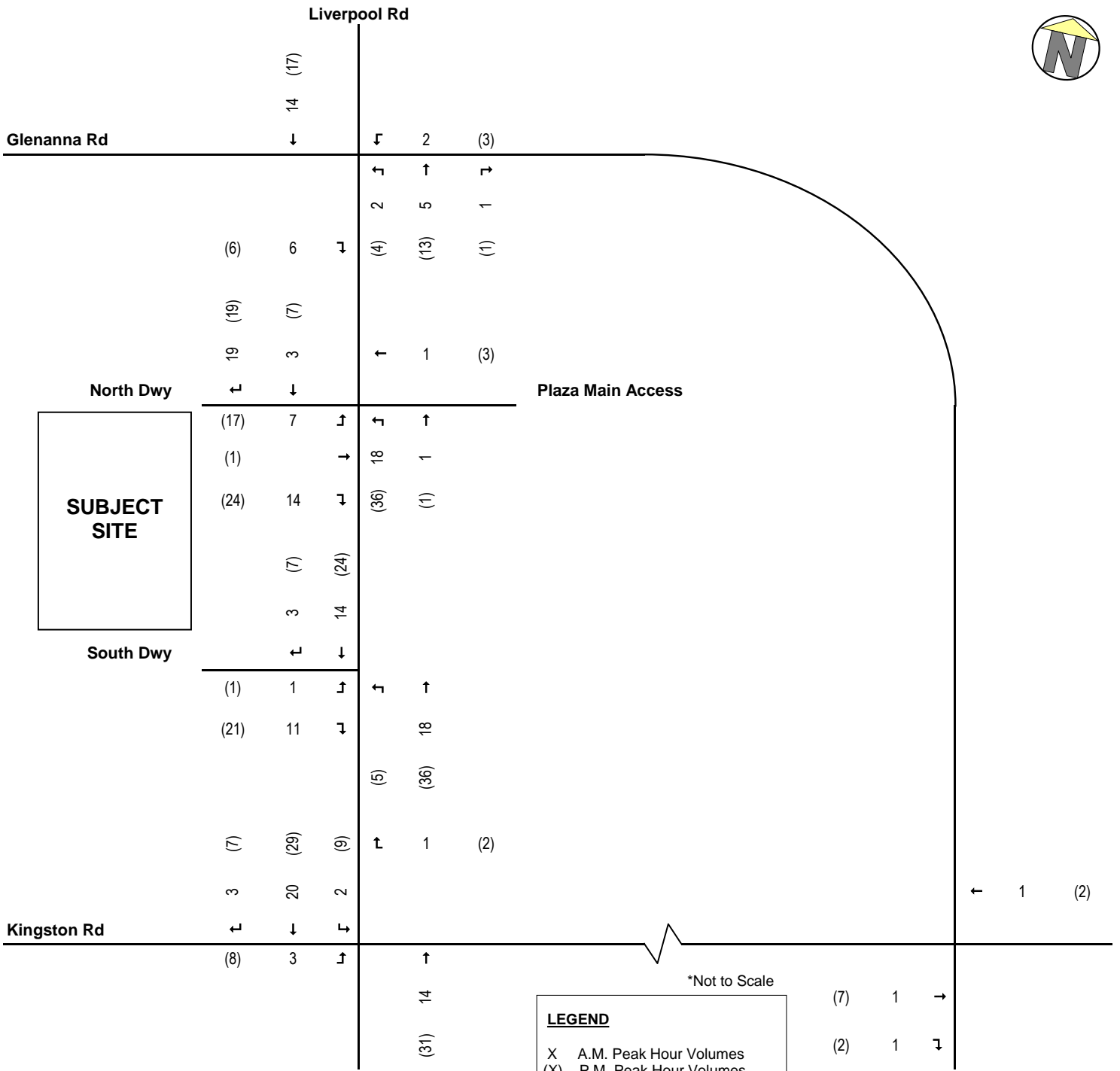


FIGURE E3  
 EXISTING SITE PEAK TRAFFIC





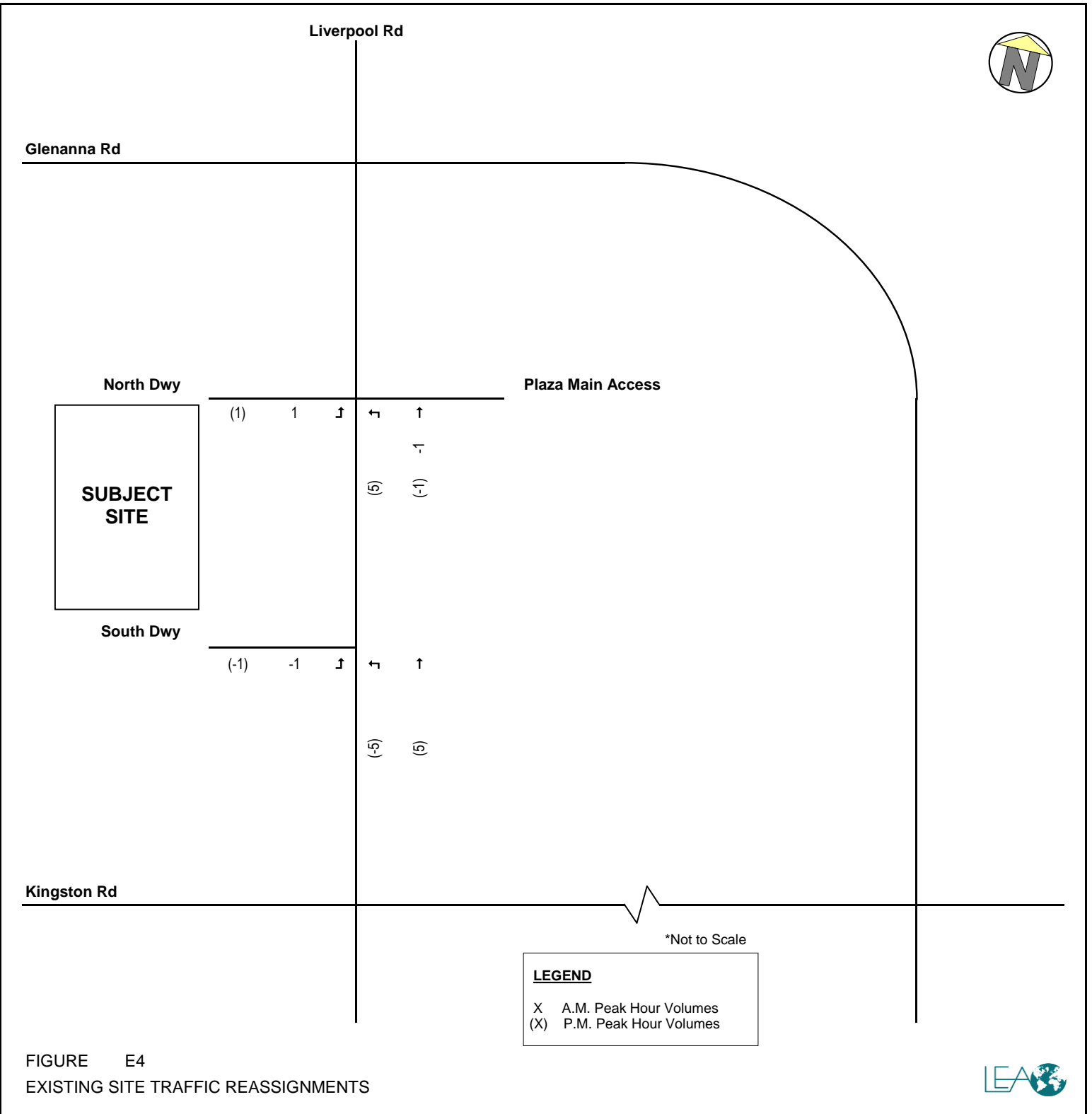


FIGURE E4  
EXISTING SITE TRAFFIC REASSIGNMENTS

**LEGEND**  
X A.M. Peak Hour Volumes  
(X) P.M. Peak Hour Volumes

\*Not to Scale



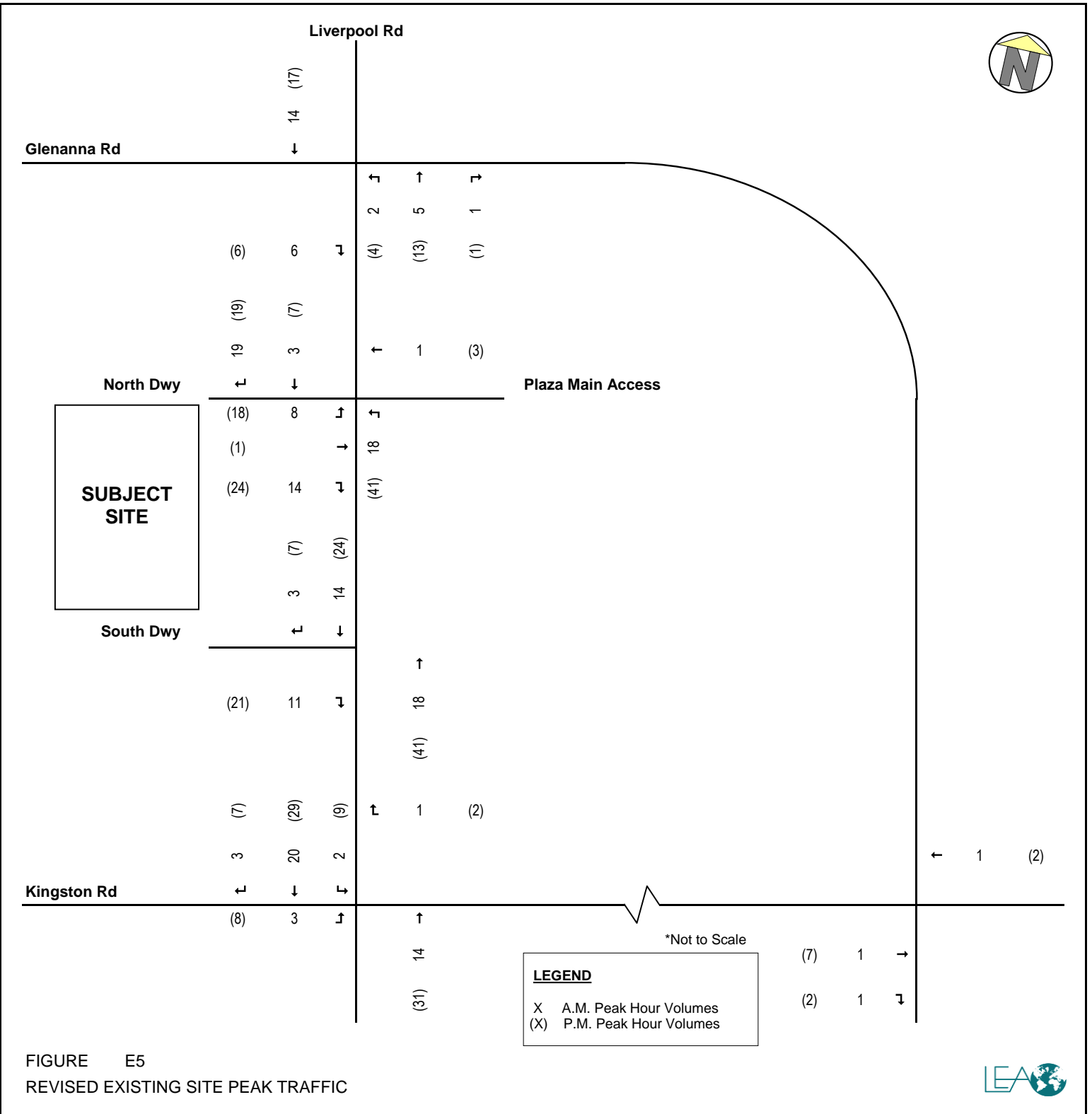


FIGURE E5  
 REVISED EXISTING SITE PEAK TRAFFIC



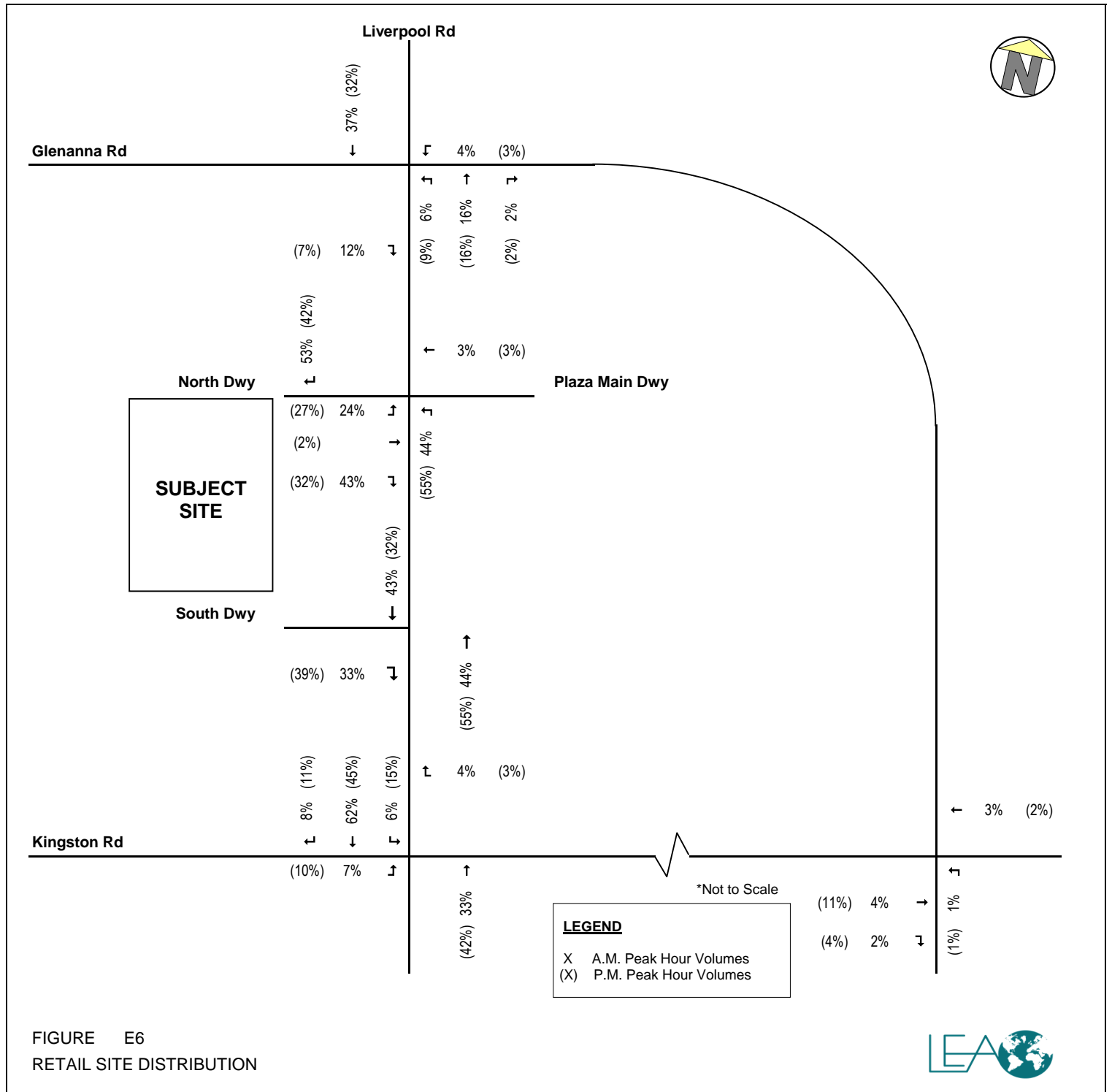


FIGURE E6  
RETAIL SITE DISTRIBUTION



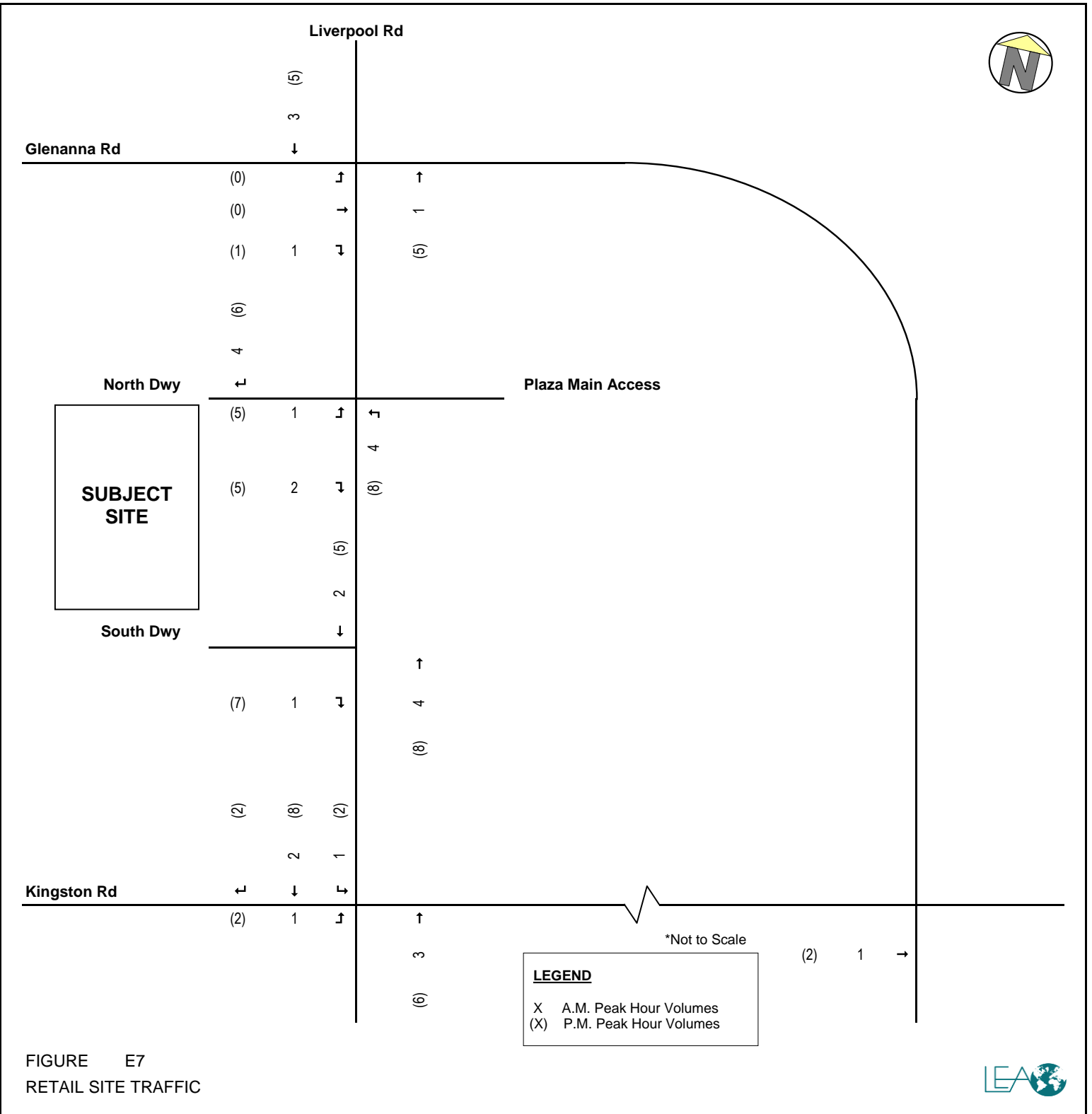


FIGURE E7  
RETAIL SITE TRAFFIC

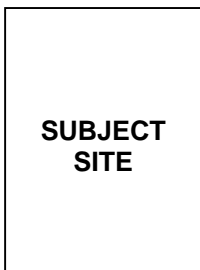




Liverpool Rd

Glenanna Rd

North Dwy



South Dwy

Plaza Main Dwy

	64% (28%)			
	↓			
		-64% (-28%)		
	↑			
(72%)	36%	↑	↑	↑
(28%)	64%	↓	(72%)	(-72%) -36%

Kingston Rd

\*Not to Scale

**LEGEND**

X A.M. Peak Hour Volumes  
(X) P.M. Peak Hour Volumes

FIGURE E8  
RETAIL PASSBY SITE DISTRIBUTION (2 Accesses)



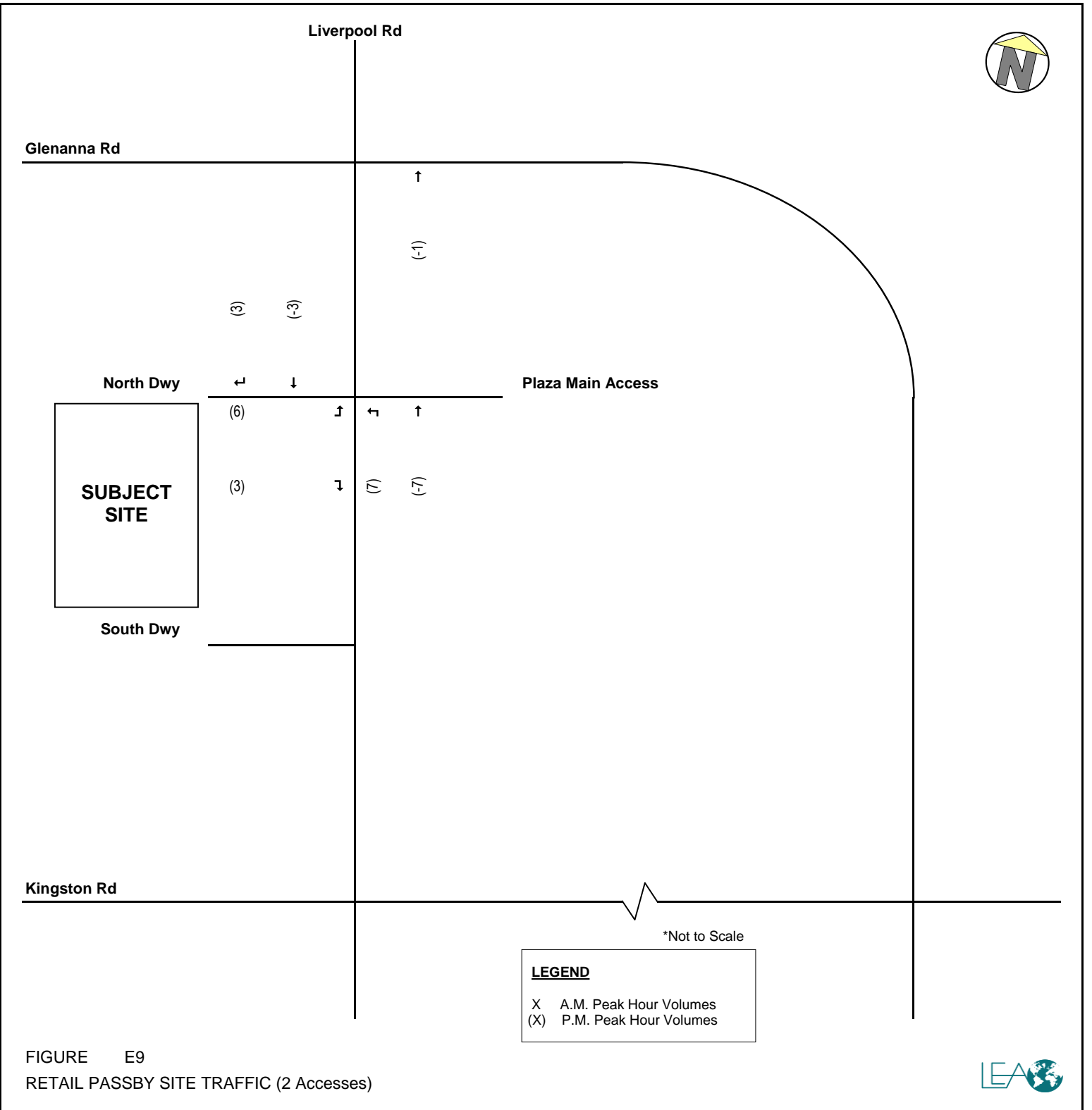


FIGURE E9  
RETAIL PASSBY SITE TRAFFIC (2 Accesses)



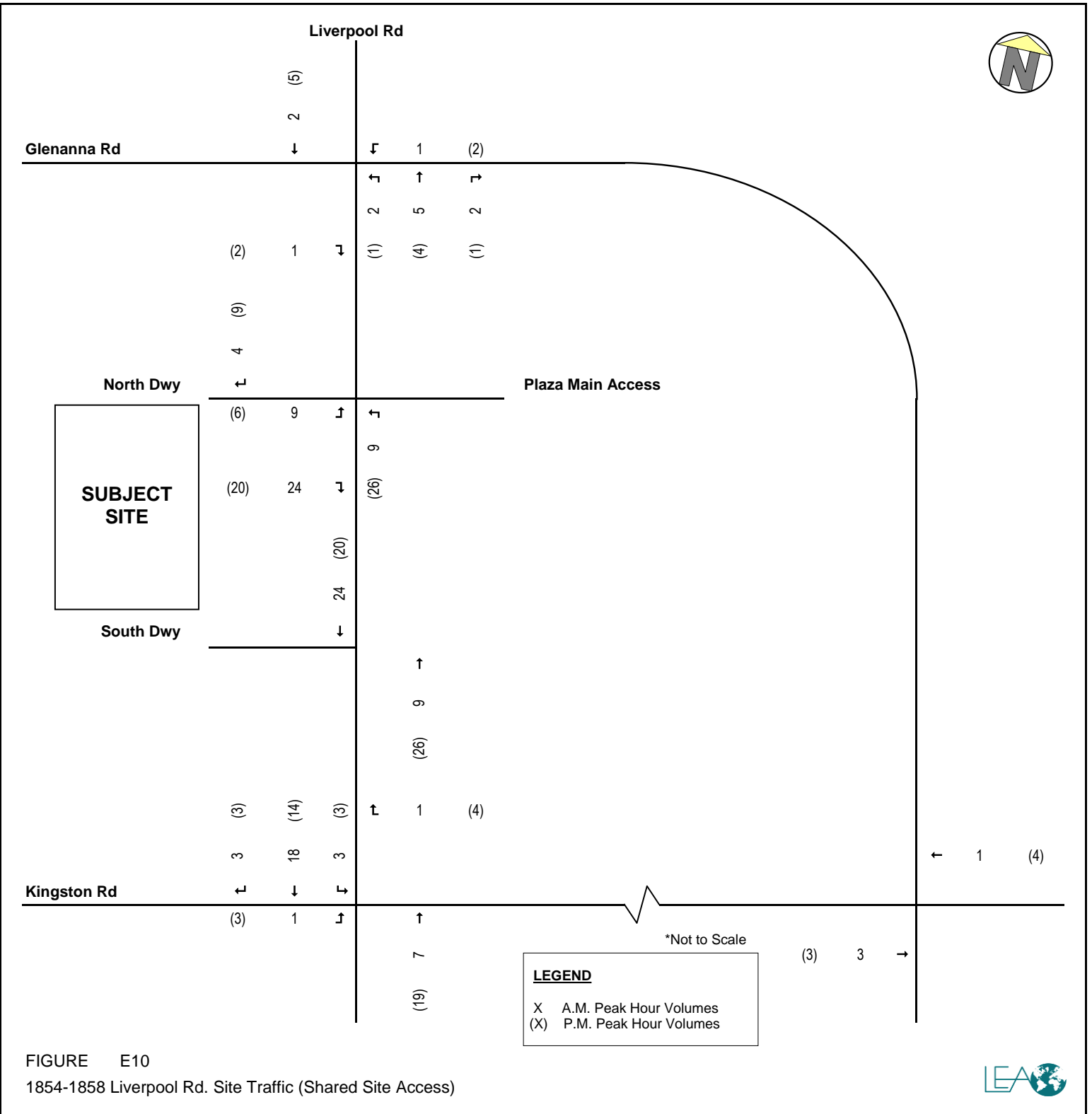


FIGURE E10  
 1854-1858 Liverpool Rd. Site Traffic (Shared Site Access)





# APPENDIX F

Memorandum: Site Access Options Review





# MEMORANDUM

July 31, 2020

Reference No.: 19225

**TO:** Melanie Hare, Tatjana Trebic, Urban Strategies  
David Butterworth, Kirkor Architects  
Muky Rajadurai, Altona Group

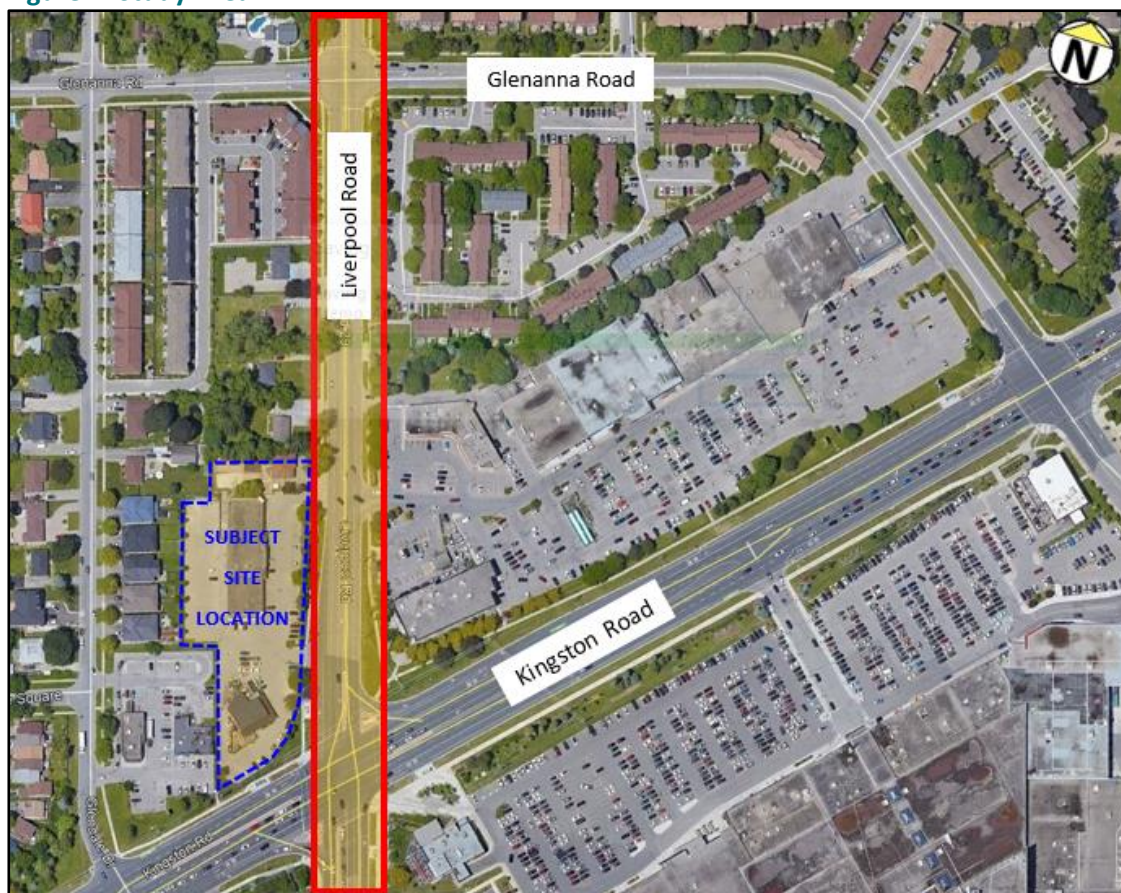
**FROM:** Nixon Chan / Anatole Kung

**CC:**

**RE: Site Access Options Review for 1294 Kingston Road, 1848 & 1852 Liverpool Road.**

This memo was prepared to summarize different access options that were discussed with Durham Region and City of Pickering staff during a meeting on January 16<sup>th</sup>, 2020. It is understood that a comparative assessment to Liverpool Road traffic flow is sought. This review also evaluated the location of a midblock traffic signal between Kingston Road and Glenanna Road. **Figure 1** shows the subject site and highlights the area for analysis.

**Figure 1: Study Area**





**1. Option Descriptions**

Seven options were reviewed to determine the most appropriate access arrangement and Liverpool Road corridor operations. Full build-out for the subject site is anticipated for 2023. Future traffic conditions were analyzed for five-years after full build-out, or 2028. For all future scenarios, background corridor traffic was increased by 0.5% per year. The general area has stagnant growth with no known development plans except at the City Centre Area are known. Subsequently, any increase in traffic was applied to through movements on Kingston and Liverpool Roads.

Each access option is summarized in **Table 1** with additional information provided below. Conceptual drawings of each access option can be found in **Appendix A**.

**Table 1: Summary of Access Scenarios**

Options	Subject Site		Main Plaza Driveway
	North Driveway	South Driveway	
0	Unsignalized	Existing Configuration	Existing location
1	Aligned with the Main Plaza Driveway to the east, and signalized	Channelized Right-In/Right-Out	
1A		Right-In/Right-Out with extended median on Liverpool Road	
2		Right-out only	
3		Access removed	
4	Shifted to align at the north property line, and signalized	Right-out only	Aligned with North Driveway
4A			

Option 0

This option maintains the current access arrangement with both subject site driveways operating as unsignalized intersections. The south and north driveways are situated approximately 63 and 142 metres north, respectively, from the Liverpool/Kingston intersection. Unless otherwise noted, the following access options include the following transportation elements:

- ▶ South Driveway was relocated 20 metres north of its current location.
- ▶ A new signalized intersection at the North Driveway at Liverpool Road was reviewed with a 100 second cycle length. East-west movements operate with a left and a shared through-right turn lane. Centre two-way left turn lane at the North Driveway was replaced with exclusive left turn lane with 30 metre of storage space.
- ▶ Southbound left storage space at Kingston Road reduced from 50 metres to 30 metres.
- ▶ An optimized timing plan was applied to the Liverpool/Kingston intersection during the PM Peak Hour.

Options 1 and 1A

This access option includes a traffic signal at the north driveway and retains its current location. The south driveway allows right-in and right-out movements with a median pork chop to discourage left turn movements.



Option 1A is similar to Option 1 but as a means to remove any left turns at the south driveway, the centre median on Liverpool Road is extended from Kingston Road to the North Driveway.

#### Option 2

Option 2 is similar to the Options 1/1A except the South Driveway permits only outbound right movements. This driveway curbs will be constructed to channelize all site traffic south towards Kingston Road.

#### Option 3

Option 3 reviews the conditions where the south access is closed, and all site access occurs at the North Driveway. Similar to the previous options, the North Driveway maintains its current location and lane configurations.

#### Option 4

Under this option, the North Driveway is moved 25 metres north to approximately 167 metres north of the Liverpool/Kingston intersection. This new North Driveway is centred at the north property line. The Main Plaza Driveway, to the east, maintains its current location, which forms an intersection with offsetting driveways at the east and west legs. This intersection layout requires customized signal timing plans given the potential for north and south left movements conflict if moving simultaneously. We have examined two different timing plans and these plans are further described in the Intersection Capacity Analysis section.

1. Dedicated phase per approach; and
2. Split north and south left turn phase, north-south common phase and split phase for east and west movements.

The south driveway allows only outbound right movements.

#### Option 4A

The operation of this access option is similar to Option 2, but the entire North Driveway/Main Plaza Access intersection is shifted approximately 25 metres north to be aligned at the north property line. The south driveway allows only outbound right movements, which is the same as Option 2.

#### Background Development: 1854-1858 Liverpool Road

Background trips include site traffic for the property north of the subject site with an address of 1854-1858 Liverpool Road; it include 98 units with site access connection connecting or sharing with the subject property, depending on the Options being analyzed. All relevant site traffic was assigned to the North Driveway intersection.

## **2. Trip Generation**

The subject site is proposed to be redeveloped with a mixed-use development with two residential towers and ground floor commercial space. A 25-storey tower, and a 13-storey midrise building. Restaurant or other active commercial/retail use make up 1,332 m<sup>2</sup> along the Liverpool and Kingston Road frontages of the new buildings and the retained Old Liverpool House. Development proposal statistics are summarized in **Table 2**.



**Table 2: Subject Site Building Statistics**

Buildings	Retail GFA (m <sup>2</sup> )	Number of Residential Units
Building A - Apartment Units	-	217
Building A – At-grade Retail	370	-
Building B - Apartment Units	-	258
Building B - At-grade Retail	519	--
Retained Old Liverpool House (Retail)	442	--
<b>TOTAL</b>	<b>1,332</b>	<b>495</b>

Trip generation for the apartment units was calculated based on the Institute of Transportation Engineers (ITE) Trip Generation Manual 10<sup>th</sup> Edition, Land Use Code 222 (Multifamily Housing/High-Rise). Trip generation for the retail/commercial uses was generated by applying the Land Use Code 820 (Shopping Center). The existing site distribution was applied for these site trips. To be conservative, we calculated the number of site trips based on 500 units. For the retail/commercial component, we assumed a total size of 1,350 m<sup>2</sup>.

The mix of residential and retail/commercial use is subject to site interaction trips and a 10% reduction for transit trips. Total proposed development generates about 150-210 of two-way trips during the respective peak hours. **Table 3** summarizes the site trip generation values.

**Table 3: Site Trip Generation**

Land Use	Number of Units	Size (m <sup>2</sup> )	AM Peak Hour			PM Peak Hour		
			In	Out	Total	In	Out	Total
Apartment	500		37	116	153	109	70	179
Retail		1,350m <sup>2</sup>	9	5	14	26	29	55
Site Interaction	-		-2	-2	-4	-5	-5	-10
Transit Reduction (10%)	-		-4	-12	-16	-11	-7	-18
<b>Total</b>	<b>500</b>	<b>1,350</b>	<b>70</b>	<b>107</b>	<b>147</b>	<b>119</b>	<b>87</b>	<b>206</b>

In discussion with the Region staff, it was determined that growth in the general area has remained stagnant. A growth rate of 0.5% was recommended by Region staff for this study. Full build-out is expected by 2023. Future traffic analyses were reviewed for 2028 and it is assumed the background development to the north will also be completed.

The land uses north and west of the subject site contain low density residential uses. Growth in the general area was deemed stagnant according to the Region. Future long terms plans include land use intensification to the Pickering City centre area but the timeline for completion is uncertain at this time. Since there are no potential sources for new traffic generation in the general area, any volume increase will be added to the through movements on Liverpool and Kingston Roads.



### 3. Base Evaluation Criteria

Each access option was compared operationally. Four performance measures were examined:

1. Intersection capacity results and movement delay times.
2. Sufficient left turn storage space and taper space use on Liverpool Road.
3. Travel time and average speed on Liverpool Road.
4. Safety Issues.

Each of these performance measures are explained further below.

#### Intersection Capacity Analysis

This analysis was used to identify any constraints to a turning movement. Typical measures reviewed include volume/capacity, movement delay and queuing. Intersection capacity analysis was conducted 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.

**Figures 2 and 3** show the existing and future total traffic volumes with current access arrangements and Option 1/1A, respectively. **Figures 4 to 7** contain the 2028 Future Total traffic volumes for Options 2, 3, 4, and 4A, respectively.



Figure 2: Existing Traffic Volumes

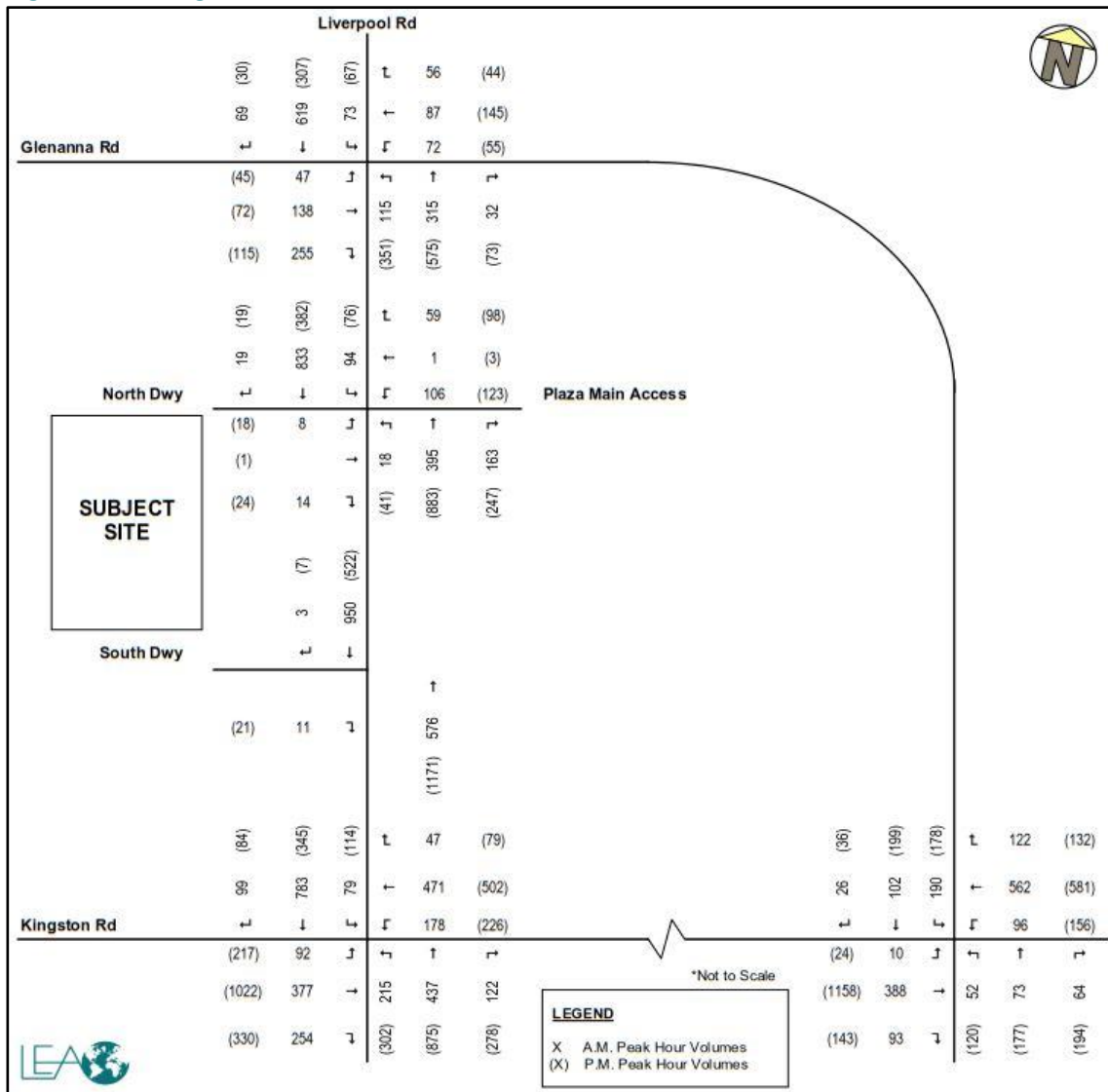






Figure 3: Future Total Traffic Volumes – Option 0 & 1/1A

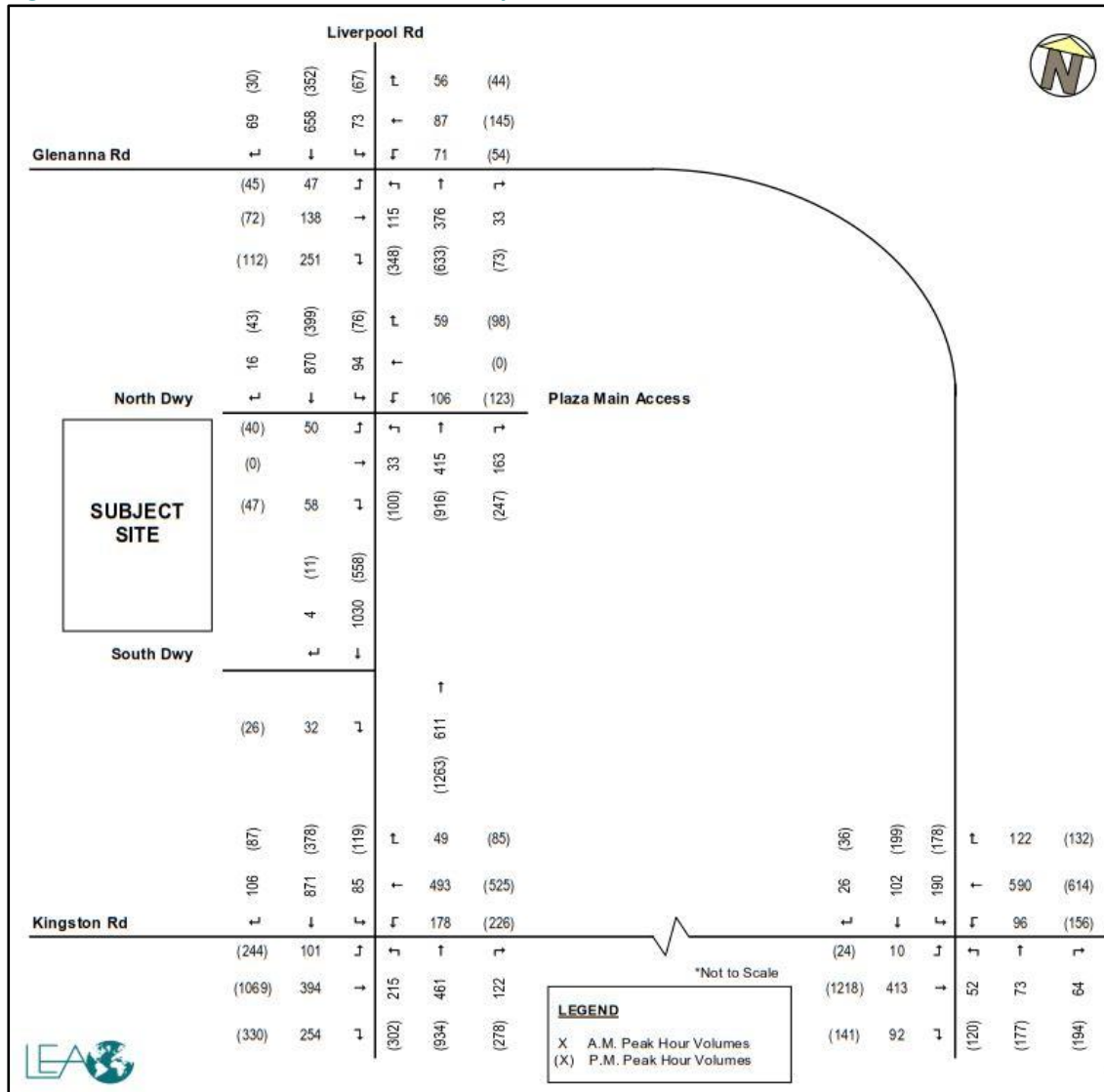




Figure 4: Future Total Traffic Volumes – Option 2

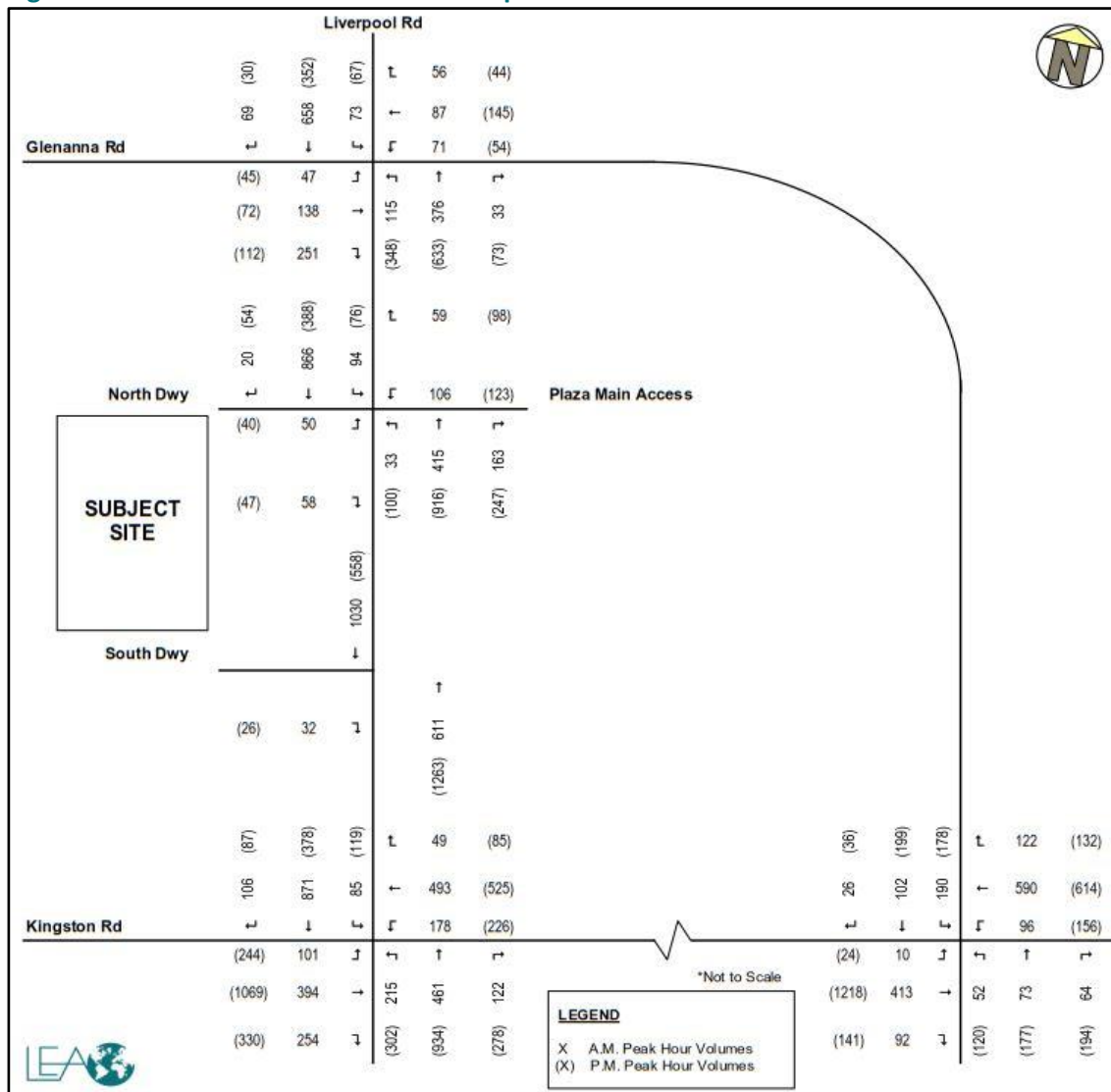






Figure 5: Future Total Traffic Volumes – Option 3

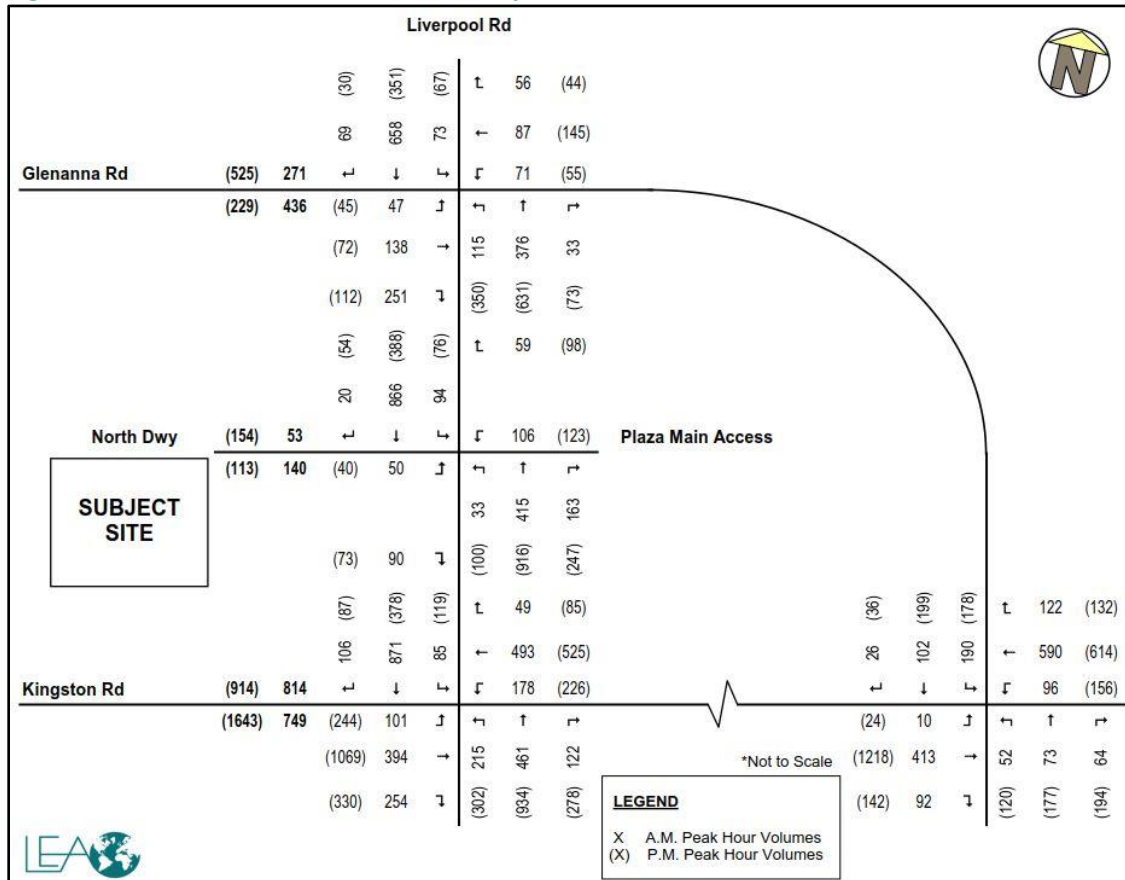




Figure 6: Future Total Traffic Volumes – Option 4

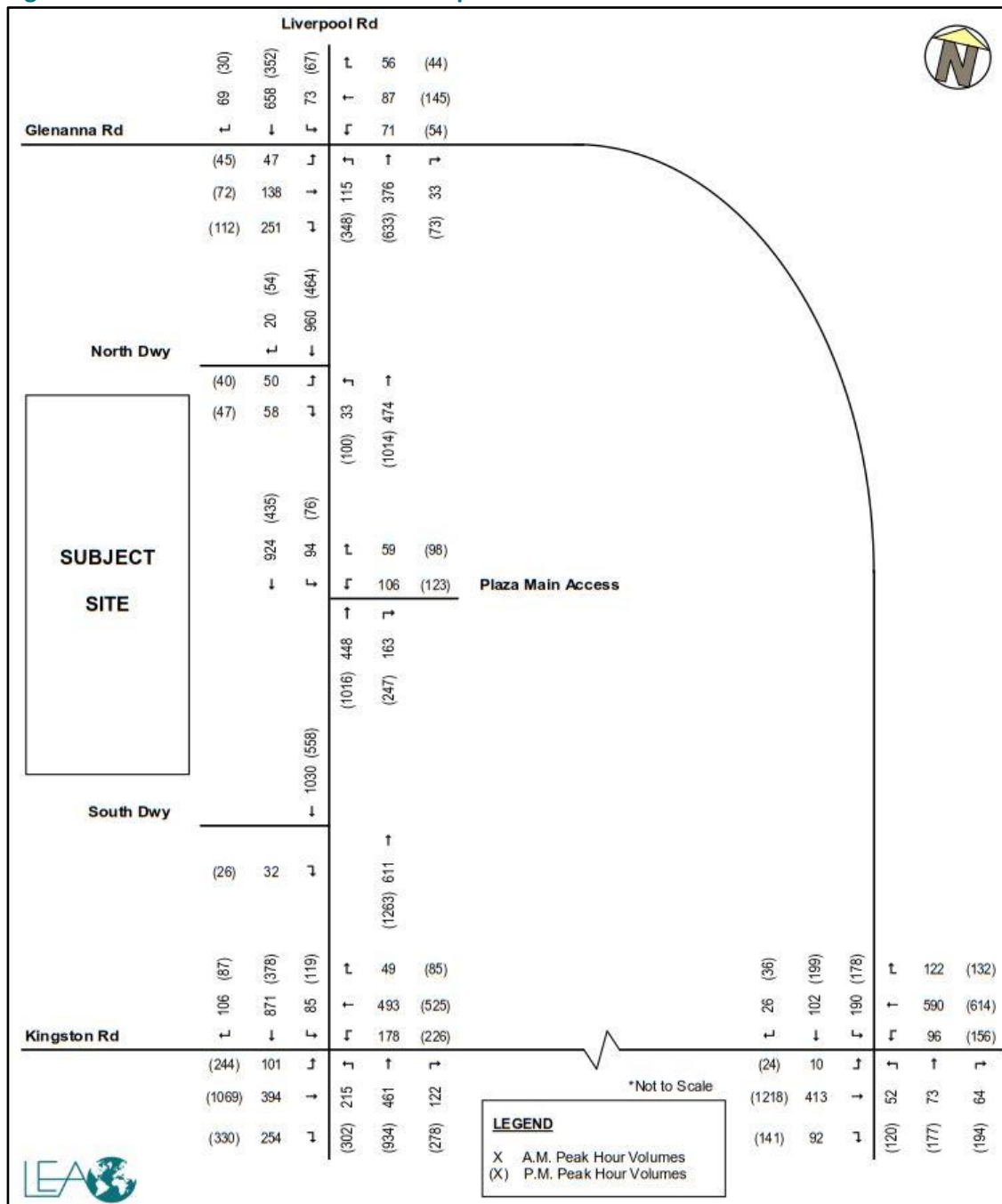
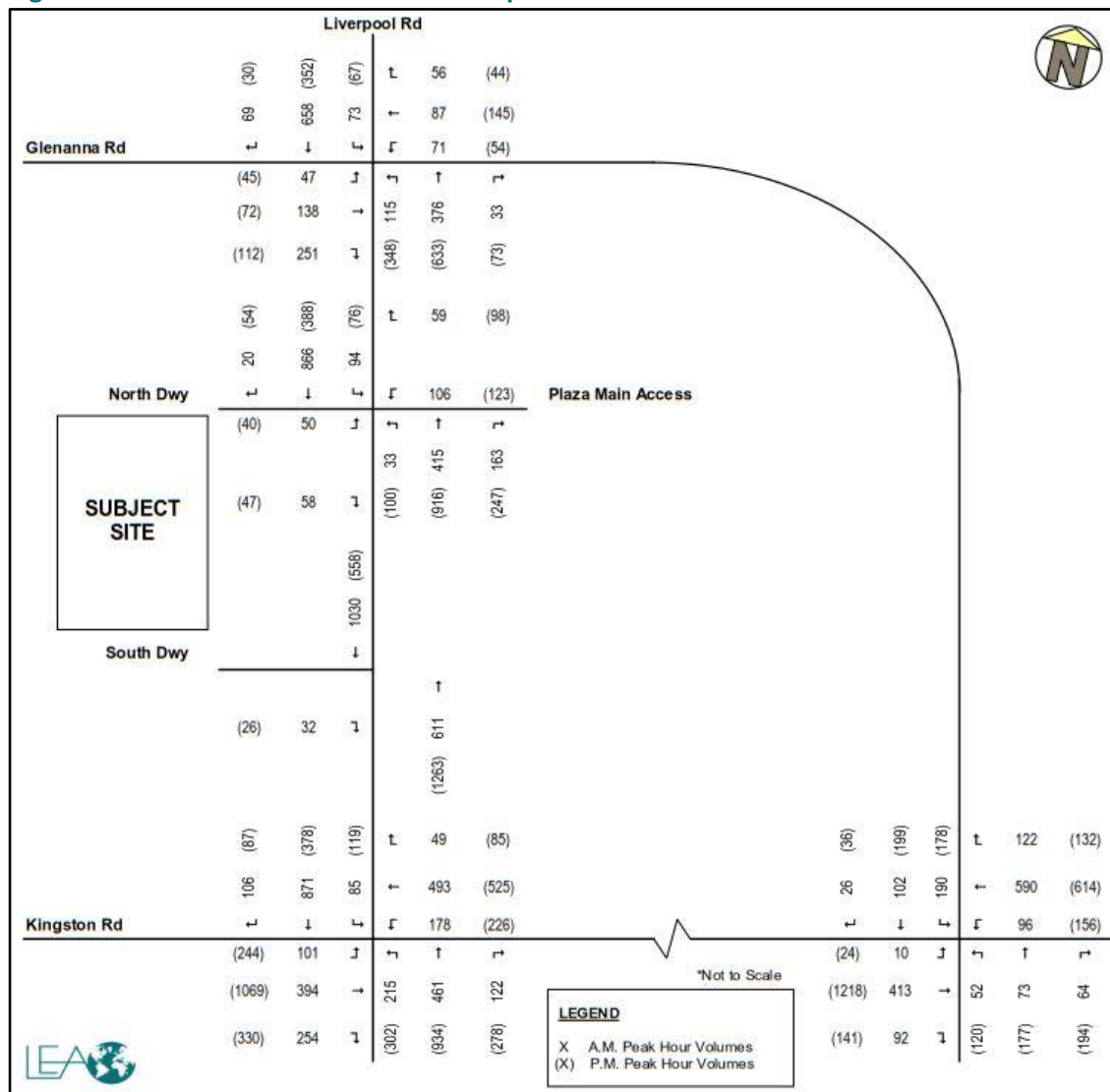




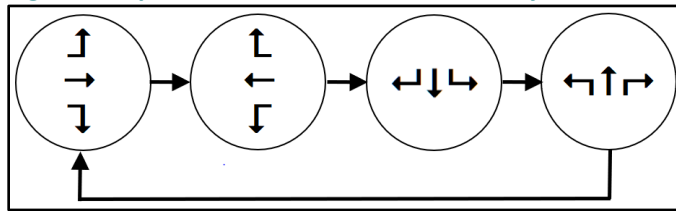
Figure 7: Future Total Traffic Volumes – Option 4A



For the North Driveway intersection signal timing plan, most of them would run on a typical phasing structure, except Option 4 when the east and west legs were offset as a customized phasing plan was applied. Safety issues were identified, and the timing plans applied in this review are discussed below. Detailed safety discussion is provided in the Traffic Operations Safety section.

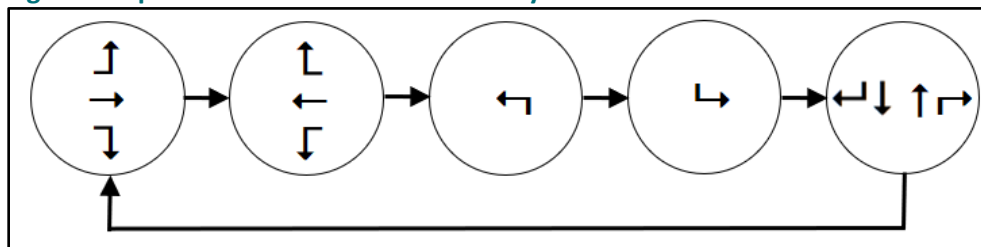
Phasing Plan P1 is a protected phase by approach which allows only one approach to progress through the intersection with no right turns on red permitted. **Figure 8** show the phasing order. As a result of the separated/protected phasing plan for each of the four approaches, the green time available for the heaviest movement of north-south approach is reduced.

**Figure 8: Option 4-P1 at the North Driveway Intersection**



Phasing Plan P2 includes a permissive north-south phase with the north and south left turns running on a full-protected separated phase per direction as shown in **Figure 9**. The reason for separating the north and south left turns as split phases, instead of running them together as a north-south left turn phase, is due to the physical staggered position of the east-west legs. If the east leg is closer to the north and west leg is closer to the south (like a mirror flip of Option 4 configuration), the north-south left turn will not overlap each other when running on a concurrent phase. The P2 arrangement is proposed to resolve the safety issue.

**Figure 9: Option 4-P2 at the North Driveway Intersection**



**Table 4** compares the intersection capacity analyses with more detailed outputs found in **Appendix B**.

**Table 4: Summary of Signalized Intersection Capacity Analyses**

INTERSECTION	Existing Traffic			Option 0 (Base Case)			Option 1 & 1A			Option 2			Option 3			Option 4 (Offsetting Driveways)								
	V/C	Delay	LOS	V/C	Delay	LOS	V/C	Delay	LOS	V/C	Delay	LOS	V/C	Delay	LOS	Phasing Plan P1			Phasing Plan P2			Option 4A		
<i>AM Peak Hour</i>																								
Liverpool Rd at Kingston Rd	0.76	37	D	0.78	37	D	0.78	36	D	0.77	36	D	0.70	36	D	0.78	20	C	0.78	23	C	0.76	35	C
Liverpool Rd at North Dwy / Plaza Main Dwy							0.42	9	A	0.42	9	A	0.43	11	A	0.86	194	F	0.74	76	E	0.42	9	A
Liverpool Rd at Glenanna Rd	0.35	18	B	0.36	16.7	B	0.36	17	B	0.36	17	B	0.36	17	B	0.36	16	B	0.36	16	B	0.35	17	B
<i>PM Peak Hour</i>																								
Liverpool Rd at Kingston Rd	0.98	44	D	1.03	49	D	0.99	46	D	0.99	46	D	0.99	47	D	0.99	45	D	0.99	47	D	0.99	46	D
Liverpool Rd at North Dwy / Plaza Main Dwy							0.54	9	A	0.54	9	A	0.55	19	A	0.93	82	F	0.92	189	F	0.54	9	A
Liverpool Rd at Glenanna Rd	0.58	12	B	0.60	12	B	0.60	12	B	0.60	12	B	0.60	14	B	0.60	11	B	0.60	15	B	0.60	12	B

The following is a highlight of the analysis:

- Liverpool/Kingston: All options generally have the same Levels of Service (LOS) except Option 0 for PM where v/c ratio is slightly over 1.0.
- North Driveway: All options are expected to operate very similar condition except Options 4-P1 or P2, depending on the peak hours analyzed. Based on the analysis and/or the physical/phasing plan constraints, Option 4 is definitely not a preferred option.
- Liverpool/Glenanna: All options are expected to operate in very similar conditions.



Among all options assessed under capacity analysis, Options 1 to 3 are the better ones. Option 2 may be considered the best one given South Driveway being an outbound access and balanced between 0 and 2 movements allowed (Options 1 and 3).

**4. Liverpool Road Storage Length Assessment**

This section assesses the left turn storage space for the northbound left at the North Driveway and the southbound left at the Liverpool/Kingston intersection. Other than Option 4A, the combined storage and taper space between the two intersection is about 107 metres. The taper space between both intersections is a vehicle a deceleration lane but can also be used for any vehicle storage spillover. Ideally, sufficient vehicle storage length should be available to prevent vehicle spillover and impede into the through movement.

SimTraffic software was used to simulate the vehicle progression through the study area. Option 1A was not analyzed since median extension is introduced and the storage/taper lane would not be shared for the respective left turns. All outputs from the simulations are contained in **Appendix C**.

**Table 5** summarizes the queue values and the amount of taper space occupied. **Figures D1** and **D2** in **Appendix D** illustrates the extent of vehicle queues for the AM and PM peak hours, respectively.

**Table 5: Queuing, Storage and Taper Analysis Summary**

Access Option	Parameter	AM Peak Hour			PM Peak Hour		
		SBL Liverpool / Kingston	Combined Taper Area	NBL Liverpool Road at North Site Driveway	SBL Liverpool / Kingston	Combined Taper Area	NBL Liverpool Road at North Site Driveway
	<b>Storage Length (m)</b>	<b>50.0</b>	<b>31.6</b>	<b>25.9</b>	<b>50.0</b>	<b>31.6</b>	<b>25.9</b>
Existing Traffic	Average	14.6	0	2.5	16.3	0	3.7
	95th Percentile	33.3	0	8.5	29.1	0	10.2
	Maximum	31.5	0	8.1	29.9	0	8.3
0	Average	12.1	0	4.8	17.5	0	7.3
	95th Percentile	27.6	0	13.1	29.5	0	18.0
	Maximum	30.8	0.0	16.6	30.2	0	24.9
	<b>Storage Length (m)</b>	<b>30.9</b>	<b>45.7</b>	<b>30.0</b>	<b>30.9</b>	<b>45.7</b>	<b>30.0</b>
1	Average	11.5	0	5.2	19.8	0	7.3
	95th Percentile	25.2	0	14.1	33.1	0	17.5
	Maximum	30.1	0	19.3	30.2	0.0	25.7
2	Average	9.9	0	4.8	17.4	0	7.4
	95th Percentile	22.8	0	12.2	30.2	0	18.5
	Maximum	30.1	0	15.5	30.2	0	28.6
3	Average	13.6	0	5.5	20.2	0	17.0
	95th Percentile	32.7	1.9	14.7	36.7	15.3	39.4
	Maximum	37.4	6.6	22.2	35	11.5	37.3
4-P1	Average	8.6	0	5.5	19.1	0	13.3
	95th Percentile	19	0	25.7	31.9	11.0	41.0
	Maximum	24.5	7.4	37.4	29.9	7.4	37.4
4-P2	Average	11.4	0	7.8	20.8	0	20.7
	95th Percentile	25.8	0	30.6	34.4	14.1	44.1
	Maximum	30.1	7.4	37.4	30.2	7.4	37.4
	<b>Storage Length (m)</b>	<b>30.9</b>	<b>57.8</b>	<b>30.0</b>	<b>30.9</b>	<b>57.8</b>	<b>30.0</b>
4A	Average	11.4	0	7.1	17.2	0	14.8
	95th Percentile	27	0	18.8	30.4	2.7	33.1
	Maximum	30	0	29.6	31	7.3	37.3



Results show that in most circumstances, a minimal amount of vehicle queues occupy the taper space. The highest amount of taper space use is approximately 16 metres. The combined taper space value was used to calculate the theoretical number of vehicles that can occupy this space. Assuming a base vehicle length of 6.5 metres per vehicle, approximately 4-5 vehicles can be situated in the combined taper space with the current road configuration. **Table 6** summarized the potential number of vehicles occupying the combined taper length as storage.

**Table 6: Utilization of the Combined Taper Space**

Access Option	Parameter	AM Peak Hour					PM Peak Hour				
		SBL Liverpool / Kingston	Number of Vehicles Beyond Storage Area	Combined Taper Area	NBL Liverpool Road at North Site Driveway	Number of Vehicles Beyond Storage Area	SBL Liverpool / Kingston	Number of Vehicles Beyond Storage Area	Combined Taper Area	NBL Liverpool Road at North Site Driveway	Number of Vehicles Beyond Storage Area
Existing Traffic	Storage Length (m)	50.0		31.6	25.9		50.0		31.6	25.9	
	Average	14.6	-	0	2.5	-	16.3	-	0	3.7	-
	95th Percentile	33.3	-	0	8.5	-	29.1	-	0	10.2	-
	Maximum	31.5	-	0	8.1	-	29.9	-	0	8.3	-
0	Average	12.1	-	0	4.8	-	17.5	-	0	7.3	-
	95th Percentile	27.6	-	0	13.1	-	29.5	-	0	18.0	-
	Maximum	30.8	-	0.0	16.6	-	30.2	-	0	24.9	-
1	Storage Length (m)	30.9		45.7	30.0		30.9		45.7	30.0	
	Average	11.5	-	0	5.2	-	19.8	-	0	7.3	-
	95th Percentile	25.2	-	0	14.1	-	33.1	1	0	17.5	-
	Maximum	30.1	-	0	19.3	-	30.2	-	0.0	25.7	-
2	Average	9.9	-	0	4.8	-	17.4	-	0	7.4	-
	95th Percentile	22.8	-	0	12.2	-	30.2	-	0	18.5	-
	Maximum	30.1	-	0	15.5	-	30.2	-	0	28.6	-
3	Average	13.6	-	0	5.5	-	20.2	-	0	17.0	-
	95th Percentile	32.7	1	1.9	14.7	-	36.7	1	15.3	39.4	2
	Maximum	37.4	2	6.6	22.2	-	35	1	11.5	37.3	2
4-P1	Average	8.6	-	0	5.5	-	19.1	-	0	13.3	-
	95th Percentile	19	-	0	25.7	-	31.9	1	11.0	41.0	2
	Maximum	24.5	-	7.4	37.4	2	29.9	-	7.4	37.4	2
4-P2	Average	11.4	-	0	7.8	-	20.8	-	0	20.7	-
	95th Percentile	25.8	-	0	30.6	1	34.4	1	14.1	44.1	3
	Maximum	30.1	-	7.4	37.4	2	30.2	-	7.4	37.4	2
4A	Storage Length (m)	30.9		57.8	30.0		30.9		57.8	30.0	
	Average	11.4	-	0	7.1	-	17.2	-	0	14.8	-
	95th Percentile	27	-	0	18.8	-	30.4	-	2.7	33.1	1
	Maximum	30	-	0	29.6	-	31	1	7.3	37.3	2

The following is a highlight of the analysis:

- Option 3 has the highest use of the combined taper space with three vehicles. This may be attributed by the site traffic using a single site access point as south access is closed.
- All other access options indicated a maximum usage of the combined taper space with two vehicles. This is the best use of the unrestricted combined taper space. The results also indicated that no spillover to the through lanes is expected for both direction on Liverpool Road.

From the above analyses, it can be concluded that Option 3 presents unfavorable conditions and is deemed not preferred.



**5. Corridor Assessments**

This analysis shows how effectively vehicles travel on Liverpool Road. The measures of performance are a function of the length of time for vehicle stoppages while traveling between intersections. Ideally, the signal timing would be metered to allow for quick passage from one intersection to another while minimizing stoppage time at any intersection. All attempts to offset the timing plan between successive intersections were attempted. SimTraffic outputs include delay per vehicle and travel time in the through the study corridor. The average speed travel time through the corridor was applied to calculate the average travel speed using the distance between southbound stop bar at Liverpool/Kingston to the northbound stop bar at Liverpool/Glenanna intersections.

The base criteria was established to determine if condition improve or deteriorate with each access option. **Table 7** summarizes the results for all access options.

**Table 7: Summary of Calculated Travel Time and Average Speed on Liverpool Road**

Access Option	Traffic Control at North Driveway	Traffic Direction	AM Peak Hour			PM Peak Hour		
			Delay (seconds / vehicle)	Travel Time (seconds)	Average Speed (Kilometres / Hour)	Delay (seconds / vehicle)	Travel Time (seconds)	Average Speed (Kilometres / Hour)
-	Unsignalized - Existing Traffic	NB Liverpool	28	72	16	55	99	12
		SB Liverpool	45	106	11	35	97	12
0	Unsignalized - Future Total	NB Liverpool	26	71	16	<b>83</b>	<b>146</b>	<b>8</b>
		SB Liverpool	<b>36</b>	<b>97</b>	<b>12</b>	34	<b>95</b>	12
1	Signalized	NB Liverpool	29	74	16	<b>103</b>	<b>175</b>	<b>7</b>
		SB Liverpool	<b>40</b>	<b>101</b>	11	<b>45</b>	<b>106</b>	11
2	Signalized	NB Liverpool	29	73	16	<b>82</b>	<b>133</b>	<b>9</b>
		SB Liverpool	<b>41</b>	<b>102</b>	11	<b>47</b>	<b>108</b>	11
3	Signalized	NB Liverpool	<b>33</b>	<b>77</b>	15	<b>121</b>	<b>180</b>	<b>6</b>
		SB Liverpool	<b>39</b>	<b>100</b>	<b>12</b>	<b>53</b>	<b>113</b>	10
4 - P1	Signalized	NB Liverpool	<b>85</b>	<b>129</b>	<b>9</b>	<b>210</b>	<b>556</b>	<b>2</b>
		SB Liverpool	<b>177</b>	<b>386</b>	<b>3</b>	<b>76</b>	<b>135</b>	<b>9</b>
4 - P2	Signalized	NB Liverpool	<b>63</b>	<b>106</b>	<b>11</b>	<b>244</b>	<b>733</b>	<b>2</b>
		SB Liverpool	<b>81</b>	<b>144</b>	<b>8</b>	<b>73</b>	<b>132</b>	<b>9</b>
4A	Signalized	NB Liverpool	<b>34</b>	<b>78</b>	15	<b>80</b>	<b>126</b>	<b>9</b>
		SB Liverpool	<b>48</b>	<b>109</b>	11	<b>46</b>	<b>107</b>	11

All values shown in green font represents an improvement while red values indicate a decent depreciation of performance.



The following is a highlight of the analysis:

- Option 0 generally improved from existing condition due to signal optimization and the North Driveway operates under stop-controlled.
- Options 1 and 2 improved the AM corridor operation slightly while PM exhibits a slight decrease in performance
- Option 3 operates decent during the AM peak while it exhibits much worsen operations during the PM peak hour for the northbound direction.
- Option 4 exhibits poor vehicle delay and travel times through the corridor. This option is definitely not preferred.

Overall, Options 1 and 2 are the preferred options under the corridor assessment.

## 6. Overall Assessments

Overall, Options 1 and 2 are among the better alternative consider capacity analysis, queue/storage length assessment and corridor analysis. Among the two options, Option 2 is considered the best alternative. This option retains the South Driveway as a second access driveway for site exit, regulates all outbound left turn to the new signalized intersection, and in maintaining the north driveway at its current location, prevent unnecessary construction costs related to driveway relocation while allowing maximum development space potential for the property to the immediate north.

Retaining two access points to the subject site provides a number of benefits for internal site circulation and queuing for the proposed development as well as to the neighbouring site immediately to the north, whose potential redevelopment may share a coordinated signalized access point at the North Driveway.

In the Pickering City entre Urban Design guidelines, Section 2.3.5.2 Surface Parking, item e) state: “Access to parking and automobile drop-off area will be designed to minimize pedestrian/vehicle conflict. The number of vehicular access points will be kept to a minimum to reduce the potential conflict between pedestrian, cyclists and motor vehicles.” The preference from the Region is one access point on the subject site; however, It would be more beneficial for the proposed development to retain the South Driveway. **Table 8** provides a summary of pros and cons of the number of access points.





**Table 8: Pros and Cons by the Number of Site Accesses**

	One Access	Two Accesses
<b>Pros</b>	<ul style="list-style-type: none"> <li>Limits the number of accesses and curb cut on Liverpool Road.</li> <li>Limits the potential for pedestrian and bicycle and motor vehicle conflicts at Liverpool Road.</li> <li>Meets Regional guidelines regarding site accessibility.</li> </ul>	<ul style="list-style-type: none"> <li>The second access provides a second exit point in the event main access point is restricted/blocked.</li> <li>Prevent the potential for on-site outbound queues if only one access is available.</li> <li>The second access allows for quicker site exit in the event of need for site evacuation.</li> <li>The second access can be used by emergency vehicles (especially ambulance) for quicker site exit and potentially save travel time.</li> </ul>
<b>Cons</b>	<ul style="list-style-type: none"> <li>All outbound left traffic exit at one access.</li> <li>Site exit may be slowed with only one access. In the event the single access is restricted, no other means for egress is available. This is especially critical if an emergency vehicle (i.e. ambulance) requires a quick departure to a medical institution.</li> <li>There is a potential for outbound queuing that could extend internally which may create circulation congestion.</li> </ul>	<ul style="list-style-type: none"> <li>Traffic exiting from the South Driveway may experience queued traffic on Liverpool Road, potentially preventing quick exit. Such conditions are more likely to occur during weekday AM peak hour and not other periods.</li> </ul>

As shown above, there are many advantages to retain the South Driveway as the second point of access. The benefits of having the secondary access overrides the dis-benefits and improves the overall site accessibility. Therefore, it is deemed that the second access at the South Driveway serves as a net benefit to the site operation.

Enclosed: Appendix A: Access Options Drawings  
 Appendix B: Intersection Capacity outputs  
 Appendix C: SimTraffic Outputs  
 Appendix D: Vehicle Queues



**1. Option Descriptions**

Seven options were reviewed to determine the most appropriate access arrangement and Liverpool Road corridor operations. Full build-out for the subject site is anticipated for 2023. Future traffic conditions were analyzed for five-years after full build-out, or 2028. For all future scenarios, background corridor traffic was increased by 0.5% per year. The general area has stagnant growth with no known development plans except at the City Centre Area are known. Subsequently, any increase in traffic was applied to through movements on Kingston and Liverpool Roads.

Each access option is summarized in **Table 1** with additional information provided below. Conceptual drawings of each access option can be found in **Appendix A**.

**Table 1: Summary of Access Scenarios**

Options	Subject Site		Main Plaza Driveway
	North Driveway	South Driveway	
0	Unsignalized	Existing Configuration	Existing location
1	Aligned with the Main Plaza Driveway to the east, and signalized	Channelized Right-In/Right-Out	
1A		Right-In/Right-Out with extended median on Liverpool Road	
2		Right-out only	
3		Access removed	
4	Shifted to align at the north property line, and signalized	Right-out only	Aligned with North Driveway
4A			

Option 0

This option maintains the current access arrangement with both subject site driveways operating as unsignalized intersections. The south and north driveways are situated approximately 63 and 142 metres north, respectively, from the Liverpool/Kingston intersection. Unless otherwise noted, the following access options include the following transportation elements:

- ▶ South Driveway was relocated 20 metres north of its current location.
- ▶ A new signalized intersection at the North Driveway at Liverpool Road was reviewed with a 100 second cycle length. East-west movements operate with a left and a shared through-right turn lane. Centre two-way left turn lane at the North Driveway was replaced with exclusive left turn lane with 30 metre of storage space.
- ▶ Southbound left storage space at Kingston Road reduced from 50 metres to 30 metres.
- ▶ An optimized timing plan was applied to the Liverpool/Kingston intersection during the PM Peak Hour.

Options 1 and 1A

This access option includes a traffic signal at the north driveway and retains its current location. The south driveway allows right-in and right-out movements with a median pork chop to discourage left turn movements.



Option 1A is similar to Option 1 but as a means to remove any left turns at the south driveway, the centre median on Liverpool Road is extended from Kingston Road to the North Driveway.

#### Option 2

Option 2 is similar to the Options 1/1A except the South Driveway permits only outbound right movements. This driveway curbs will be constructed to channelize all site traffic south towards Kingston Road.

#### Option 3

Option 3 reviews the conditions where the south access is closed, and all site access occurs at the North Driveway. Similar to the previous options, the North Driveway maintains its current location and lane configurations.

#### Option 4

Under this option, the North Driveway is moved 25 metres north to approximately 167 metres north of the Liverpool/Kingston intersection. This new North Driveway is centred at the north property line. The Main Plaza Driveway, to the east, maintains its current location, which forms an intersection with offsetting driveways at the east and west legs. This intersection layout requires customized signal timing plans given the potential for north and south left movements conflict if moving simultaneously. We have examined two different timing plans and these plans are further described in the Intersection Capacity Analysis section.

1. Dedicated phase per approach; and
2. Split north and south left turn phase, north-south common phase and split phase for east and west movements.

The south driveway allows only outbound right movements.

#### Option 4A

The operation of this access option is similar to Option 2, but the entire North Driveway/Main Plaza Access intersection is shifted approximately 25 metres north to be aligned at the north property line. The south driveway allows only outbound right movements, which is the same as Option 2.

#### Background Development: 1854-1858 Liverpool Road

Background trips include site traffic for the property north of the subject site with an address of 1854-1858 Liverpool Road; it include 98 units with site access connection connecting or sharing with the subject property, depending on the Options being analyzed. All relevant site traffic was assigned to the North Driveway intersection.

## **2. Trip Generation**

The subject site is proposed to be redeveloped with a mixed-use development with two residential towers and ground floor commercial space. A 25-storey tower, and a 13-storey midrise building. Restaurant or other active commercial/retail use make up 1,332 m<sup>2</sup> along the Liverpool and Kingston Road frontages of the new buildings and the retained Old Liverpool House. Development proposal statistics are summarized in **Table 2**.



**Table 2: Subject Site Building Statistics**

Buildings	Retail GFA (m <sup>2</sup> )	Number of Residential Units
Building A - Apartment Units	-	217
Building A – At-grade Retail	370	-
Building B - Apartment Units	-	258
Building B - At-grade Retail	519	--
Retained Old Liverpool House (Retail)	442	--
<b>TOTAL</b>	<b>1,332</b>	<b>495</b>

Trip generation for the apartment units was calculated based on the Institute of Transportation Engineers (ITE) Trip Generation Manual 10<sup>th</sup> Edition, Land Use Code 222 (Multifamily Housing/High-Rise). Trip generation for the retail/commercial uses was generated by applying the Land Use Code 820 (Shopping Center). The existing site distribution was applied for these site trips. To be conservative, we calculated the number of site trips based on 500 units. For the retail/commercial component, we assumed a total size of 1,350 m<sup>2</sup>.

The mix of residential and retail/commercial use is subject to site interaction trips and a 10% reduction for transit trips. Total proposed development generates about 150-210 of two-way trips during the respective peak hours. **Table 3** summarizes the site trip generation values.

**Table 3: Site Trip Generation**

Land Use	Number of Units	Size (m <sup>2</sup> )	AM Peak Hour			PM Peak Hour		
			In	Out	Total	In	Out	Total
Apartment	500		37	116	153	109	70	179
Retail		1,350m <sup>2</sup>	9	5	14	26	29	55
Site Interaction	-		-2	-2	-4	-5	-5	-10
Transit Reduction (10%)	-		-4	-12	-16	-11	-7	-18
<b>Total</b>	<b>500</b>	<b>1,350</b>	<b>70</b>	<b>107</b>	<b>147</b>	<b>119</b>	<b>87</b>	<b>206</b>

In discussion with the Region staff, it was determined that growth in the general area has remained stagnant. A growth rate of 0.5% was recommended by Region staff for this study. Full build-out is expected by 2023. Future traffic analyses were reviewed for 2028 and it is assumed the background development to the north will also be completed.

The land uses north and west of the subject site contain low density residential uses. Growth in the general area was deemed stagnant according to the Region. Future long terms plans include land use intensification to the Pickering City centre area but the timeline for completion is uncertain at this time. Since there are no potential sources for new traffic generation in the general area, any volume increase will be added to the through movements on Liverpool and Kingston Roads.



### 3. Base Evaluation Criteria

Each access option was compared operationally. Four performance measures were examined:

1. Intersection capacity results and movement delay times.
2. Sufficient left turn storage space and taper space use on Liverpool Road.
3. Travel time and average speed on Liverpool Road.
4. Safety Issues.

Each of these performance measures are explained further below.

#### Intersection Capacity Analysis

This analysis was used to identify any constraints to a turning movement. Typical measures reviewed include volume/capacity, movement delay and queuing. Intersection capacity analysis was conducted 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.

**Figures 2 and 3** show the existing and future total traffic volumes with current access arrangements and Option 1/1A, respectively. **Figures 4 to 7** contain the 2028 Future Total traffic volumes for Options 2, 3, 4, and 4A, respectively.



Figure 2: Existing Traffic Volumes

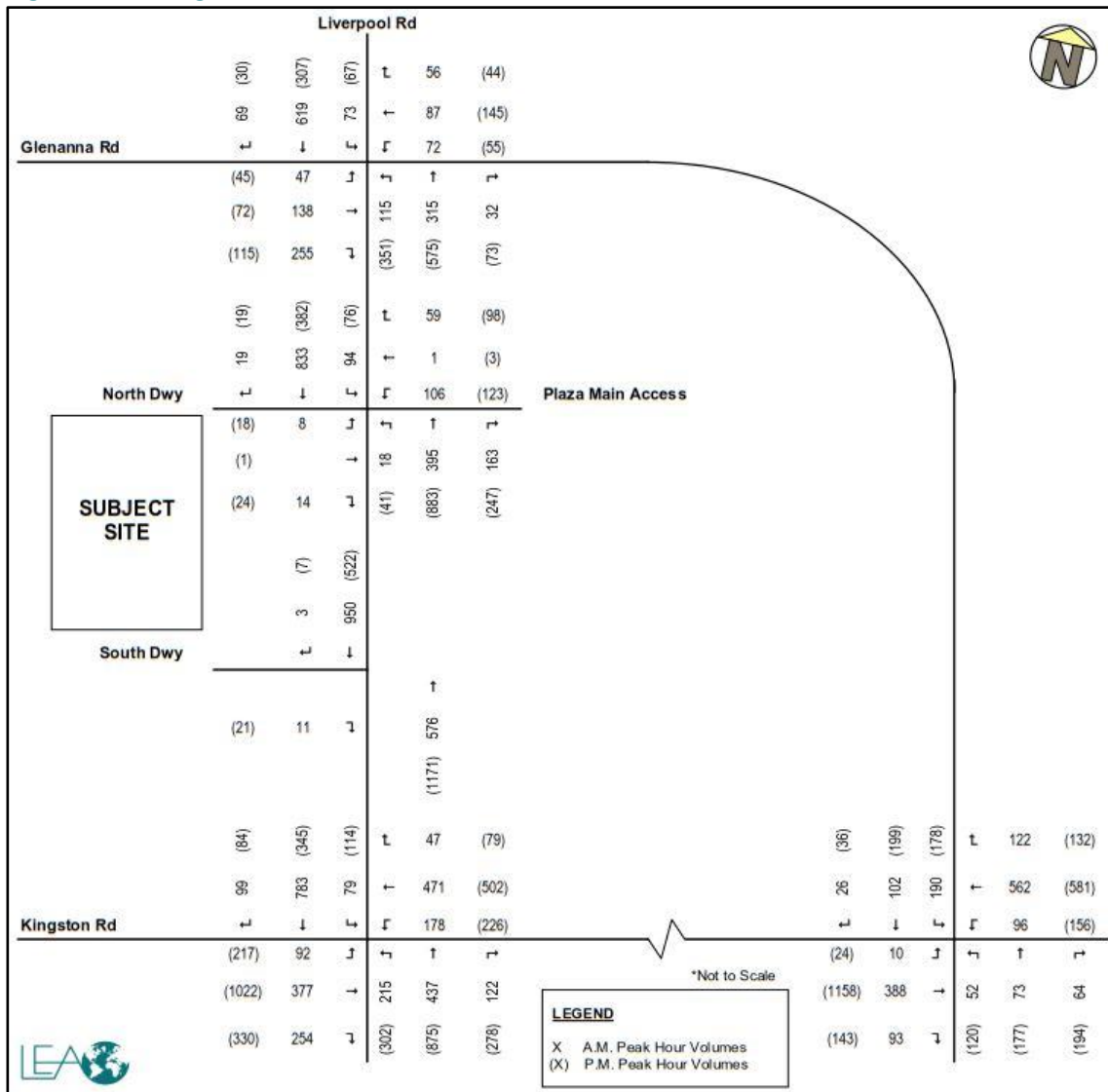




Figure 3: Future Total Traffic Volumes – Option 0 & 1/1A

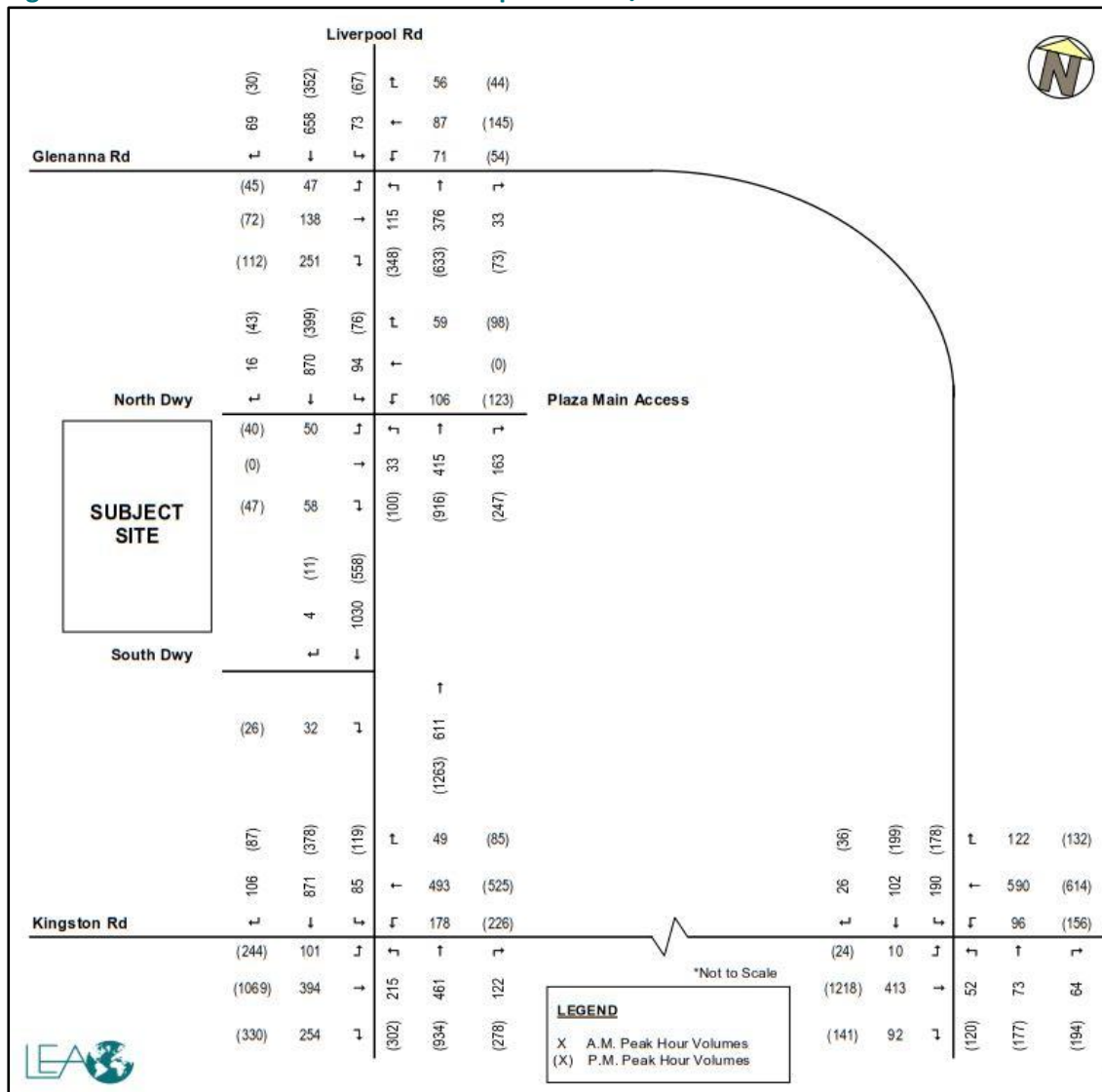




Figure 4: Future Total Traffic Volumes – Option 2

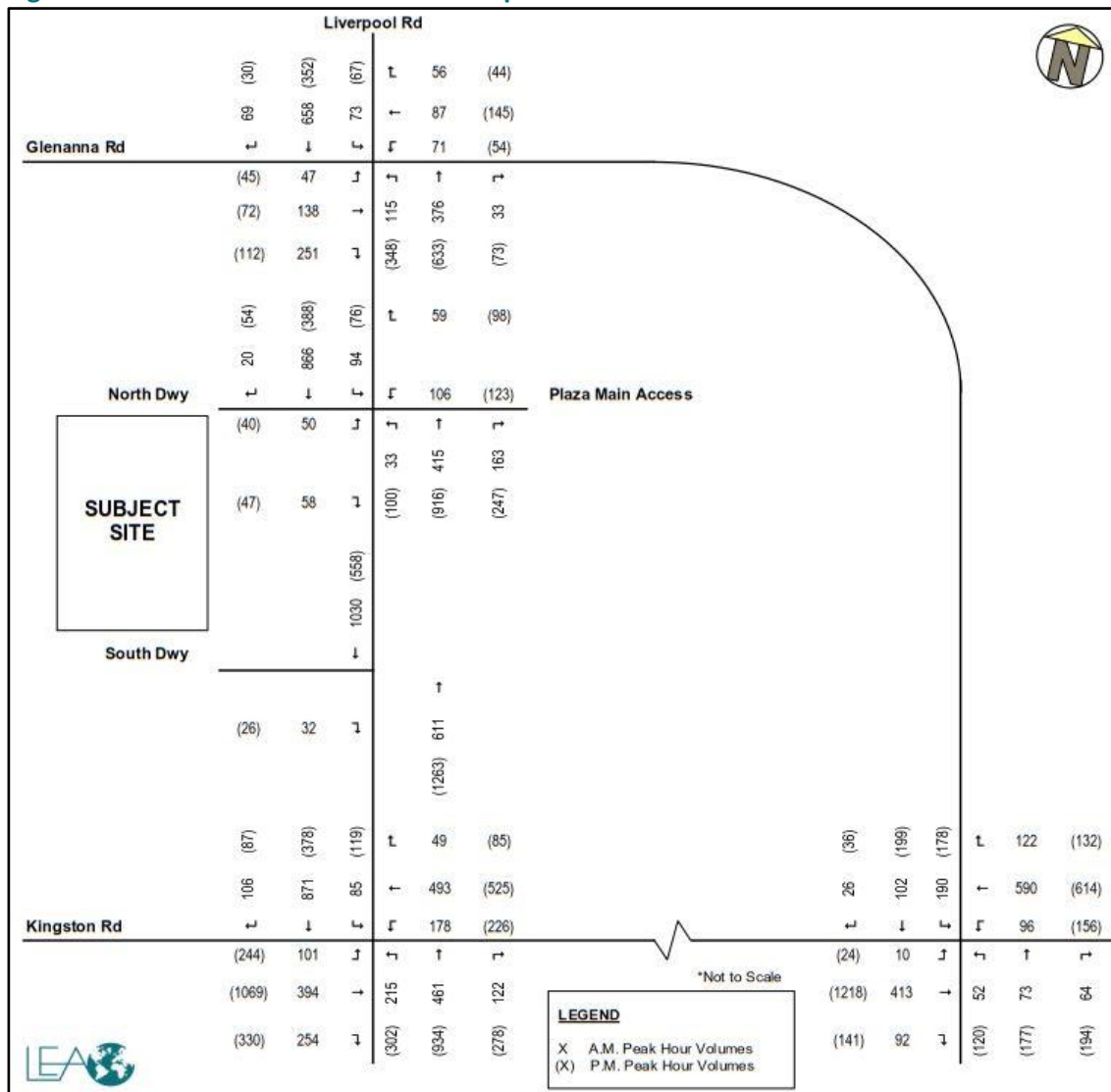






Figure 5: Future Total Traffic Volumes – Option 3

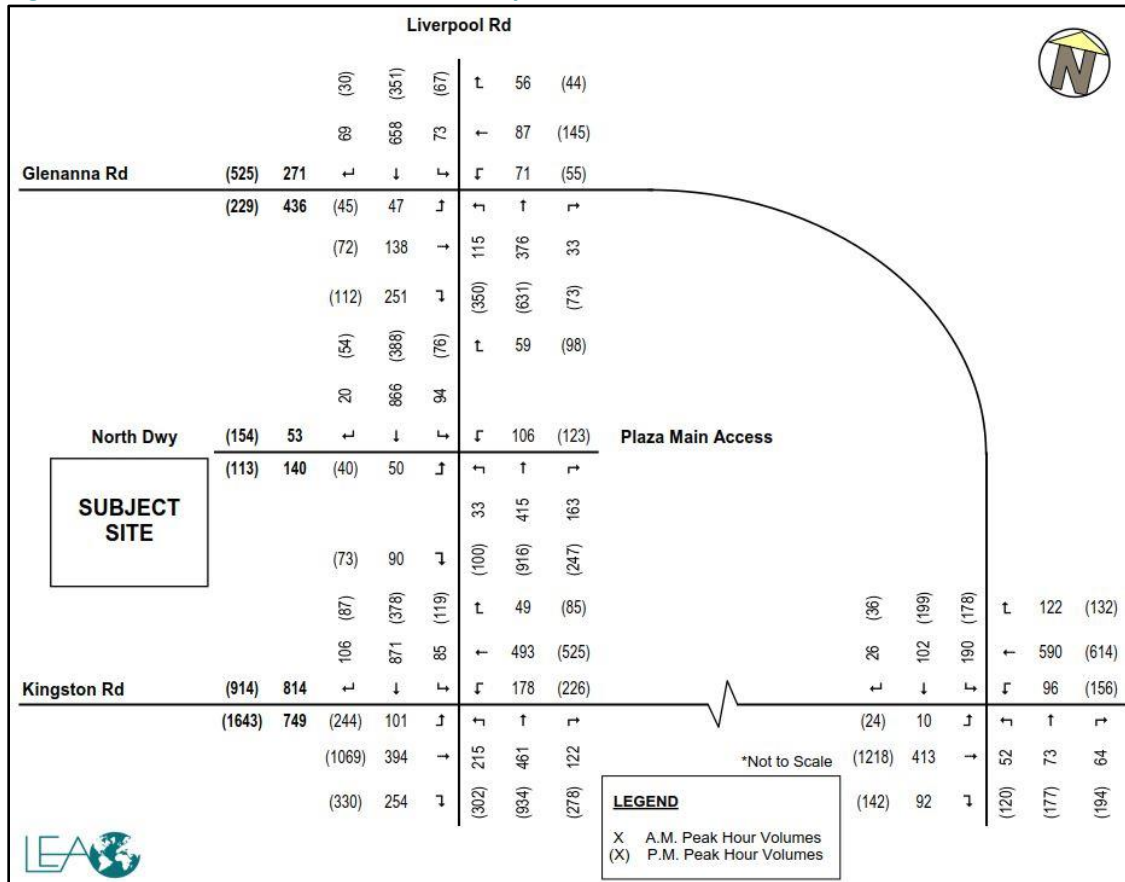




Figure 6: Future Total Traffic Volumes – Option 4

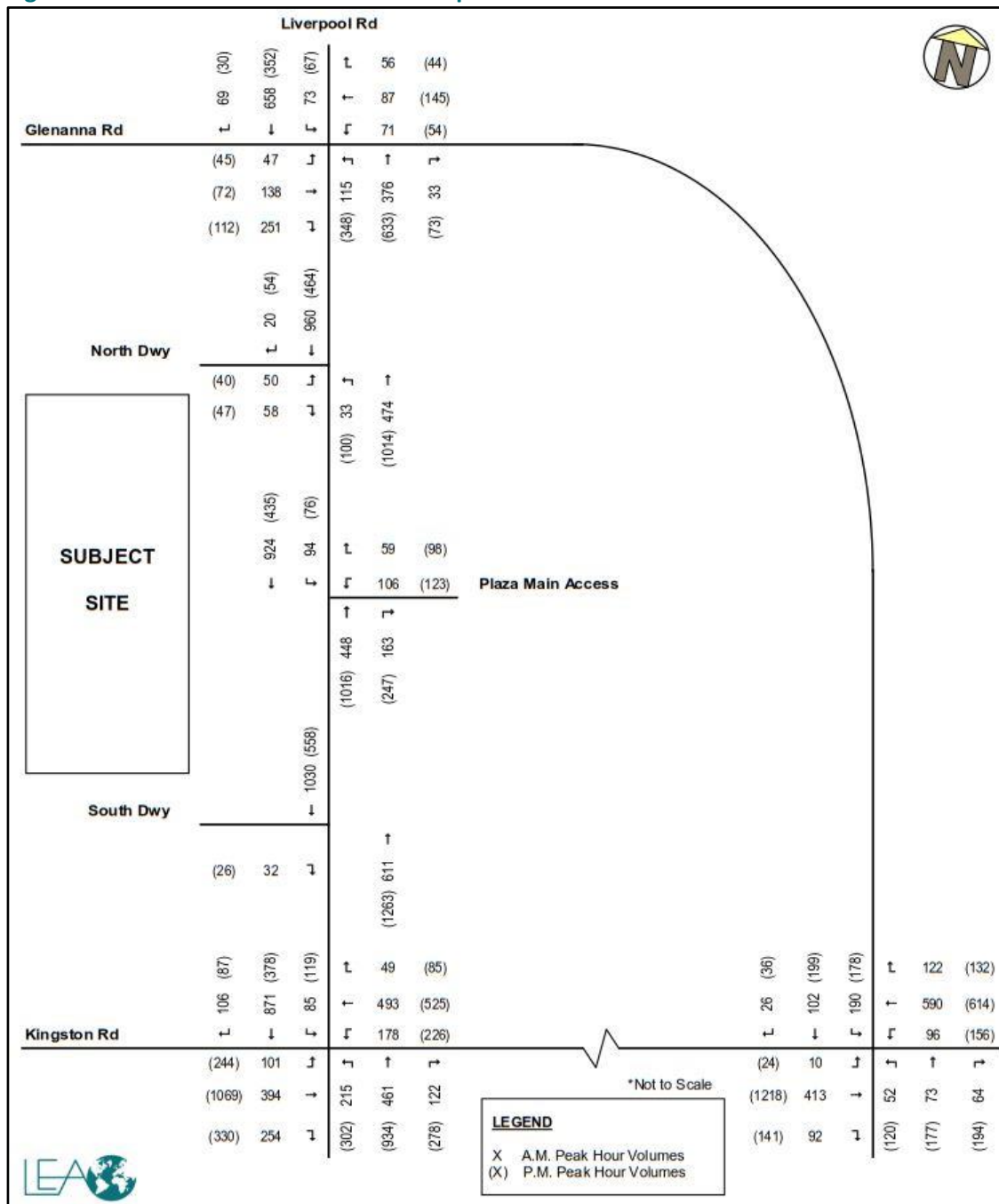
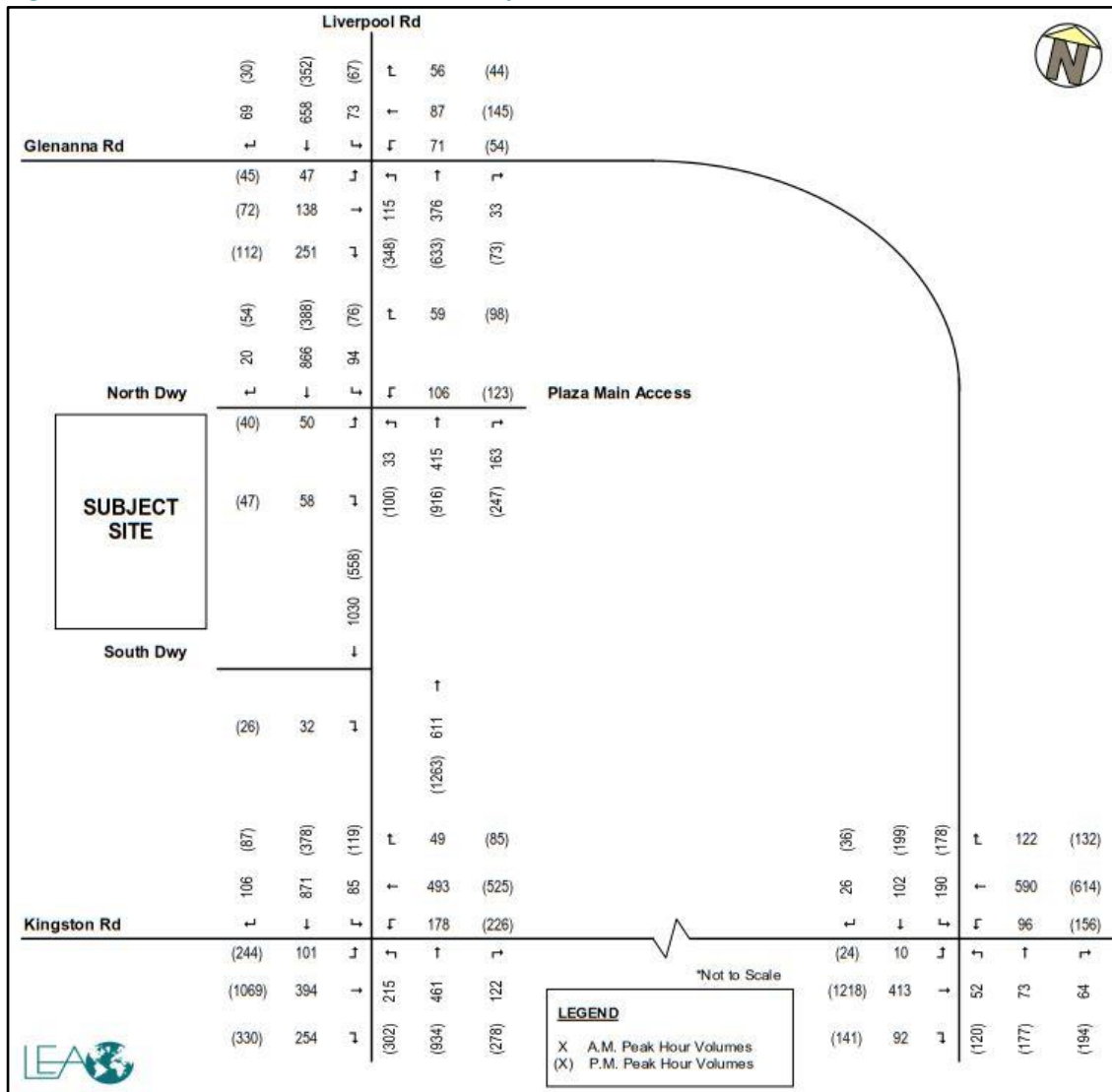


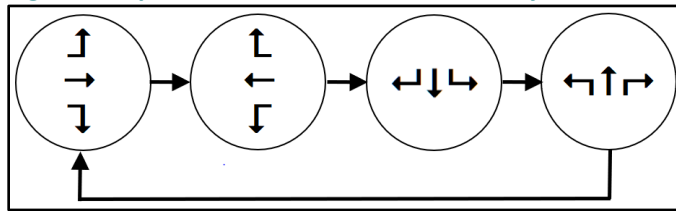
Figure 7: Future Total Traffic Volumes – Option 4A



For the North Driveway intersection signal timing plan, most of them would run on a typical phasing structure, except Option 4 when the east and west legs were offset as a customized phasing plan was applied. Safety issues were identified, and the timing plans applied in this review are discussed below. Detailed safety discussion is provided in the Traffic Operations Safety section.

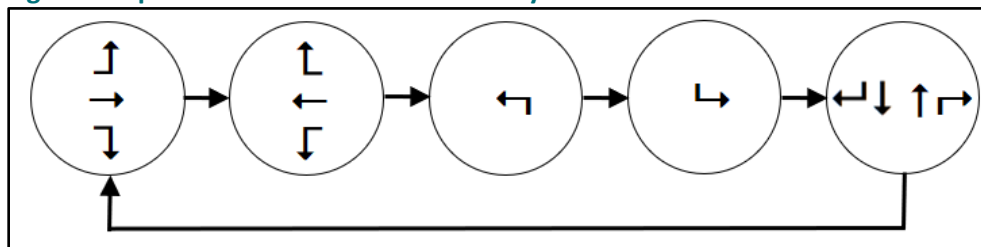
Phasing Plan P1 is a protected phase by approach which allows only one approach to progress through the intersection with no right turns on red permitted. **Figure 8** show the phasing order. As a result of the separated/protected phasing plan for each of the four approaches, the green time available for the heaviest movement of north-south approach is reduced.

**Figure 8: Option 4-P1 at the North Driveway Intersection**



Phasing Plan P2 includes a permissive north-south phase with the north and south left turns running on a full-protected separated phase per direction as shown in **Figure 9**. The reason for separating the north and south left turns as split phases, instead of running them together as a north-south left turn phase, is due to the physical staggered position of the east-west legs. If the east leg is closer to the north and west leg is closer to the south (like a mirror flip of Option 4 configuration), the north-south left turn will not overlap each other when running on a concurrent phase. The P2 arrangement is proposed to resolve the safety issue.

**Figure 9: Option 4-P2 at the North Driveway Intersection**



**Table 4** compares the intersection capacity analyses with more detailed outputs found in **Appendix B**.

**Table 4: Summary of Signalized Intersection Capacity Analyses**

INTERSECTION	Existing Traffic			Option 0 (Base Case)			Option 1 & 1A			Option 2			Option 3			Option 4 (Offsetting Driveways)								
																Phasing Plan P1			Phasing Plan P2			Option 4A		
	V/C	Delay	LOS	V/C	Delay	LOS	V/C	Delay	LOS	V/C	Delay	LOS	V/C	Delay	LOS	V/C	Delay	LOS	V/C	Delay	LOS	V/C	Delay	LOS
<i>AM Peak Hour</i>																								
Liverpool Rd at Kingston Rd	0.76	37	D	0.78	37	D	0.78	36	D	0.77	36	D	0.70	36	D	0.78	20	C	0.78	23	C	0.76	35	C
Liverpool Rd at North Dwy / Plaza Main Dwy							0.42	9	A	0.42	9	A	0.43	11	A	0.86	194	F	0.74	76	E	0.42	9	A
Liverpool Rd at Glenanna Rd	0.35	18	B	0.36	16.7	B	0.36	17	B	0.36	17	B	0.36	17	B	0.36	16	B	0.36	16	B	0.35	17	B
<i>PM Peak Hour</i>																								
Liverpool Rd at Kingston Rd	0.98	44	D	1.03	49	D	0.99	46	D	0.99	46	D	0.99	47	D	0.99	45	D	0.99	47	D	0.99	46	D
Liverpool Rd at North Dwy / Plaza Main Dwy							0.54	9	A	0.54	9	A	0.55	19	A	0.93	82	F	0.92	189	F	0.54	9	A
Liverpool Rd at Glenanna Rd	0.58	12	B	0.60	12	B	0.60	12	B	0.60	12	B	0.60	14	B	0.60	11	B	0.60	15	B	0.60	12	B

The following is a highlight of the analysis:

- Liverpool/Kingston: All options generally have the same Levels of Service (LOS) except Option 0 for PM where v/c ratio is slightly over 1.0.
- North Driveway: All options are expected to operate very similar condition except Options 4-P1 or P2, depending on the peak hours analyzed. Based on the analysis and/or the physical/phasing plan constraints, Option 4 is definitely not a preferred option.
- Liverpool/Glenanna: All options are expected to operate in very similar conditions.



Among all options assessed under capacity analysis, Options 1 to 3 are the better ones. Option 2 may be considered the best one given South Driveway being an outbound access and balanced between 0 and 2 movements allowed (Options 1 and 3).

#### 4. Liverpool Road Storage Length Assessment

This section assesses the left turn storage space for the northbound left at the North Driveway and the southbound left at the Liverpool/Kingston intersection. Other than Option 4A, the combined storage and taper space between the two intersection is about 107 metres. The taper space between both intersections is a vehicle a deceleration lane but can also be used for any vehicle storage spillover. Ideally, sufficient vehicle storage length should be available to prevent vehicle spillover and impede into the through movement.

SimTraffic software was used to simulate the vehicle progression through the study area. Option 1A was not analyzed since median extension is introduced and the storage/taper lane would not be shared for the respective left turns. All outputs from the simulations are contained in **Appendix C**.

**Table 5** summarizes the queue values and the amount of taper space occupied. **Figures D1** and **D2** in **Appendix D** illustrates the extent of vehicle queues for the AM and PM peak hours, respectively.

**Table 5: Queuing, Storage and Taper Analysis Summary**

Access Option	Parameter	AM Peak Hour			PM Peak Hour		
		SBL Liverpool / Kingston	Combined Taper Area	NBL Liverpool Road at North Site Driveway	SBL Liverpool / Kingston	Combined Taper Area	NBL Liverpool Road at North Site Driveway
	<b>Storage Length (m)</b>	<b>50.0</b>	<b>31.6</b>	<b>25.9</b>	<b>50.0</b>	<b>31.6</b>	<b>25.9</b>
Existing Traffic	Average	14.6	0	2.5	16.3	0	3.7
	95th Percentile	33.3	0	8.5	29.1	0	10.2
	Maximum	31.5	0	8.1	29.9	0	8.3
0	Average	12.1	0	4.8	17.5	0	7.3
	95th Percentile	27.6	0	13.1	29.5	0	18.0
	Maximum	30.8	0.0	16.6	30.2	0	24.9
	<b>Storage Length (m)</b>	<b>30.9</b>	<b>45.7</b>	<b>30.0</b>	<b>30.9</b>	<b>45.7</b>	<b>30.0</b>
1	Average	11.5	0	5.2	19.8	0	7.3
	95th Percentile	25.2	0	14.1	33.1	0	17.5
	Maximum	30.1	0	19.3	30.2	0.0	25.7
2	Average	9.9	0	4.8	17.4	0	7.4
	95th Percentile	22.8	0	12.2	30.2	0	18.5
	Maximum	30.1	0	15.5	30.2	0	28.6
3	Average	13.6	0	5.5	20.2	0	17.0
	95th Percentile	32.7	1.9	14.7	36.7	15.3	39.4
	Maximum	37.4	6.6	22.2	35	11.5	37.3
4-P1	Average	8.6	0	5.5	19.1	0	13.3
	95th Percentile	19	0	25.7	31.9	11.0	41.0
	Maximum	24.5	7.4	37.4	29.9	7.4	37.4
4-P2	Average	11.4	0	7.8	20.8	0	20.7
	95th Percentile	25.8	0	30.6	34.4	14.1	44.1
	Maximum	30.1	7.4	37.4	30.2	7.4	37.4
	<b>Storage Length (m)</b>	<b>30.9</b>	<b>57.8</b>	<b>30.0</b>	<b>30.9</b>	<b>57.8</b>	<b>30.0</b>
4A	Average	11.4	0	7.1	17.2	0	14.8
	95th Percentile	27	0	18.8	30.4	2.7	33.1
	Maximum	30	0	29.6	31	7.3	37.3



Results show that in most circumstances, a minimal amount of vehicle queues occupy the taper space. The highest amount of taper space use is approximately 16 metres. The combined taper space value was used to calculate the theoretical number of vehicles that can occupy this space. Assuming a base vehicle length of 6.5 metres per vehicle, approximately 4-5 vehicles can be situated in the combined taper space with the current road configuration. **Table 6** summarized the potential number of vehicles occupying the combined taper length as storage.

**Table 6: Utilization of the Combined Taper Space**

Access Option	Parameter	AM Peak Hour					PM Peak Hour				
		SBL Liverpool / Kingston	Number of Vehicles Beyond Storage Area	Combined Taper Area	NBL Liverpool Road at North Site Driveway	Number of Vehicles Beyond Storage Area	SBL Liverpool / Kingston	Number of Vehicles Beyond Storage Area	Combined Taper Area	NBL Liverpool Road at North Site Driveway	Number of Vehicles Beyond Storage Area
Existing Traffic	Storage Length (m)	50.0		31.6	25.9		50.0		31.6	25.9	
	Average	14.6	-	0	2.5	-	16.3	-	0	3.7	-
	95th Percentile	33.3	-	0	8.5	-	29.1	-	0	10.2	-
	Maximum	31.5	-	0	8.1	-	29.9	-	0	8.3	-
0	Average	12.1	-	0	4.8	-	17.5	-	0	7.3	-
	95th Percentile	27.6	-	0	13.1	-	29.5	-	0	18.0	-
	Maximum	30.8	-	0.0	16.6	-	30.2	-	0	24.9	-
1	Storage Length (m)	30.9		45.7	30.0		30.9		45.7	30.0	
	Average	11.5	-	0	5.2	-	19.8	-	0	7.3	-
	95th Percentile	25.2	-	0	14.1	-	33.1	1	0	17.5	-
	Maximum	30.1	-	0	19.3	-	30.2	-	0.0	25.7	-
2	Average	9.9	-	0	4.8	-	17.4	-	0	7.4	-
	95th Percentile	22.8	-	0	12.2	-	30.2	-	0	18.5	-
	Maximum	30.1	-	0	15.5	-	30.2	-	0	28.6	-
3	Average	13.6	-	0	5.5	-	20.2	-	0	17.0	-
	95th Percentile	32.7	1	1.9	14.7	-	36.7	1	15.3	39.4	2
	Maximum	37.4	2	6.6	22.2	-	35	1	11.5	37.3	2
4-P1	Average	8.6	-	0	5.5	-	19.1	-	0	13.3	-
	95th Percentile	19	-	0	25.7	-	31.9	1	11.0	41.0	2
	Maximum	24.5	-	7.4	37.4	2	29.9	-	7.4	37.4	2
4-P2	Average	11.4	-	0	7.8	-	20.8	-	0	20.7	-
	95th Percentile	25.8	-	0	30.6	1	34.4	1	14.1	44.1	3
	Maximum	30.1	-	7.4	37.4	2	30.2	-	7.4	37.4	2
4A	Storage Length (m)	30.9		57.8	30.0		30.9		57.8	30.0	
	Average	11.4	-	0	7.1	-	17.2	-	0	14.8	-
	95th Percentile	27	-	0	18.8	-	30.4	-	2.7	33.1	1
	Maximum	30	-	0	29.6	-	31	1	7.3	37.3	2

The following is a highlight of the analysis:

- Option 3 has the highest use of the combined taper space with three vehicles. This may be attributed by the site traffic using a single site access point as south access is closed.
- All other access options indicated a maximum usage of the combined taper space with two vehicles. This is the best use of the unrestricted combined taper space. The results also indicated that no spillover to the through lanes is expected for both direction on Liverpool Road.

From the above analyses, it can be concluded that Option 3 presents unfavorable conditions and is deemed not preferred.



**5. Corridor Assessments**

This analysis shows how effectively vehicles travel on Liverpool Road. The measures of performance are a function of the length of time for vehicle stoppages while traveling between intersections. Ideally, the signal timing would be metered to allow for quick passage from one intersection to another while minimizing stoppage time at any intersection. All attempts to offset the timing plan between successive intersections were attempted. SimTraffic outputs include delay per vehicle and travel time in the through the study corridor. The average speed travel time through the corridor was applied to calculate the average travel speed using the distance between southbound stop bar at Liverpool/Kingston to the northbound stop bar at Liverpool/Glenanna intersections.

The base criteria was established to determine if condition improve or deteriorate with each access option. **Table 7** summarizes the results for all access options.

**Table 7: Summary of Calculated Travel Time and Average Speed on Liverpool Road**

Access Option	Traffic Control at North Driveway	Traffic Direction	AM Peak Hour			PM Peak Hour		
			Delay (seconds / vehicle)	Travel Time (seconds)	Average Speed (Kilometres / Hour)	Delay (seconds / vehicle)	Travel Time (seconds)	Average Speed (Kilometres / Hour)
-	Unsignalized - Existing Traffic	NB Liverpool	28	72	16	55	99	12
		SB Liverpool	45	106	11	35	97	12
0	Unsignalized - Future Total	NB Liverpool	26	71	16	<b>83</b>	<b>146</b>	<b>8</b>
		SB Liverpool	<b>36</b>	<b>97</b>	<b>12</b>	34	<b>95</b>	12
1	Signalized	NB Liverpool	29	74	16	<b>103</b>	<b>175</b>	<b>7</b>
		SB Liverpool	<b>40</b>	<b>101</b>	11	<b>45</b>	<b>106</b>	11
2	Signalized	NB Liverpool	29	73	16	<b>82</b>	<b>133</b>	<b>9</b>
		SB Liverpool	<b>41</b>	<b>102</b>	11	<b>47</b>	<b>108</b>	11
3	Signalized	NB Liverpool	<b>33</b>	<b>77</b>	15	<b>121</b>	<b>180</b>	<b>6</b>
		SB Liverpool	<b>39</b>	<b>100</b>	<b>12</b>	<b>53</b>	<b>113</b>	10
4 - P1	Signalized	NB Liverpool	<b>85</b>	<b>129</b>	<b>9</b>	<b>210</b>	<b>556</b>	<b>2</b>
		SB Liverpool	<b>177</b>	<b>386</b>	<b>3</b>	<b>76</b>	<b>135</b>	<b>9</b>
4 - P2	Signalized	NB Liverpool	<b>63</b>	<b>106</b>	<b>11</b>	<b>244</b>	<b>733</b>	<b>2</b>
		SB Liverpool	<b>81</b>	<b>144</b>	<b>8</b>	<b>73</b>	<b>132</b>	<b>9</b>
4A	Signalized	NB Liverpool	<b>34</b>	<b>78</b>	15	<b>80</b>	<b>126</b>	<b>9</b>
		SB Liverpool	<b>48</b>	<b>109</b>	11	<b>46</b>	<b>107</b>	11

All values shown in green font represents an improvement while red values indicate a decent depreciation of performance.



The following is a highlight of the analysis:

- Option 0 generally improved from existing condition due to signal optimization and the North Driveway operates under stop-controlled.
- Options 1 and 2 improved the AM corridor operation slightly while PM exhibits a slight decrease in performance
- Option 3 operates decent during the AM peak while it exhibits much worsen operations during the PM peak hour for the northbound direction.
- Option 4 exhibits poor vehicle delay and travel times through the corridor. This option is definitely not preferred.

Overall, Options 1 and 2 are the preferred options under the corridor assessment.

## 6. Overall Assessments

Overall, Options 1 and 2 are among the better alternative consider capacity analysis, queue/storage length assessment and corridor analysis. Among the two options, Option 2 is considered the best alternative. This option retains the South Driveway as a second access driveway for site exit, regulates all outbound left turn to the new signalized intersection, and in maintaining the north driveway at its current location, prevent unnecessary construction costs related to driveway relocation while allowing maximum development space potential for the property to the immediate north.

Retaining two access points to the subject site provides a number of benefits for internal site circulation and queuing for the proposed development as well as to the neighbouring site immediately to the north, whose potential redevelopment may share a coordinated signalized access point at the North Driveway.

In the Pickering City entre Urban Design guidelines, Section 2.3.5.2 Surface Parking, item e) state: “Access to parking and automobile drop-off area will be designed to minimize pedestrian/vehicle conflict. The number of vehicular access points will be kept to a minimum to reduce the potential conflict between pedestrian, cyclists and motor vehicles.” The preference from the Region is one access point on the subject site; however, It would be more beneficial for the proposed development to retain the South Driveway. **Table 8** provides a summary of pros and cons of the number of access points.





**Table 8: Pros and Cons by the Number of Site Accesses**

	One Access	Two Accesses
<b>Pros</b>	<ul style="list-style-type: none"> <li>Limits the number of accesses and curb cut on Liverpool Road.</li> <li>Limits the potential for pedestrian and bicycle and motor vehicle conflicts at Liverpool Road.</li> <li>Meets Regional guidelines regarding site accessibility.</li> </ul>	<ul style="list-style-type: none"> <li>The second access provides a second exit point in the event main access point is restricted/blocked.</li> <li>Prevent the potential for on-site outbound queues if only one access is available.</li> <li>The second access allows for quicker site exit in the event of need for site evacuation.</li> <li>The second access can be used by emergency vehicles (especially ambulance) for quicker site exit and potentially save travel time.</li> </ul>
<b>Cons</b>	<ul style="list-style-type: none"> <li>All outbound left traffic exit at one access.</li> <li>Site exit may be slowed with only one access. In the event the single access is restricted, no other means for egress is available. This is especially critical if an emergency vehicle (i.e. ambulance) requires a quick departure to a medical institution.</li> <li>There is a potential for outbound queuing that could extend internally which may create circulation congestion.</li> </ul>	<ul style="list-style-type: none"> <li>Traffic exiting from the South Driveway may experience queued traffic on Liverpool Road, potentially preventing quick exit. Such conditions are more likely to occur during weekday AM peak hour and not other periods.</li> </ul>

As shown above, there are many advantages to retain the South Driveway as the second point of access. The benefits of having the secondary access overrides the dis-benefits and improves the overall site accessibility. Therefore, it is deemed that the second access at the South Driveway serves as a net benefit to the site operation.

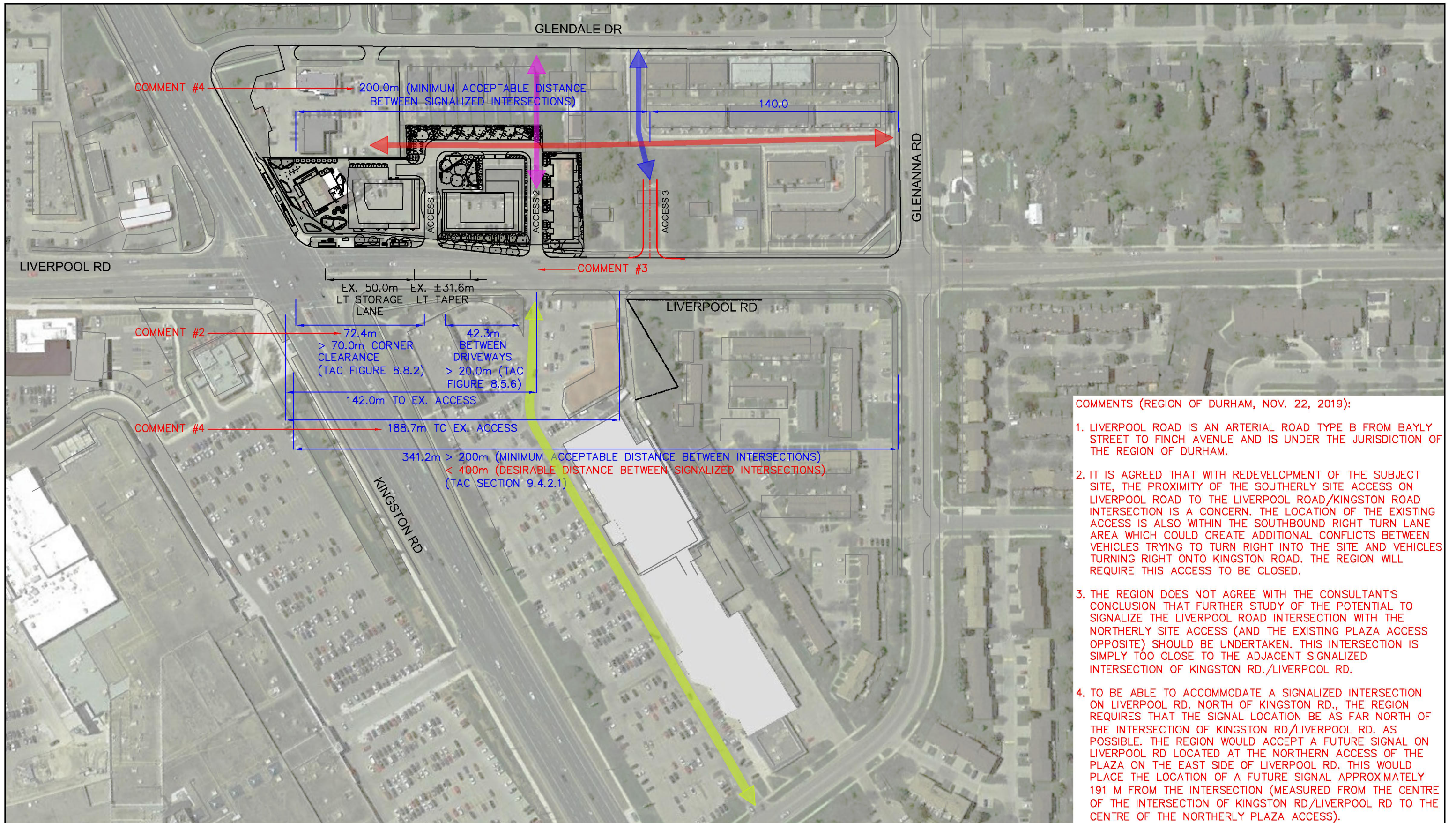
Enclosed: Appendix A: Access Options Drawings  
 Appendix B: Intersection Capacity outputs  
 Appendix C: SimTraffic Outputs  
 Appendix D: Vehicle Queues




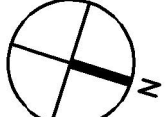
# APPENDIX A

Access Options Drawings

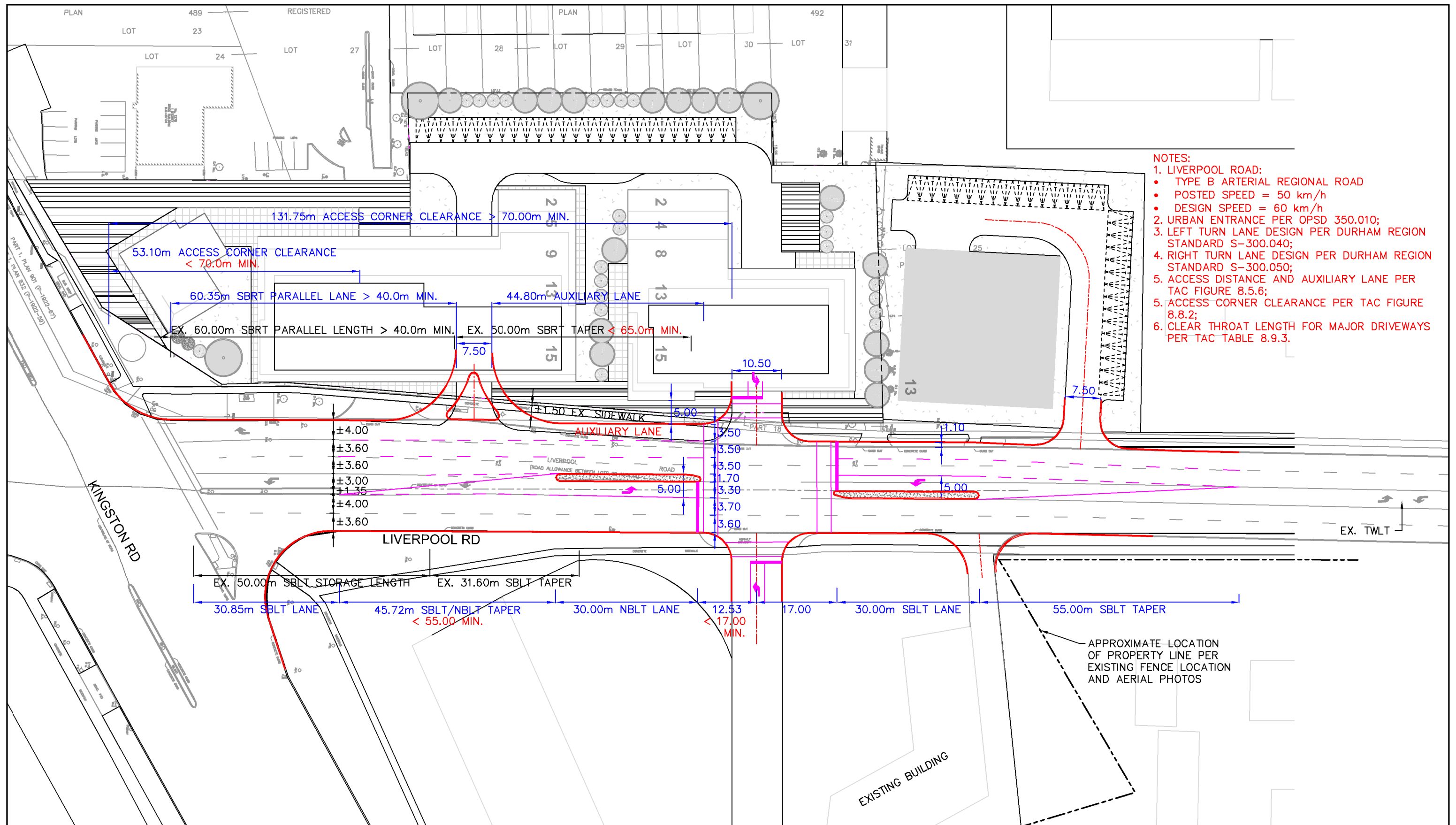




- COMMENTS (REGION OF DURHAM, NOV. 22, 2019):
1. LIVERPOOL ROAD IS AN ARTERIAL ROAD TYPE B FROM BAYLY STREET TO FINCH AVENUE AND IS UNDER THE JURISDICTION OF THE REGION OF DURHAM.
  2. IT IS AGREED THAT WITH REDEVELOPMENT OF THE SUBJECT SITE, THE PROXIMITY OF THE SOUTHERLY SITE ACCESS ON LIVERPOOL ROAD TO THE LIVERPOOL ROAD/KINGSTON ROAD INTERSECTION IS A CONCERN. THE LOCATION OF THE EXISTING ACCESS IS ALSO WITHIN THE SOUTHBOUND RIGHT TURN LANE AREA WHICH COULD CREATE ADDITIONAL CONFLICTS BETWEEN VEHICLES TRYING TO TURN RIGHT INTO THE SITE AND VEHICLES TURNING RIGHT ONTO KINGSTON ROAD. THE REGION WILL REQUIRE THIS ACCESS TO BE CLOSED.
  3. THE REGION DOES NOT AGREE WITH THE CONSULTANT'S CONCLUSION THAT FURTHER STUDY OF THE POTENTIAL TO SIGNALIZE THE LIVERPOOL ROAD INTERSECTION WITH THE NORTHERLY SITE ACCESS (AND THE EXISTING PLAZA ACCESS OPPOSITE) SHOULD BE UNDERTAKEN. THIS INTERSECTION IS SIMPLY TOO CLOSE TO THE ADJACENT SIGNALIZED INTERSECTION OF KINGSTON RD./LIVERPOOL RD.
  4. TO BE ABLE TO ACCOMMODATE A SIGNALIZED INTERSECTION ON LIVERPOOL RD. NORTH OF KINGSTON RD., THE REGION REQUIRES THAT THE SIGNAL LOCATION BE AS FAR NORTH OF THE INTERSECTION OF KINGSTON RD./LIVERPOOL RD. AS POSSIBLE. THE REGION WOULD ACCEPT A FUTURE SIGNAL ON LIVERPOOL RD LOCATED AT THE NORTHERN ACCESS OF THE PLAZA ON THE EAST SIDE OF LIVERPOOL RD. THIS WOULD PLACE THE LOCATION OF A FUTURE SIGNAL APPROXIMATELY 191 M FROM THE INTERSECTION (MEASURED FROM THE CENTRE OF THE INTERSECTION OF KINGSTON RD./LIVERPOOL RD TO THE CENTRE OF THE NORTHERLY PLAZA ACCESS).

<p>LEA Consulting Ltd. Consulting Engineers and Planners www.LEA.ca</p>  	<p>Project No. <b>19225-200</b></p> <p>Date FEB. 03, 2020</p>	<p style="text-align: center; font-size: 2em; opacity: 0.5;">DRAFT</p> <p style="text-align: center; font-size: 0.8em; opacity: 0.5;">NOT FOR CONSTRUCTION</p>	<p style="text-align: center;"><b>1294 KINGSTON ROAD PICKERING ONTARIO</b></p> <p style="text-align: center;">20 0 20 30 40m</p> <p style="text-align: center;">1:2000</p>	<p style="text-align: center; font-size: 1.5em;"><b>CONTEXT PLAN</b></p>	<p>Drawing No. <b>SK00</b></p>
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- NOTES:**
- LIVERPOOL ROAD:
    - TYPE B ARTERIAL REGIONAL ROAD
    - POSTED SPEED = 50 km/h
    - DESIGN SPEED = 60 km/h
  - URBAN ENTRANCE PER OPSD 350.010;
  - LEFT TURN LANE DESIGN PER DURHAM REGION STANDARD S-300.040;
  - RIGHT TURN LANE DESIGN PER DURHAM REGION STANDARD S-300.050;
  - ACCESS DISTANCE AND AUXILIARY LANE PER TAC FIGURE 8.5.6;
  - ACCESS CORNER CLEARANCE PER TAC FIGURE 8.8.2;
  - CLEAR THROAT LENGTH FOR MAJOR DRIVEWAYS PER TAC TABLE 8.9.3.

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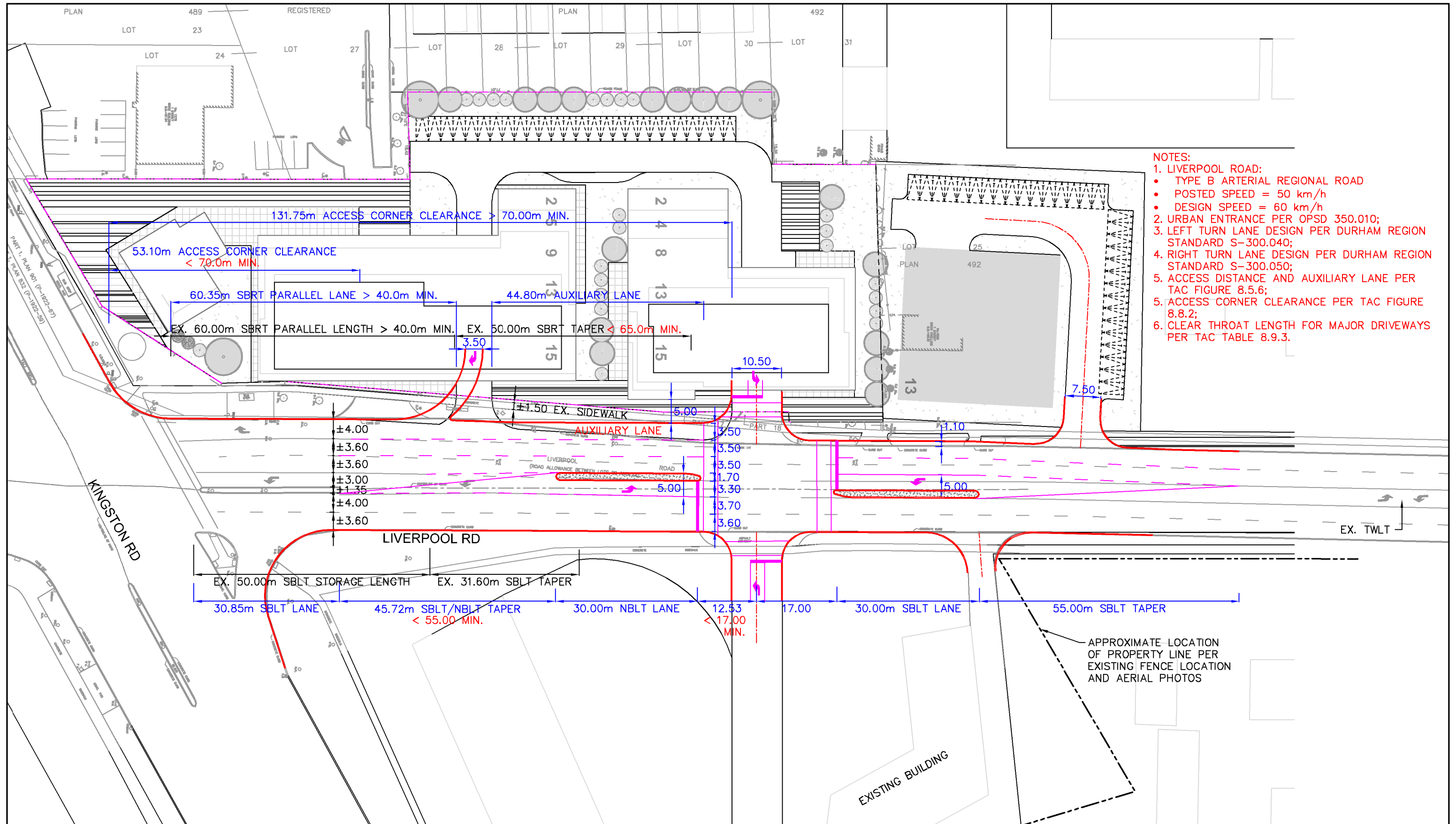
**DRAFT**  
 NOT FOR CONSTRUCTION

1294 KINGSTON ROAD  
 PICKERING ONTARIO

7.5 0 7.5 15 22.5m  
 1:750

SITE PLAN (OPTION 1)  
 TWO ACCESSES  
 DESIGN

Drawing No.  
**SK01**



- NOTES:**
- LIVERPOOL ROAD:**
    - TYPE B ARTERIAL REGIONAL ROAD
    - POSTED SPEED = 50 km/h
    - DESIGN SPEED = 60 km/h
  - URBAN ENTRANCE PER OPSD 350.010;
  - LEFT TURN LANE DESIGN PER DURHAM REGION STANDARD S-300.040;
  - RIGHT TURN LANE DESIGN PER DURHAM REGION STANDARD S-300.050;
  - ACCESS DISTANCE AND AUXILIARY LANE PER TAC FIGURE 8.5.6;
  - ACCESS CORNER CLEARANCE PER TAC FIGURE 8.8.2;
  - CLEAR THROAT LENGTH FOR MAJOR DRIVEWAYS PER TAC TABLE 8.9.3.

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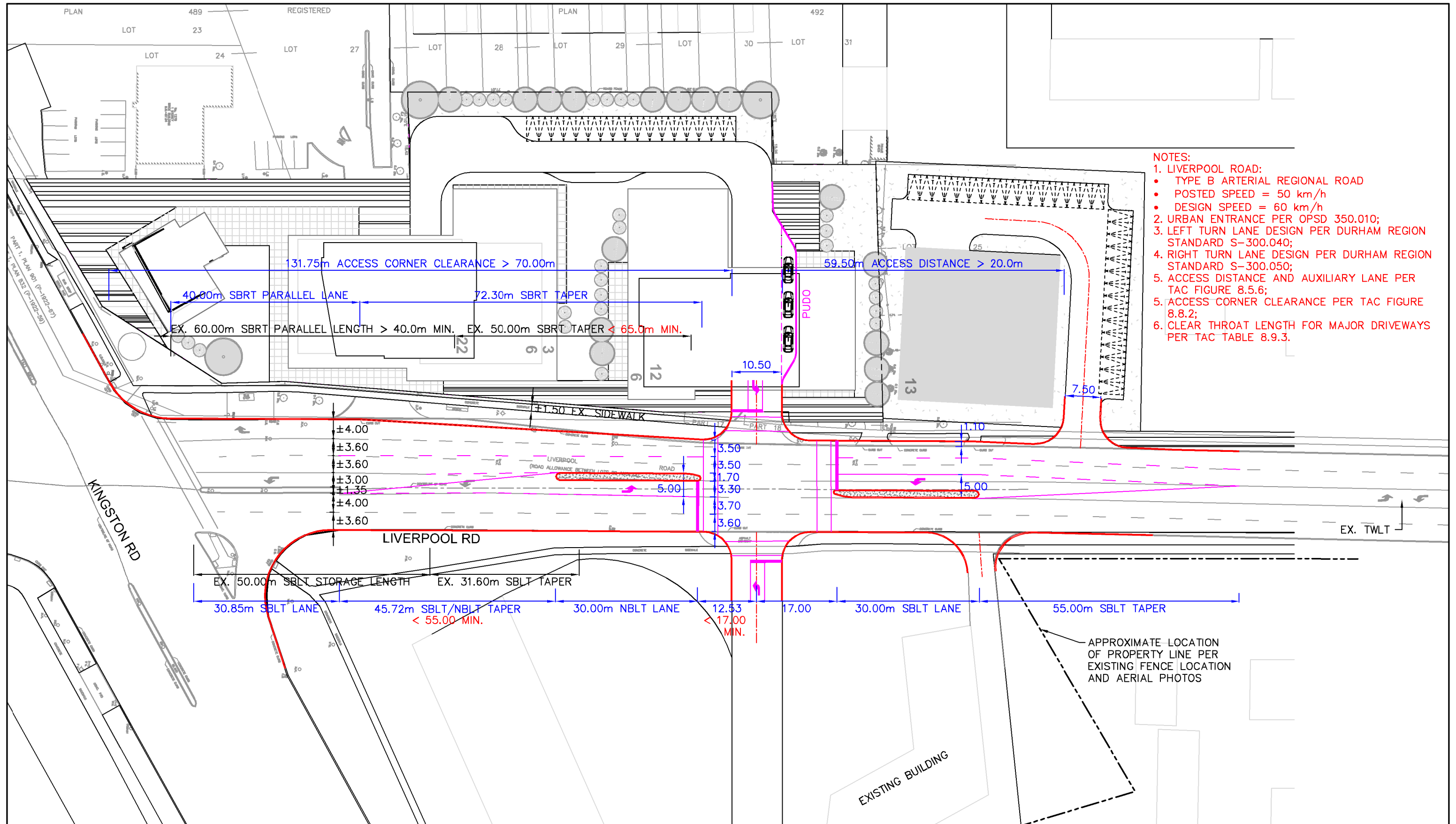
**DRAFT**  
 NOT FOR CONSTRUCTION

**1294 KINGSTON ROAD**  
**PICKERING ONTARIO**

7.5 0 7.5 15 22.5m  
 1:750

**SITE PLAN (OPTION 2)**  
**TWO ACCESSES**  
**DESIGN**

Drawing No.  
**SK02**



- NOTES:**
- LIVERPOOL ROAD:**
    - TYPE B ARTERIAL REGIONAL ROAD
    - POSTED SPEED = 50 km/h
    - DESIGN SPEED = 60 km/h
  - URBAN ENTRANCE PER OPSD 350.010;
  - LEFT TURN LANE DESIGN PER DURHAM REGION STANDARD S-300.040;
  - RIGHT TURN LANE DESIGN PER DURHAM REGION STANDARD S-300.050;
  - ACCESS DISTANCE AND AUXILIARY LANE PER TAC FIGURE 8.5.6;
  - ACCESS CORNER CLEARANCE PER TAC FIGURE 8.8.2;
  - CLEAR THROAT LENGTH FOR MAJOR DRIVEWAYS PER TAC TABLE 8.9.3.

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Date  
 FEB. 03, 2020

**DRAFT**  
 NOT FOR CONSTRUCTION

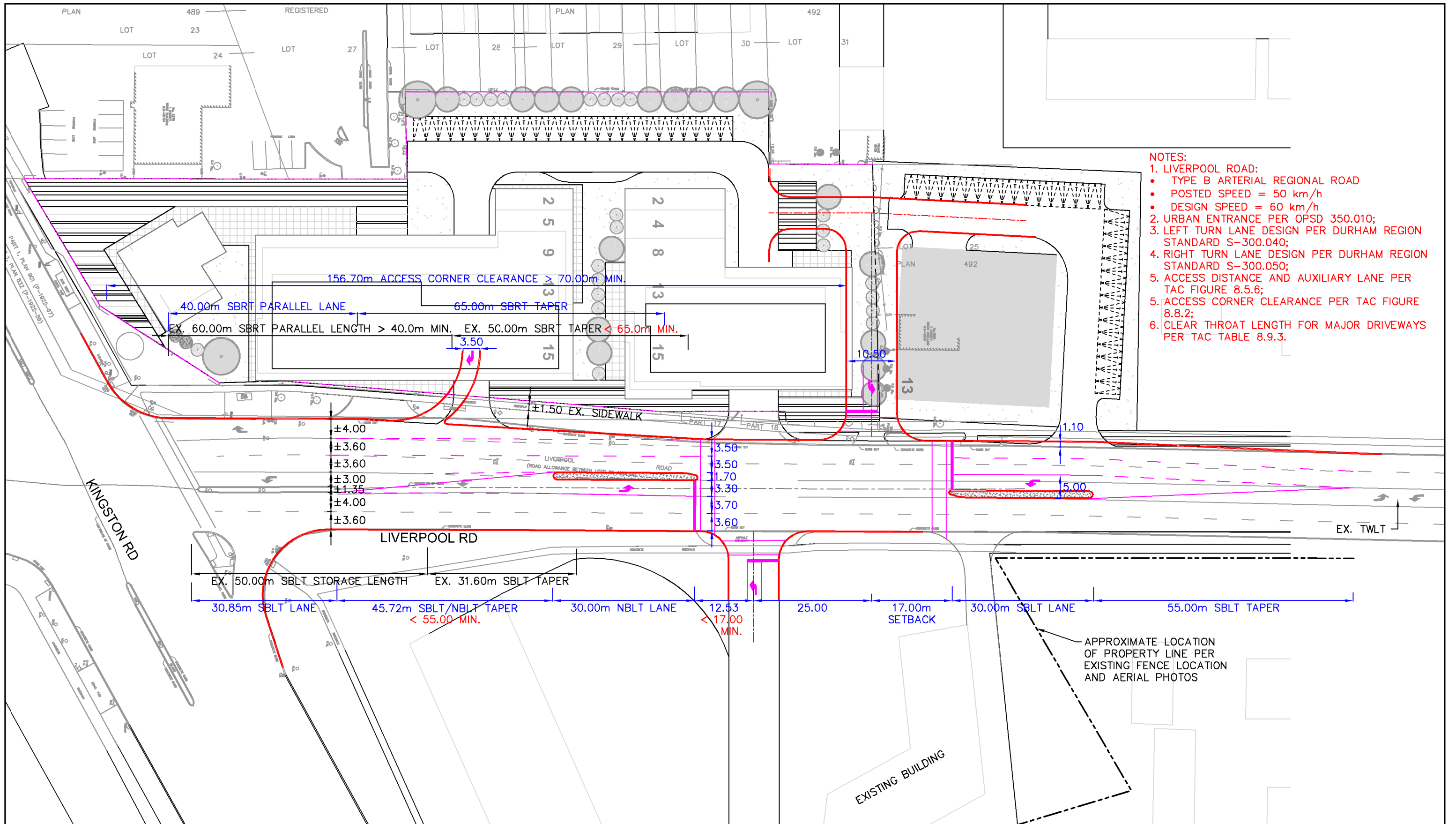
**1294 KINGSTON ROAD**  
**PICKERING ONTARIO**

7.5 0 7.5 15 22.5m  
 1: 750

**SITE PLAN (OPTION 3)**  
**ONE ACCESS**  
**DESIGN**

Drawing No.  
**SK03**





- NOTES:
- LIVERPOOL ROAD:
    - TYPE B ARTERIAL REGIONAL ROAD
    - POSTED SPEED = 50 km/h
    - DESIGN SPEED = 60 km/h
  - URBAN ENTRANCE PER OPSD 350.010;
  - LEFT TURN LANE DESIGN PER DURHAM REGION STANDARD S-300.040;
  - RIGHT TURN LANE DESIGN PER DURHAM REGION STANDARD S-300.050;
  - ACCESS DISTANCE AND AUXILIARY LANE PER TAC FIGURE 8.5.6;
  - ACCESS CORNER CLEARANCE PER TAC FIGURE 8.8.2;
  - CLEAR THROAT LENGTH FOR MAJOR DRIVEWAYS PER TAC TABLE 8.9.3.

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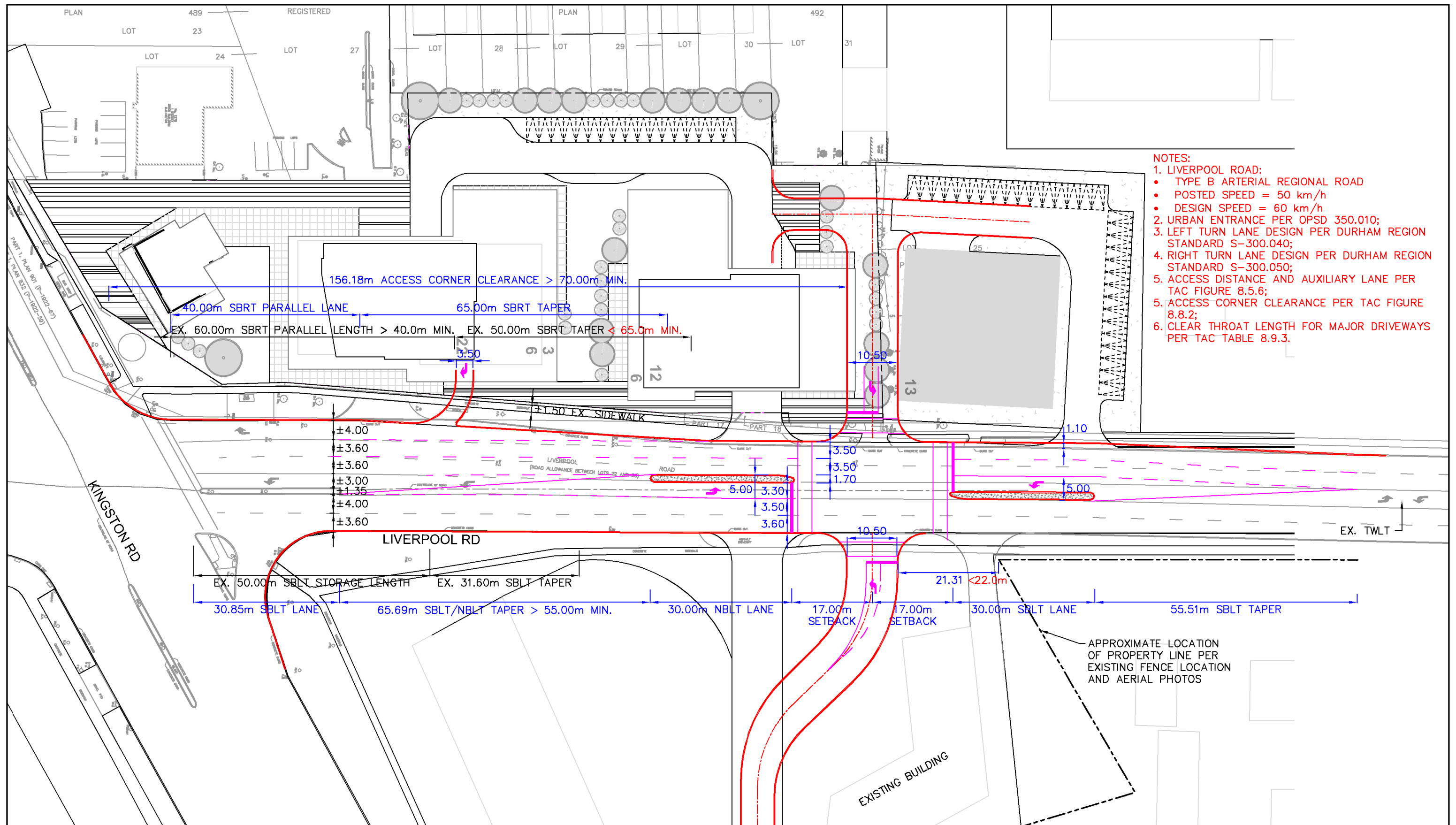
1294 KINGSTON ROAD  
PICKERING ONTARIO

7.5 0 7.5 15 22.5m

1:750

SITE PLAN (OPTION 4)  
TWO ACCESS DESIGN  
BETWEEN PROPERTIES

Drawing No.  
**SK04**



- NOTES:
- LIVERPOOL ROAD:
    - TYPE B ARTERIAL REGIONAL ROAD
    - POSTED SPEED = 50 km/h
    - DESIGN SPEED = 60 km/h
  - URBAN ENTRANCE PER OPSD 350.010;
  - LEFT TURN LANE DESIGN PER DURHAM REGION STANDARD S-300.040;
  - RIGHT TURN LANE DESIGN PER DURHAM REGION STANDARD S-300.050;
  - ACCESS DISTANCE AND AUXILIARY LANE PER TAC FIGURE 8.5.6;
  - ACCESS CORNER CLEARANCE PER TAC FIGURE 8.8.2;
  - CLEAR THROAT LENGTH FOR MAJOR DRIVEWAYS PER TAC TABLE 8.9.3.

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Project No.  
 19225-200

Date  
 FEB. 03, 2020

**DRAFT**  
 NOT FOR CONSTRUCTION

1294 KINGSTON ROAD  
 PICKERING ONTARIO

7.5 0 7.5 15 22.5m

1:750

SITE PLAN (OPTION 4A)  
 TWO ACCESS DESIGN  
 BETWEEN PROPERTIES

Drawing No.  
 SK05





# APPENDIX B

## Intersection Capacity Analysis

The background of the page features several thick, overlapping, curved grey lines that sweep across the frame from the top and right towards the bottom and left, creating a sense of dynamic movement and depth.

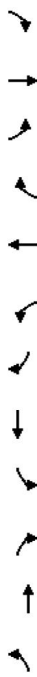
**Existing Traffic**



**Weekday AM Peak Hour**

HCM Signalized Intersection Capacity Analysis  
 1: Glenanna Rd & Kingston Rd

19225 | 1294 Kingston Rd  
 EX AM



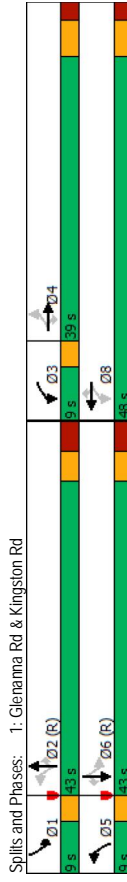
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	10	388	93	96	562	122	52	73	64	190	102	26
Traffic Volume (vph)	10	388	93	96	562	122	52	73	64	190	102	26
Future Volume (vph)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Ideal Flow (vphpl)	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2
Lane Width	6.4	6.4	6.4	3.0	6.4	6.4	3.0	7.0	3.0	7.0	3.0	7.0
Total Lost Time (s)	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Util. Factor	1.00	1.00	0.83	1.00	1.00	0.90	1.00	1.00	0.91	1.00	1.00	0.84
Frbp. ped/bikes	0.96	1.00	1.00	0.98	1.00	1.00	0.91	1.00	1.00	0.96	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)	1663	3500	1220	1628	3500	1373	1575	1879	1385	1649	1824	1295
Flt Permitted	0.42	1.00	1.00	0.32	1.00	1.00	0.69	1.00	1.00	0.66	1.00	1.00
Satd. Flow (perm)	736	3500	1220	541	3500	1373	1136	1879	1385	1143	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)	11	422	101	104	611	133	57	79	70	207	111	28
RTOR Reduction (vph)	0	0	82	0	0	69	0	0	41	0	0	15
Lane Group Flow (vph)	11	422	19	104	611	64	57	79	29	207	111	13
Conf. Peds. (#/hr)	30	55	55	30	91	30	91	50	50	50	30	91
Heavy Vehicles (%)	0%	2%	5%	4%	2%	1%	0%	0%	1%	0%	3%	0%
Turn Type	Perm	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm
Permitted Phases	4	4	4	3	8	8	5	2	2	1	6	6
Actuated Green, G (s)	18.5	18.5	30.2	30.2	30.2	48.0	42.1	42.1	42.1	56.4	47.5	47.5
Effective Green, g (s)	18.5	18.5	30.2	30.2	30.2	48.0	42.1	42.1	42.1	56.4	47.5	47.5
Actuated g/C Ratio	0.18	0.18	0.30	0.30	0.30	0.48	0.42	0.42	0.42	0.56	0.48	0.48
Clearance Time (s)	6.4	6.4	6.4	3.0	6.4	6.4	3.0	7.0	3.0	7.0	3.0	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	3.0
Lane Grp Cap (vph)	136	647	225	257	1057	414	571	791	583	701	866	615
v/s Ratio Prot	0.01	0.12	0.04	0.04	c0.17	0.01	0.04	0.04	0.02	c0.03	0.06	0.06
v/s Ratio Perm	0.01	0.02	0.09	0.05	0.05	0.05	0.04	0.02	0.02	c0.13	0.01	0.01
Uniform Delay, d1	0.08	0.65	0.08	0.40	0.58	0.15	0.10	0.10	0.05	0.30	0.13	0.02
Progression Factor	0.67	0.63	0.18	1.00	1.00	1.00	1.00	1.00	1.00	0.79	0.87	1.00
Incremental Delay, d2	0.2	2.3	0.2	1.0	0.8	0.2	0.1	0.3	0.2	0.2	0.3	0.1
Delay (s)	22.9	26.2	6.2	27.4	30.3	25.7	14.1	17.8	17.3	8.9	13.1	14.0
Level of Service	C	C	A	C	C	C	B	B	B	A	B	B
Approach Delay (s)	C	22.4	A	C	C	29.2	B	16.6	B	A	10.6	B
Approach LOS	C	C	A	C	C	C	B	B	B	A	B	B
Intersection Summary												
HCM 2000 Control Delay	22.7 HCM 2000 Level of Service C											
HCM 2000 Volume to Capacity ratio	0.42											
Actuated Cycle Length (s)	100.0 Sum of lost time (s) 19.4											
Intersection Capacity Utilization	54.3% ICU Level of Service A											
Analysis Period (min)	15											
C Critical Lane Group												

1: Glenanna Rd & Kingston Rd

19225 | 1294 Kingston Rd  
 EX AM



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	10	388	93	96	562	122	52	73	64	190	102	26
Traffic Volume (vph)	10	388	93	96	562	122	52	73	64	190	102	26
Future Volume (vph)	11	422	101	104	611	133	57	79	70	207	111	28
Lane Group Flow (vph)	11	422	101	104	611	133	57	79	70	207	111	28
Lane Width	6.4	6.4	6.4	3.0	6.4	6.4	3.0	7.0	3.0	7.0	3.0	7.0
Total Lost Time (s)	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Util. Factor	1.00	1.00	0.83	1.00	1.00	0.90	1.00	1.00	0.91	1.00	1.00	0.84
Frbp. ped/bikes	0.96	1.00	1.00	0.98	1.00	1.00	0.91	1.00	1.00	0.96	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)	1663	3500	1220	1628	3500	1373	1575	1879	1385	1649	1824	1295
Flt Permitted	0.42	1.00	1.00	0.32	1.00	1.00	0.69	1.00	1.00	0.66	1.00	1.00
Satd. Flow (perm)	736	3500	1220	541	3500	1373	1136	1879	1385	1143	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)	11	422	101	104	611	133	57	79	70	207	111	28
RTOR Reduction (vph)	0	0	82	0	0	69	0	0	41	0	0	15
Lane Group Flow (vph)	11	422	19	104	611	64	57	79	29	207	111	13
Conf. Peds. (#/hr)	30	55	55	30	91	30	91	50	50	50	30	91
Heavy Vehicles (%)	0%	2%	5%	4%	2%	1%	0%	0%	1%	0%	3%	0%
Turn Type	Perm	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm
Permitted Phases	4	4	4	3	8	8	5	2	2	1	6	6
Actuated Green, G (s)	18.5	18.5	30.2	30.2	30.2	48.0	42.1	42.1	42.1	56.4	47.5	47.5
Effective Green, g (s)	18.5	18.5	30.2	30.2	30.2	48.0	42.1	42.1	42.1	56.4	47.5	47.5
Actuated g/C Ratio	0.18	0.18	0.30	0.30	0.30	0.48	0.42	0.42	0.42	0.56	0.48	0.48
Clearance Time (s)	6.4	6.4	6.4	3.0	6.4	6.4	3.0	7.0	3.0	7.0	3.0	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	3.0
Lane Grp Cap (vph)	136	647	225	257	1057	414	571	791	583	701	866	615
v/s Ratio Prot	0.01	0.12	0.04	0.04	c0.17	0.01	0.04	0.04	0.02	c0.13	0.06	0.06
v/s Ratio Perm	0.01	0.02	0.09	0.05	0.05	0.05	0.04	0.02	0.02	c0.13	0.01	0.01
Uniform Delay, d1	0.08	0.65	0.08	0.40	0.58	0.15	0.10	0.10	0.05	0.30	0.13	0.02
Progression Factor	0.67	0.63	0.18	1.00	1.00	1.00	1.00	1.00	1.00	0.79	0.87	1.00
Incremental Delay, d2	0.2	2.3	0.2	1.0	0.8	0.2	0.1	0.3	0.2	0.2	0.3	0.1
Delay (s)	22.9	26.2	6.2	27.4	30.3	25.7	14.1	17.8	17.3	8.9	13.1	14.0
Level of Service	C	C	A	C	C	C	B	B	B	A	B	B
Approach Delay (s)	C	22.4	A	C	C	29.2	B	16.6	B	A	10.6	B
Approach LOS	C	C	A	C	C	C	B	B	B	A	B	B
Intersection Summary												
HCM 2000 Control Delay	22.7 HCM 2000 Level of Service C											
HCM 2000 Volume to Capacity ratio	0.42											
Actuated Cycle Length (s)	100.0 Sum of lost time (s) 19.4											
Intersection Capacity Utilization	54.3% ICU Level of Service A											
Analysis Period (min)	15											
C Critical Lane Group												



HCM Signalized Intersection Capacity Analysis  
 2: Liverpool Rd & Kingston Rd

19225 | 1294 Kingston Rd  
 EX AM  
 Queues  
 2: Liverpool Rd & Kingston Rd

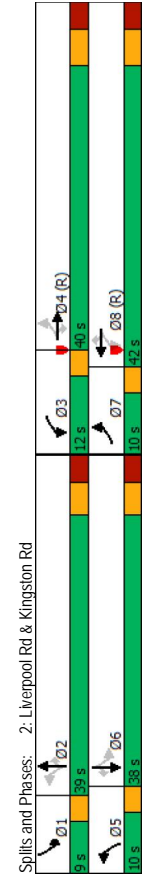


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	→	→	→	←	←	←	←	←	←	←	←	←
Traffic Volume (vph)	92	377	254	178	471	47	215	437	122	79	783	99
Future Volume (vph)	92	377	254	178	471	47	215	437	122	79	783	99
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.5	3.2	3.2	3.5	3.2	3.5	3.2	3.5	3.2	3.5	3.2
Total Lost Time (s)	3.0	7.4	7.4	3.0	7.4	3.0	6.9	6.9	3.0	6.9	6.9	6.9
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	0.95	1.00	0.95	1.00
Frbp. ped/bikes	1.00	1.00	0.94	1.00	1.00	0.95	1.00	1.00	0.91	1.00	1.00	0.93
Frbp. ped/bikes	0.99	1.00	1.00	0.99	1.00	1.00	1.00	1.00	0.98	1.00	1.00	0.85
Frbp. ped/bikes	0.95	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	0.95	1.00	1.00	0.95
Satd. Flow (prot)	1693	3500	1416	1690	3500	1431	1691	3535	1363	1643	3570	1397
Flt Permitted	0.45	1.00	1.00	0.43	1.00	1.00	0.13	1.00	0.10	0.48	1.00	1.00
Satd. Flow (perm)	797	3500	1416	764	3500	1431	231	3535	1363	831	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)	100	400	276	193	512	51	234	475	133	86	851	108
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	100	410	276	193	512	51	234	475	46	86	851	31
Conf. Peds. (#/hr)	26	32	32	32	32	26	34	48	48	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
Permitted Phases	4	4	8	8	8	8	2	2	2	6	6	6
Actuated Green, G (s)	35.4	29.5	29.5	41.8	32.9	32.9	43.9	34.7	34.7	35.3	29.1	29.1
Effective Green, g (s)	35.4	29.5	29.5	41.8	32.9	32.9	43.9	34.7	34.7	35.3	29.1	29.1
Actuated g/C Ratio	0.35	0.29	0.29	0.42	0.33	0.33	0.44	0.35	0.35	0.35	0.29	0.29
Clearance Time (s)	3.0	7.4	7.4	3.0	7.4	3.0	6.9	6.9	3.0	6.9	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)	335	1032	417	405	1151	470	273	1226	472	343	1038	406
v/s Ratio Prot	0.02	0.12	0.04	0.15	0.04	0.15	0.13	0.02	0.02	0.24	0.02	0.24
v/s Ratio Perm	0.09	0.19	0.15	0.15	0.04	0.28	0.03	0.03	0.07	0.07	0.02	0.02
Uniform Delay, d1	22.2	28.2	30.9	19.3	26.4	23.3	21.7	24.6	22.1	22.1	33.0	25.7
Progression Factor	1.00	1.00	1.00	2.34	1.97	2.04	1.00	1.00	1.00	0.86	0.88	0.55
Incremental Delay, d2	0.5	1.1	8.0	0.8	1.2	0.4	22.3	0.2	0.1	0.4	5.0	0.1
Delay (s)	22.7	29.3	38.9	46.0	53.1	48.0	44.1	24.8	22.2	19.3	34.1	14.1
Level of Service	C	D	D	D	D	D	D	C	C	C	B	C
Approach Delay (s)	C	31.8	C	50.9	D	29.8	C	30.9	C	C	30.9	C
Approach LOS	C	C	C	D	D	C	C	C	C	C	C	C

Intersection Summary	Value
HCM 2000 Control Delay	35.2
HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.77
Actuated Cycle Length (s)	100.0
Intersection Capacity Utilization	77.0%
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
Permitted Phases	7	4	4	4	4	8	8	2	2	6	6	6
Detector Phase	7	4	4	4	4	8	8	2	2	6	6	6
Switch Phase	7	4	4	4	4	8	8	2	2	6	6	6
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 Spill (%)	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	None	None	C-Min	None	None	C-Min	None	None	C-Min	None
v/s Ratio	0.25	0.39	0.65	0.44	0.43	0.10	0.84	0.39	0.24	0.22	0.84	0.23
Control Delay	17.3	29.4	39.1	42.1	53.7	51.1	49.8	26.2	5.6	14.1	37.4	3.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	17.3	29.4	39.1	42.1	53.7	51.1	49.8	26.2	5.6	14.1	37.4	3.7
Queue Length 50th (m)	12.5	38.0	53.5	39.2	58.1	10.7	25.9	36.2	0.0	7.4	85.5	0.4
Queue Length 95th (m)	20.0	46.7	75.0	52.0	71.2	21.8	#89.0	54.5	13.1	14.6	81.4	5.3
Internal Link Dist (m)							242.2					
Turn Bay Length (m)	33.5	49.1	103.2	61.6	46.2	61.6	46.2	51.8	47.9	39.9	47.9	39.9
Base Capacity (vph)	397	1173	474	438	1306	534	277	1227	560	387	1110	512
Stallion 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	0.25	0.35	0.58	0.44	0.39	0.10	0.84	0.39	0.24	0.22	0.77	0.21

Intersection Summary	Value
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.	



HCM Unsignalized Intersection Capacity Analysis  
 4: Liverpool Rd & North Dwy/Main Plaza Dwy

HCM Unsignalized Intersection Capacity Analysis  
 3: Liverpool Rd & South Dwy

19225 | 1294 Kingston Rd  
 EX AM

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 EX AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	8	0	14	106	1	59	18	395	163	94	833	19
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	Stop	Stop	0%	0%	Free	Free	Free	Free	Free	Free
Grade	0%	0%	0%	0%	0%	0%	0%	0%	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	6	0	15	115	1	64	20	429	177	102	905	21
Lane Width (m)	3.5	3.5	3.4	3.4	3.4	3.4	1.2	1.2	1.2	1.2	3.4	3.4
Walking Speed (m/s)	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Percent Blockage	0	0	0	0	0	0	0	0	0	0	0	0
Right turn flare (veh)												
Median type							TW/TLT	TW/TLT	TW/TLT	TW/TLT	TW/TLT	TW/TLT
Median storage (veh)							2	2	2	2	2	2
Upstream signal (m)	0.92	0.92	0.98	0.92	0.92	0.91	0.98	0.92	0.92	0.91	0.91	216
pX, platoon unblocked	1446	1786	470	1245	1708	319	932	1400	621	621	621	621
vC, conflicting volume	1126	1126	572	572	572	572	572	572	572	572	572	572
vC1, stage 1 conf vol	320	661	672	672	1136	672	1136	672	1136	672	1136	672
vC2, stage 2 conf vol	1191	1562	408	973	1477	44	881	44	881	44	377	377
vCu, unblocked vol	7.5	6.5	6.9	7.5	6.5	6.9	4.1	6.9	4.1	4.1	4.1	4.1
tC, single (s)	6.5	5.5	6.5	6.5	5.5	6.5	5.5	5.5	5.5	5.5	5.5	5.5
tC, 2 stage (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2	3.3	2.2	2.2	2.2	2.2
p0 queue free %	96	100	97	65	100	93	97	97	97	90	90	90
cM capacity (veh/h)	201	229	581	332	224	914	753	753	753	1069	1069	1069
Direction, Lane #	EB.1	WB.1	WB.2	NB.1	NB.2	NB.3	SB.1	SB.2	SB.3	SB.3	SB.3	SB.3
Volume Total	24	115	65	20	286	320	102	603	323	323	323	323
Volume Left	9	115	0	20	0	0	102	0	0	0	0	0
Volume Right	15	0	64	0	0	177	0	0	21	21	21	21
cSH	340	332	872	753	1700	1700	1069	1700	1700	1700	1700	1700
Volume to Capacity	0.07	0.35	0.07	0.03	0.17	0.19	0.10	0.35	0.19	0.19	0.35	0.19
Queue Length 95th (m)	1.8	12.1	1.9	0.7	0.0	0.0	2.5	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	16.4	21.5	9.5	9.9	0.0	0.0	8.7	0.0	0.0	0.0	0.0	0.0
Lane LOS	C	C	A	A	A	A	A	A	A	A	A	A
Approach Delay (s)	16.4	17.2	0.3	0.3	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Approach LOS	C	C	C	C	C	C	C	C	C	C	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	NBR	SBT	SBR
Lane Configurations	0	11	0	576	950	3	3
Traffic Volume (veh/h)	0	11	0	576	950	3	3
Future Volume (Veh/h)	0	11	0	576	950	3	3
Sign Control	Stop	Free	Free	Free	Free	Free	Free
Grade	0%	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	12	0	626	1033	3	3
Pedestrians	4	4	4	4	4	4	4
Lane Width (m)	3.2	3.2	3.2	3.2	3.2	3.2	3.2
Walking Speed (m/s)	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Percent Blockage	0	0	0	0	0	0	0
Right turn flare (veh)							
Median type						None	TW/TLT
Median storage (veh)						2	2
Upstream signal (m)	0.90	0.90	0.90	0.90	0.90	59	297
pX, platoon unblocked	1352	522	1040	1352	522	1040	1040
vC, conflicting volume	1038	1038	1038	1038	1038	1038	1038
vC1, stage 1 conf vol	313	313	313	313	313	313	313
vC2, stage 2 conf vol	1170	522	1040	1170	522	1040	1040
vCu, unblocked vol	6.8	6.9	4.1	6.8	6.9	4.1	4.1
tC, single (s)	5.8	5.8	3.3	5.8	5.8	3.3	3.3
tC, 2 stage (s)	3.5	3.3	2.2	3.5	3.3	2.2	2.2
p0 queue free %	100	98	100	100	98	100	100
cM capacity (veh/h)	295	503	674	295	503	674	674
Direction, Lane #	EB.1	NB.1	NB.2	SB.1	SB.2	SB.2	SB.2
Volume Total	12	209	417	689	347	347	347
Volume Left	0	0	0	0	0	0	0
Volume Right	12	0	0	0	0	3	3
cSH	503	674	1700	1700	1700	1700	1700
Volume to Capacity	0.02	0.00	0.25	0.41	0.20	0.20	0.20
Queue Length 95th (m)	0.6	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	12.3	0.0	0.0	0.0	0.0	0.0	0.0
Lane LOS	B	B	B	B	B	B	B
Approach Delay (s)	12.3	0.0	0.0	0.0	0.0	0.0	0.0
Approach LOS	B	B	B	B	B	B	B
Intersection Summary							
Average Delay	0.1						
Intersection Capacity Utilization	36.4%						
ICU Level of Service	A						
Analysis Period (min)	15						

HCM Signalized Intersection Capacity Analysis  
6: Liverpool Rd & Glenanna Rd

19225 | 1294 Kingston Rd  
EX AM

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	1.00	5.9	5.9	5.9	6.7	6.7	6.7	6.7	6.7	6.7	6.7
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frbp. ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frbp. ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Flt Protected	0.95	1.00	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1725	1824	1543	1725	1744	1708	3456	1694	3516	1694	3516	3516
Flt Permitted	0.55	1.00	1.00	0.57	1.00	0.36	1.00	0.53	1.00	0.53	1.00	1.00
Satd. Flow (perm)	995	1824	1543	1031	1744	655	3456	941	3516	941	3516	3516
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	204	0	28	0	0	5	0	0	5	0
Lane Group Flow (vph)	51	150	73	78	128	0	125	372	0	79	743	0
Conf. Ped. (#/hr)	0%	3%	0%	0%	1%	2%	1%	1%	5%	0%	0%	0%
Heavy Vehicles (%)	0%	3%	0%	0%	1%	2%	1%	1%	5%	0%	0%	0%
Turn Type	Perm	NA	Perm	Perm	NA	Perm	NA	NA	Perm	NA	Perm	NA
Permitted Phases	4		4	8		2			6			6
Actuated Green, G (s)	13.7	13.7	13.7	13.7	13.7	73.7	73.7	73.7	73.7	73.7	73.7	73.7
Effective Green, g (s)	13.7	13.7	13.7	13.7	13.7	73.7	73.7	73.7	73.7	73.7	73.7	73.7
Actuated g/C Ratio	0.14	0.14	0.14	0.14	0.14	0.74	0.74	0.74	0.74	0.74	0.74	0.74
Clearance Time (s)	5.9	5.9	5.9	5.9	5.9	6.7	6.7	6.7	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	3.0	3.0	3.0
Lane Grp Cap (vph)	136	249	211	141	238	482	2547	693	2591	693	2591	2591
v/s Ratio Prot	c0.08				0.07			0.11			c0.21	
v/s Ratio Perm	0.05		0.05	0.08		0.19		0.15		0.08		0.08
Uniform Delay, d1	0.38	0.60	0.35	0.55	0.54	0.26	0.15	0.11	0.29	0.11	0.29	0.29
Progression Factor	1.00	1.00	1.00	1.03	1.01	0.71	0.67	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.7	4.1	1.0	4.6	2.3	1.3	0.1	0.3	0.3	0.3	0.3	0.3
Delay (s)	41.0	44.7	40.1	46.0	43.1	4.3	2.7	4.1	4.7	4.1	4.7	4.7
Level of Service	D	D	D	D	D	A	A	A	A	A	A	A
Approach Delay (s)	41.6			44.0		4.0		3.1		4.6		4.6
Approach LOS	D			D		A		A		A		A

Intersection Summary	Value	Level of Service
HCM 2000 Control Delay	17.4	HCM 2000 Level of Service B
HCM 2000 Volume to Capacity ratio	0.34	
Actuated Cycle Length (s)	100.0	Sum of lost time (s) 12.6
Intersection Capacity Utilization	61.3%	ICU Level of Service B
Analysis Period (min)	15	
Critical Lane Group		

Queues  
6: Liverpool Rd & Glenanna Rd

19225 | 1294 Kingston Rd  
EX AM

Lane Group	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
Lane Group Flow (vph)	51	150	277	78	156	125	377	79	748			
Turn Type	Perm	NA	Perm	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm
Protected Phases	4		4	8		2			6			6
Permitted Phases	4		4	8		2			6			6
Switch Phase	4		4	8		2			6			6
Minimum Initial (s)	8.0	8.0	8.0	8.0	8.0	8.0	5.0	5.0	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	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	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%	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	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	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	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	6.7	6.7	6.7
LeadLag												
LeadLag Optimize?												
Recall Mode	None	None	None	None	None	None	C-Min	C-Min	C-Min	C-Min	C-Min	C-Min
v/c Ratio	0.38	0.60	0.67	0.55	0.58	0.26	0.15	0.11	0.29	0.11	0.29	0.29
Control Delay	45.5	49.9	16.5	54.9	40.2	5.1	2.9	5.0	5.0	5.0	5.0	5.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	45.5	49.9	16.5	54.9	40.2	5.1	2.9	5.0	5.0	5.0	5.0	5.0
Queue Length 50th (m)	9.6	29.2	7.5	15.7	24.8	4.7	6.5	3.9	21.6	6.5	3.9	21.6
Queue Length 95th (m)	20.2	46.6	31.6	30.8	45.6	10.2	11.6	10.4	36.8	10.4	36.8	36.8
Internal Link Dist (m)				416.6			192.1					
Turn Bay Length (m)	22.0			24.3			24.4			46.2		
Base Capacity (vph)	299	549	629	310	548	481	2550	693	2595	693	2595	2595
Stallcap 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	0.17	0.27	0.44	0.25	0.28	0.26	0.15	0.11	0.29	0.15	0.29	0.29

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

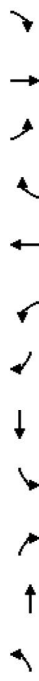
The background features several thick, overlapping, curved grey lines that sweep across the page from the top and bottom edges towards the center. These lines create a sense of motion and depth, with some lines crossing over others.

**Weekday PM Peak Hour**



HCM Signalized Intersection Capacity Analysis  
 1: Glenanna Rd & Kingston Rd

19225 | 1294 Kingston Rd  
 EX PM



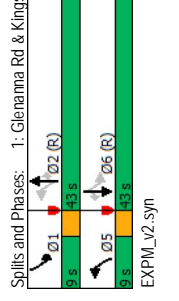
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	24	1158	143	156	581	132	102	177	194	178	199	36
Future Volume (vph)	24	1158	143	156	581	132	102	177	194	178	199	36
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	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	6.4	3.0	6.4	6.4	7.0	7.0	3.0	7.0	3.0	7.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frbp. ped/bikes	1.00	1.00	0.83	1.00	1.00	0.90	1.00	1.00	0.91	1.00	1.00	0.84
Frbp. ped/bikes	0.97	1.00	1.00	1.00	1.00	0.96	1.00	1.00	0.97	1.00	1.00	0.85
Flt	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	0.95	1.00	1.00	0.85
Satd. Flow (prot)	1665	3500	1220	1658	3500	1373	1649	1879	1385	1673	1824	1295
Flt Permitted	0.41	1.00	1.00	0.09	1.00	1.00	0.47	1.00	1.00	0.53	1.00	1.00
Satd. Flow (perm)	722	3500	1220	151	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	0	60	0	0	41	0	0	171	0	0	32
Lane Group Flow (vph)	26	1259	95	170	632	102	111	192	40	193	216	7
Conf. Peds. (#/hr)	30	55	55	30	91	30	91	50	50	50	50	91
Heavy Vehicles (%)	0%	2%	5%	4%	2%	1%	0%	0%	0%	1%	0%	3%
Turn Type	Perm	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm
Permitted Phases	4	4	4	8	8	8	5	2	2	2	6	6
Actuated Green, G (s)	44.5	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	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	0.44	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	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	3.0
Lane Grp Cap (vph)	321	1557	542	283	2110	827	239	325	239	262	315	224
v/s Ratio Prot	c0.36	c0.08	c0.08	0.18	0.03	0.10	0.03	0.10	0.04	0.12	0.04	0.12
v/s Ratio Perm	0.04	0.08	0.08	0.28	0.07	0.08	0.03	0.08	0.03	0.13	0.03	0.01
Uniform Delay, d1	0.08	0.81	0.17	0.60	0.30	0.12	0.46	0.59	0.17	0.74	0.69	0.03
Progression Factor	0.46	0.49	0.16	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.04	1.05
Incremental Delay, d2	0.1	1.6	0.1	3.6	0.1	0.1	1.4	7.7	1.5	10.3	11.5	0.2
Delay (s)	7.4	13.4	2.7	22.1	9.7	8.6	33.1	45.8	36.7	46.4	52.3	34.6
Level of Service	A	B	A	C	A	A	C	D	D	D	D	C
Approach Delay (s)	12.1			11.8			39.3				48.2	
Approach LOS	B			B			D				D	
Intersection Summary												
HCM 2000 Control Delay	21.0 HCM 2000 Level of Service C											
HCM 2000 Volume to Capacity ratio	0.75											
Actuated Cycle Length (s)	100.0 Sum of lost time (s) 19.4											
Intersection Capacity Utilization	83.3% ICU Level of Service E											
Analysis Period (min)	15											
C Critical Lane Group												

Queues  
 1: Glenanna Rd & Kingston Rd

19225 | 1294 Kingston Rd  
 EX PM

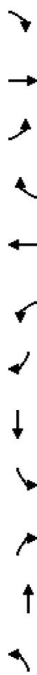


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	24	1158	143	156	581	132	102	177	194	178	199	36
Future Volume (vph)	24	1158	143	156	581	132	102	177	194	178	199	36
Lane Group Flow (vph)	26	1259	155	170	632	143	111	192	211	193	216	39
Turn Type	Perm	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm
Permitted Phases	4	4	4	8	8	8	5	2	2	2	6	6
Detector Phase	4	4	4	3	8	8	5	2	2	2	1	6
Switch Phase	4	4	4	3	8	8	5	2	2	2	1	6
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)	24.4	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	39.0	9.0	48.0	48.0	9.0	43.0	43.0	9.0	43.0	43.0
Total Spill (%)	39.0%	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	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	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	0.0
Total Lost Time (s)	6.4	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	Lag	Lead	Lead	Lead	Lag	Lag	Lag	Lead	Lag	Lag
Lead/Lag Optimize?	None	None	None	None	None	None	None	None	None	None	None	None
Recall Mode	0.08	0.81	0.26	0.59	0.30	0.16	0.42	0.59	0.51	0.65	0.69	0.13
v/s Ratio	9.1	16.5	1.7	24.5	10.7	4.1	30.0	44.9	9.8	40.2	51.5	1.5
Control 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
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	9.1	16.5	1.7	24.5	10.7	4.1	30.0	44.9	9.8	40.2	51.5	1.5
Queue Length 50th (m)	0.9	68.8	0.0	15.3	30.4	3.1	16.8	36.5	0.7	34.6	44.0	0.1
Queue Length 95th (m)	m2.4m#16.28 m4.8 39.4 47.9 13.0 27.9 55.0 19.2 44.4 62.9 0.3 393.2											
Internal Link Dist (m)	523.9											
Turn Bay Length (m)	42.6	60.4	33.0	23.2	25.4	25.4	25.0	27.3	25.0	27.3	25.0	16.5
Base Capacity (vph)	321	1557	603	288	2110	868	265	676	631	296	656	532
Stallion Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillover 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	0.08	0.81	0.26	0.59	0.30	0.16	0.42	0.28	0.33	0.65	0.33	0.07
Intersection Summary												
Cycle Length: 100												
Offset: 0 (0%). Referenced to phase 2:NBL and 6:SBTL, Start of Green												
Natural Cycle: 80												
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.												



HCM Signalized Intersection Capacity Analysis  
 2: Liverpool Rd & Kingston Rd

19225 | 1294 Kingston Rd  
 EX PM



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	217	1022	330	226	502	79	302	875	278	114	345	84
Traffic Volume (vph)	217	1022	330	226	502	79	302	875	278	114	345	84
Future Volume (vph)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Ideal Flow (vphpl)	3.2	3.5	3.2	3.2	3.5	3.2	3.5	3.2	3.5	3.2	3.5	3.2
Lane Width	3.0	7.4	7.4	3.0	7.4	7.4	3.0	6.9	6.9	3.0	6.9	6.9
Total Lost Time (s)	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Lane Util. Factor	0.99	1.00	1.00	1.00	1.00	0.99	1.00	0.99	1.00	1.00	0.99	1.00
Frbp. ped/bikes	0.95	1.00	0.85	1.00	0.85	1.00	0.85	1.00	0.85	1.00	0.85	1.00
Flt	1.00	1.00	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	1.00
Flt Protected	1695	3500	1416	1708	3500	1431	1667	3535	1363	1675	3570	1397
Satd. Flow (prot)	0.42	1.00	1.00	0.11	1.00	0.48	1.00	0.48	1.00	0.13	1.00	1.00
Flt Permitted	746	3500	1416	204	3500	1431	846	3535	1363	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	0	143	0	64
Lane Group Flow (vph)	236	1111	359	246	546	86	328	951	159	124	375	27
Conf. Peds. (#/hr)	26	32	32	32	32	26	34	48	48	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
Permitted Phases	4	4	4	8	8	8	5	2	2	6	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	419	171	1063	416
v/s Ratio Prot	0.05	0.32	0.10	0.16	0.16	0.06	c0.06	c0.27	0.12	0.22	0.11	0.11
v/s Ratio Perm	0.21	0.25	0.25	c0.35	0.06	0.27	0.12	0.22	0.12	0.22	0.11	0.11
Uniform Delay, d1	0.63	0.97	0.78	1.00	0.44	0.17	0.87	0.38	0.38	0.73	0.35	0.07
Progression Factor	21.4	33.3	30.4	26.3	24.8	22.3	27.3	32.8	27.1	24.4	27.5	25.1
Incremental Delay, d2	3.5	21.0	12.2	55.1	1.1	0.7	19.1	8.0	0.6	14.1	0.2	0.1
Delay (s)	24.9	54.3	42.7	98.9	38.0	34.4	46.4	40.7	27.7	41.4	27.3	35.9
Level of Service	C	D	D	F	D	C	D	D	D	C	D	D
Approach Delay (s)	47.8	54.7	54.7	54.7	54.7	54.7	39.4	39.4	39.4	31.5	31.5	31.5
Approach LOS	D	D	D	D	D	D	D	D	D	C	C	C

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

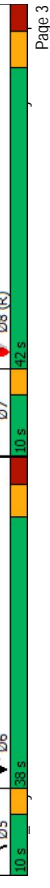
Queues  
 2: Liverpool Rd & Kingston Rd

19225 | 1294 Kingston Rd  
 EX PM



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	217	1022	330	226	502	79	302	875	278	114	345	84
Traffic Volume (vph)	217	1022	330	226	502	79	302	875	278	114	345	84
Future Volume (vph)	236	1111	359	246	546	86	328	951	302	124	375	91
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
Permitted Phases	7	4	4	4	4	4	8	2	2	6	6	6
Detector Phase	7	4	4	4	4	4	8	2	2	6	6	6
Switch Phase	7	4	4	4	4	4	8	2	2	6	6	6
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 Spill (%)	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?	None	C-Min	C-Min	None	C-Min	C-Min	None	C-Min	C-Min	None	C-Min	C-Min
Recall Mode	0.59	0.97	0.78	0.96	0.44	0.17	0.81	0.87	0.54	0.69	0.35	0.18
v/s Ratio	23.3	55.2	43.9	81.6	38.6	35.8	39.5	42.9	13.0	40.8	27.9	5.4
Control 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
Queue Delay	23.3	55.2	43.9	81.6	38.6	35.8	39.5	42.9	13.0	40.8	27.9	5.4
Total Delay	27.4	116.8	65.6	-46.2	57.3	15.6	44.4	94.1	14.2	13.5	28.9	0.0
Queue Length 50th (m)	43.9	#163.0	#111.1	#88.4	74.7	29.4	#78.5	120.3	40.3	#33.5	42.0	8.6
Queue Length 95th (m)	667.5						242.2					
Internal Link Dist (m)	33.5	49.1	103.2	61.6	46.2	51.8	47.9	39.9	39.9	47.9	39.9	39.9
Turn Bay Length (m)	402	1141	461	255	1237	506	406	1134	577	180	1110	512
Base Capacity (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Stallion Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillover 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	0.87	0.52	0.69	0.34	0.18

Intersection Summary	Value	Unit
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.		



HCM Unsignalized Intersection Capacity Analysis  
4: Liverpool Rd & North Dwy/Main Plaza Dwy

19225 | 1294 Kingston Rd  
EX PM

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	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
Grade	0%	0%	0%	0%	0%	0%	0%	0%	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	6			15			1				1	
Lane Width (m)	3.5			3.4			3.4				3.4	
Walking Speed (m/s)	1.2			1.2			1.2				1.2	
Percent Blockage	0			1			0				0	
Right turn flare (veh)												
Median type							TW/TLT				TW/TLT	
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	0.75	0.75	0.75	0.75	0.75	0.75
vC, conflicting volume	1277	1930	225	1600	1807	630	442				1243	
vC1, stage 1 conf vol	598	598		1199	1199							
vC2, stage 2 conf vol	680	1333		401	608							
vCu, unblocked vol	693	1568	225	1125	1403	0	442				647	
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	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	52	99	87	96				88	
cM capacity (veh/h)	356	192	780	279	268	802	1123				700	
Direction, Lane #	EB.1	WB.1	NB.2	NB.1	NB.2	NB.3	SB.2	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	496	279	761	1123	1700	1700	700	1700	1700			
Volume to Capacity	0.09	0.48	0.14	0.04	0.38	0.35	0.12	0.16	0.09			
Queue Length 95th (m)	2.5	19.6	4.0	1.0	0.0	0.0	3.2	0.0	0.0			
Control Delay (s)	13.0	29.3	10.5	8.3	0.0	0.0	10.8	0.0	0.0			
Lane LOS	B	D	B	A	B	B	B	B	B			
Approach Delay (s)	13.0	20.8		0.3		1.7						
Approach LOS	B	C										
<b>Intersection Summary</b>												
Average Delay	3.3											
Intersection Capacity Utilization	60.3%											
ICU Level of Service	B											
Analysis Period (min)	15											

HCM Unsignalized Intersection Capacity Analysis  
3: Liverpool Rd & South Dwy

19225 | 1294 Kingston Rd  
EX PM

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	Stop	Free	Free	Free	Free
Grade	0%	0%	0%	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	4					
Lane Width (m)	3.2					
Walking Speed (m/s)	1.2					
Percent Blockage	0					
Right turn flare (veh)						
Median type				None	TW/TLT	
Median storage (veh)				59	297	
Upstream signal (m)						
pX, platoon unblocked	0.74					
vC, conflicting volume	1212	292	579			
vC1, stage 1 conf vol	575					
vC2, stage 2 conf vol	636					
vCu, unblocked vol	597	292	579			
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)	492	709	1002			
Direction, Lane #	EB.1	NB.1	NB.2	SB.1	SB.2	
Volume Total	23	424	849	378	197	
Volume Left	0	0	0	0	0	
Volume Right	23	0	0	0	8	
cSH	709	1002	1700	1700	1700	
Volume to Capacity	0.03	0.00	0.50	0.22	0.12	
Queue Length 95th (m)	0.8	0.0	0.0	0.0	0.0	
Control Delay (s)	10.2	0.0	0.0	0.0	0.0	
Lane LOS	B	B	B	B	B	
Approach Delay (s)	10.2	0.0		0.0		
Approach LOS	B					
<b>Intersection Summary</b>						
Average Delay	0.1					
Intersection Capacity Utilization	42.4%					
ICU Level of Service	A					
Analysis Period (min)	15					

HCM Signalized Intersection Capacity Analysis  
 6: Liverpool Rd & Glenanna Rd

19225 | 1294 Kingston Rd  
 EX PM



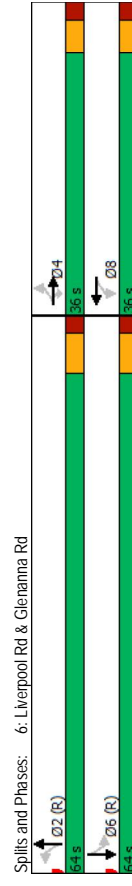
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	4	4	4	4	4	4	4	4	4	4	4	4
Traffic Volume (vph)	45	72	115	55	145	44	351	575	73	67	307	30
Future Volume (vph)	45	72	115	55	145	44	351	575	73	67	307	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
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	5.9	6.7	6.7	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	0.95	1.00	0.99	1.00	0.95
Frbp, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	0.99	1.00	1.00
Frbp, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.98	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	0.95	1.00	1.00
Satd. Flow (prot)	1725	1824	1543	1725	1791	1708	3440	1705	3522	1705	3522	1705
Flt Permitted	0.43	1.00	1.00	0.71	1.00	0.53	1.00	0.38	1.00	0.38	1.00	0.38
Satd. Flow (perm)	788	1824	1543	1282	1791	958	3440	682	3522	682	3522	682
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
Conf. Peds. (#/hr)	0%	3%	0%	0%	1%	2%	1%	1%	5%	0%	0%	0%
Heavy Vehicles (%)	0%	3%	0%	0%	1%	2%	1%	1%	5%	0%	0%	0%
Turn Type	Perm	NA	Perm	Perm	NA	Perm	NA	NA	Perm	NA	Perm	NA
Permitted Phases	4	4	8	8	8	8	2	2	6	6	6	6
Actuated Green, G (s)	16.0	16.0	16.0	16.0	16.0	16.0	71.4	71.4	71.4	71.4	71.4	71.4
Effective Green, g (s)	16.0	16.0	16.0	16.0	16.0	16.0	71.4	71.4	71.4	71.4	71.4	71.4
Actuated g/C Ratio	0.16	0.16	0.16	0.16	0.16	0.16	0.71	0.71	0.71	0.71	0.71	0.71
Clearance Time (s)	5.9	5.9	5.9	5.9	5.9	5.9	6.7	6.7	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	3.0	3.0	3.0
Lane Grp Cap (vph)	126	291	246	205	286	684	2456	486	2514	486	2514	486
v/s Ratio Prot	0.04	0.04	0.04	0.04	0.04	0.04	0.20	0.20	0.10	0.10	0.10	0.10
v/s Ratio Perm	0.06	0.01	0.05	0.05	0.05	0.05	0.40	0.40	0.11	0.11	0.11	0.11
v/c Ratio	0.39	0.27	0.08	0.29	0.67	0.56	0.28	0.15	0.14	0.15	0.14	0.14
Uniform Delay, d1	37.6	36.9	35.7	37.0	39.5	6.8	5.1	4.6	4.6	4.6	4.6	4.6
Progression Factor	1.00	1.00	1.00	0.69	0.76	0.68	0.56	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.0	0.5	0.1	0.8	6.0	2.5	0.2	0.7	0.1	0.7	0.1	0.1
Delay (s)	39.6	37.4	35.9	26.3	36.2	7.0	3.1	5.2	4.7	5.2	4.7	4.7
Level of Service	D	D	D	C	D	A	A	A	A	A	A	A
Approach Delay (s)	37.1	37.1	37.1	37.1	37.1	37.1	37.1	37.1	37.1	37.1	37.1	37.1
Approach LOS	D	D	D	C	D	A	A	A	A	A	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											
Critical Lane Group	C Critical Lane Group											

Queues  
 6: Liverpool Rd & Glenanna Rd

19225 | 1294 Kingston Rd  
 EX PM



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	4	4	4	4	4	4	4	4	4	4	4	4
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
Lane Group Flow (vph)	49	78	125	60	206	382	704	73	367	73	367	367
Turn Type	Perm	NA	Perm	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm
Protected Phases	4	4	4	4	4	4	2	2	6	6	6	6
Permitted Phases	4	4	4	4	4	4	2	2	6	6	6	6
Switch Phase	4	4	4	4	4	4	2	2	6	6	6	6
Minimum Initial (s)	8.0	8.0	8.0	8.0	8.0	8.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	23.9	23.9	23.9	23.9	23.9	23.9	24.7	24.7	24.7	24.7	24.7	24.7
Total Split (s)	36.0	36.0	36.0	36.0	36.0	36.0	64.0	64.0	64.0	64.0	64.0	64.0
Total Split (%)	36.0%	36.0%	36.0%	36.0%	36.0%	36.0%	64.0%	64.0%	64.0%	64.0%	64.0%	64.0%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	3.7	4.6	4.6	4.6	4.6	4.6	4.6
All-Red Time (s)	2.2	2.2	2.2	2.2	2.2	2.2	2.1	2.1	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	0.0	0.0	0.0
Total Lost Time (s)	5.9	5.9	5.9	5.9	5.9	5.9	6.7	6.7	6.7	6.7	6.7	6.7
LeadLag												
LeadLag Optimize?												
Recall Mode	None	None	None	None	None	None	None	None	None	None	None	None
v/c Ratio	0.39	0.27	0.36	0.29	0.69	0.56	0.29	0.15	0.15	0.15	0.15	0.15
Control Delay	45.0	37.4	9.1	27.9	39.0	8.2	3.3	6.5	5.0	6.5	5.0	5.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	45.0	37.4	9.1	27.9	39.0	8.2	3.3	6.5	5.0	6.5	5.0	5.0
Queue Length 50th (m)	9.1	14.1	0.0	5.5	16.4	19.6	17.0	4.1	10.2	17.0	4.1	10.2
Queue Length 95th (m)	19.6	28.9	14.7	21.9	62.7	m85.2	m8.8	11.4	18.8	11.4	18.8	18.8
Internal Link Dist (m)	107.2											
Turn Bay Length (m)	22.0											
Base Capacity (vph)	237	549	551	385	550	683	2461	487	2518	487	2518	487
Stallion Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillover 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	0.21	0.14	0.23	0.16	0.37	0.56	0.29	0.15	0.15	0.29	0.15	0.15
Intersection Summary												
Cycle Length: 100												
Actuated Cycle Length: 100												
Offset: 0 (0%), Referenced to phase 2:NBL and 6:SBTL, Start of Green												
Natural Cycle: 60												
Control Type: Actuated-Coordinated												
m Volume for 95th percentile queue is metered by upstream signal.												
Spillover and Phases: 6: Liverpool Rd & Glenanna Rd												





**Future Total Traffic - Option 0**



**Weekday AM Peak Hour**

HCM Signalized Intersection Capacity Analysis  
 1: Glenanna Rd & Kingston Rd  
 2028 FT AM: Option 0

Queues  
 1: Glenanna Rd & Kingston Rd  
 2028 FT AM: Option 0

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	10	413	92	96	590	122	52	73	64	190	102	26
Traffic Volume (vph)	10	413	92	96	590	122	52	73	64	190	102	26
Future Volume (vph)	10	413	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	6.4	3.0	6.4	3.0	7.0	3.0	7.0	3.0	7.0	7.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frbp, ped/bikes	1.00	1.00	0.91	1.00	1.00	0.96	1.00	1.00	0.93	1.00	1.00	0.93
Frbp, ped/bikes	0.99	1.00	1.00	0.99	1.00	1.00	0.97	1.00	1.00	0.97	1.00	0.97
Fit	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	0.95
Satd. Flow (prot)	1568	3305	1303	1646	3400	1464	1667	1860	1397	1641	1773	1436
Flt Permitted	0.41	1.00	1.00	0.31	1.00	1.00	0.69	1.00	1.00	0.66	1.00	1.00
Satd. Flow (perm)	674	3305	1303	533	3400	1464	1203	1860	1397	1134	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	449	100	104	641	133	57	79	70	207	111	28
RTOR Reduction (vph)	0	0	80	0	0	65	0	0	42	0	0	15
Lane Group Flow (vph)	11	449	20	104	641	68	57	79	28	207	111	13
Conf. Peds. (#/hr)	8	25	25	25	8	35	34	34	34	34	34	35
Heavy Vehicles (%)	9%	8%	8%	4%	5%	1%	0%	1%	3%	2%	6%	0%
Turn Type	Perm	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm
Permitted Phases	4	4	8	8	8	5	2	2	2	6	6	6
Actuated Green, G (s)	20.1	20.1	31.7	31.7	31.7	46.3	40.3	40.3	40.3	54.9	45.9	45.9
Effective Green, g (s)	20.1	20.1	31.7	31.7	31.7	46.3	40.3	40.3	40.3	54.9	45.9	45.9
Actuated g/C Ratio	0.20	0.20	0.32	0.32	0.32	0.46	0.40	0.40	0.40	0.55	0.46	0.46
Clearance Time (s)	6.4	6.4	6.4	3.0	6.4	3.0	7.0	3.0	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	3.0
Lane Grp Cap (vph)	135	664	261	264	1077	464	584	749	562	681	813	659
v/s Ratio Prot	c0.14	0.02	0.03	c0.19	0.05	0.04	0.01	0.04	0.02	c0.04	0.06	0.06
v/s Ratio Perm	0.08	0.68	0.08	0.39	0.60	0.15	0.10	0.11	0.05	0.30	0.14	0.02
Uniform Delay, d1	32.5	36.9	32.4	25.3	28.7	24.5	14.9	18.6	18.2	11.7	15.6	14.8
Progression Factor	0.63	0.81	0.20	1.00	1.00	1.00	1.00	1.00	1.00	0.73	0.83	1.00
Incremental Delay, d2	0.2	2.6	0.1	1.0	0.9	0.1	0.1	0.3	0.2	0.3	0.3	0.1
Delay (s)	20.6	32.7	6.7	26.3	29.6	24.6	15.0	18.9	18.4	8.8	13.2	14.8
Level of Service	C	C	A	C	C	C	B	B	B	A	B	B
Approach Delay (s)	C	27.8	C	C	28.5	C	17.6	B	B	10.7	B	B
Approach LOS	C	C	A	C	C	C	B	B	B	A	B	B
Intersection Summary												
HCM 2000 Control Delay	24.1 HCM 2000 Level of Service C											
HCM 2000 Volume to Capacity ratio	0.44											
Actuated Cycle Length (s)	100.0 Sum of lost time (s) 19.4											
Intersection Capacity Utilization	54.2% ICU Level of Service A											
Analysis Period (min)	15											
c Critical Lane Group												

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	10	413	92	96	590	122	52	73	64	190	102	26
Traffic Volume (vph)	10	413	92	96	590	122	52	73	64	190	102	26
Future Volume (vph)	10	413	92	96	590	122	52	73	64	190	102	26
Lane Group Flow (vph)	11	449	100	104	641	133	57	79	70	207	111	28
Turn Type	Perm	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm
Permitted Phases	4	4	4	4	4	8	8	5	2	2	6	6
Detector Phase	4	4	4	4	4	8	8	5	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	5.0	5.0	5.0	5.0
Minimum Split (s)	24.4	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	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%	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	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	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	0.0
Total Lost Time (s)	6.4	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	Lag	Lead	Lead	Lead	Lag	Lag	Lag	Lead	Lag	Lag
Lead/Lag Optimize?	None	None	None	None	None	None	None	None	None	None	None	None
Recall Mode	0.08	0.68	0.29	0.35	0.61	0.26	0.09	0.10	0.11	0.28	0.13	0.04
v/c Ratio	20.7	35.2	3.1	24.2	31.0	8.8	11.7	23.4	2.9	9.2	16.0	1.6
Control 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
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	20.7	35.2	3.1	24.2	31.0	8.8	11.7	23.4	2.9	9.2	16.0	1.6
Queue Length 50th (m)	1.0	23.3	0.0	14.4	57.1	5.4	4.7	9.8	0.0	10.7	17.2	0.2
Queue Length 95th (m)	m2.4	24.8	0.0	23.1	65.5	16.5	12.6	24.8	5.5	25.5	32.3	2.3
Internal Link Dist (m)	393.2											
Turn Bay Length (m)	42.6	60.4	33.0	23.2	25.4	25.4	25.4	25.0	27.3	41.6	16.5	16.5
Base Capacity (vph)	219	1077	498	293	1414	664	653	802	660	728	843	737
Stallion 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	0.05	0.42	0.20	0.35	0.45	0.20	0.09	0.10	0.11	0.28	0.13	0.04
Intersection Summary												
Cycle Length: 100												
Actuated Cycle Length: 100												
Offset: 0 (0%), Referenced to phase 2:NBL and 6:SBTL, Start of Green												
Natural Cycle: 70												
Control Type: Actuated-Coordinated												
m Volume for 95th percentile queue is metered by upstream signal.												



HCM Signalized Intersection Capacity Analysis  
 2: Liverpool Rd & Kingston Rd

19225 | 1294 Kingston Rd  
 2028 FT AM: Option 0

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR
Lane Configurations	←	←	←	←	←	←	←	←	←	←	←
Traffic Volume (vph)	101	394	254	178	493	49	215	461	122	85	871
Future Volume (vph)	101	394	254	178	493	49	215	461	122	85	871
Ideal Flow (vphpl)	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	3.5	3.2	3.2	3.2	3.5
Total Lost time (s)	3.0	7.0	3.0	3.0	7.0	3.0	6.9	6.9	3.0	6.9	3.2
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
Frbp, ped/bikes	1.00	1.00	0.96	1.00	1.00	0.96	1.00	1.00	0.95	1.00	0.99
Frbp, ped/bikes	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98
Flt	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	1691	3500	1329	1675	4911
Flt Permitted	0.34	1.00	1.00	0.39	1.00	1.00	0.76	1.00	1.00	0.47	1.00
Satd. Flow (perm)	598	3368	1462	678	3400	1487	283	3500	1329	826	4911
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
Adj. Flow (vph)	110	428	276	193	536	53	234	501	133	92	947
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	14
Lane Group Flow (vph)	110	428	276	193	536	53	234	501	52	92	1048
Conf. Peds. (#/hr)	15	19	9	15	15	15	25	25	25	25	22
Heavy Vehicles (%)	4%	6%	1%	5%	5%	0%	2%	2%	10%	2%	4%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA
Permitted Phases	7	4	4	8	8	8	5	2	2	1	6
Actuated Green, G (s)	32.5	23.3	23.3	35.3	24.7	24.7	49.2	39.4	39.4	41.1	34.3
Effective Green, g (s)	32.5	23.3	23.3	35.3	24.7	24.7	49.2	39.4	39.4	41.1	34.3
Actuated g/C Ratio	0.32	0.23	0.23	0.35	0.25	0.25	0.49	0.39	0.39	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)	291	784	340	341	839	367	306	1379	523	397	1684
v/s Ratio Prot	0.03	0.13	0.06	0.16	0.16	0.09	0.14	0.02	0.21	0.02	0.21
v/s Ratio Perm	0.09	0.19	0.14	0.14	0.04	0.28	0.04	0.04	0.08	0.04	0.08
Uniform Delay, d1	0.38	0.55	0.81	0.57	0.64	0.14	0.76	0.36	0.10	0.23	0.62
Progression Factor	1.00	1.00	1.00	2.36	1.84	1.94	1.00	1.00	1.00	0.93	0.93
Incremental Delay, d2	0.8	2.7	18.7	2.0	3.5	0.8	10.8	0.7	0.4	0.3	1.7
Delay (s)	25.4	36.4	55.0	58.5	65.3	57.8	27.9	22.2	19.5	17.3	27.2
Level of Service	C	D	D	E	E	E	C	C	B	B	C
Approach Delay (s)	41.2	41.2	41.2	63.1	63.1	63.1	23.3	23.3	26.5	26.5	26.5
Approach LOS	D	D	D	E	E	E	C	C	B	B	C
Intersection Summary											
HCM 2000 Control Delay	37.0 HCM 2000 Level of Service										
HCM 2000 Volume to Capacity ratio	0.78										
Actuated Cycle Length (s)	100.0										
Intersection Capacity Utilization	74.4%										
Analysis Period (min)	15										
c Critical Lane Group											

Queues  
 2: Liverpool Rd & Kingston Rd

19225 | 1294 Kingston Rd  
 2028 FT AM: Option 0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR
Lane Configurations	←	←	←	←	←	←	←	←	←	←	←
Traffic Volume (vph)	101	394	254	178	493	49	215	461	122	85	871
Future Volume (vph)	101	394	254	178	493	49	215	461	122	85	871
Lane Group Flow (vph)	110	428	276	193	536	53	234	501	133	92	1062
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA
Projected Phases	7	4	4	8	8	8	5	2	2	1	6
Permitted Phases	4	4	4	8	8	8	5	2	2	1	6
Switch Phase	7	4	4	8	8	8	5	2	2	1	6
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?	None	C-Min	None	None	C-Min	None	None	C-Min	None	None	Max
Recall Mode	0.35	0.53	0.79	0.52	0.62	0.14	0.75	0.36	0.22	0.21	0.64
v/c Ratio	20.2	35.0	51.7	48.8	63.2	54.2	34.2	24.5	5.6	13.9	28.1
Control Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
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	20.2	35.0	51.7	48.8	63.2	54.2	34.2	24.5	5.6	13.9	28.1
Queue Length 50th (m)	13.4	39.6	52.4	39.2	61.0	0.0	25.9	39.6	0.0	8.2	63.3
Queue Length 95th (m)	22.8	52.1	78.5	59.9	78.5	23.9	75.3	58.7	13.3	17.9	82.1
Internal Link Dist (m)	667.5										
Turn Bay Length (m)	393.2										
Base Capacity (vph)	33.5	49.1	103.2	61.6	46.2	61.6	46.2	51.8	47.9	47.9	47.9
Stallion Cap Reductn	348	976	423	376	986	431	312	1377	603	461	1668
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	0.32	0.44	0.65	0.51	0.54	0.12	0.75	0.36	0.22	0.20	0.64
Intersection Summary											
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.											
Spills and Phases: 2: Liverpool Rd & Kingston Rd											
Diagram											



HCM Unsignalized Intersection Capacity Analysis  
 4: Liverpool Rd & North Dwy/Main Plaza Dwy

HCM Unsignalized Intersection Capacity Analysis  
 3: Liverpool Rd & South Dwy

19225 | 1294 Kingston Rd  
 2028 FT AM: Option 0

19225 | 1294 Kingston Rd  
 2028 FT AM: Option 0

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	50	0	58	106	0	59	33	415	163	94	870	16
Future Volume (Veh/h)	50	0	58	106	0	59	33	415	163	94	870	16
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
Grade	0%	0%	0%	0%	0%	0%	0%	0%	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)	54	0	63	115	0	64	36	451	177	102	946	17
Pedestrians	4			14			1				1	
Lane Width (m)	3.5			3.4			3.4				3.4	
Walking Speed (m/s)	1.2			1.2			1.2				1.2	
Percent Blockage	0			1			0				0	
Right turn flare (veh)												
Median type												
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked	0.93	0.93	0.97	0.93	0.93	0.91	0.97			0.91		216
vC, conflicting volume	1525	1876	486	1366	1796	329	967			642		
vC1, stage 1 conf vol	1162	1162		626	626							
vC2, stage 2 conf vol	362	714		741	1171							
vCu, unblocked vol	1247	1626	401	1076	1540	64	898			408		
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	6.5	5.5							
p0 queue free %	3.5	4.0	3.4	3.5	4.0	3.3	2.2			2.2		
cM capacity (veh/h)	72	100	88	56	100	93	95			90		
	192	216	546	263	202	894	737			1032		
Direction, Lane #	EB.1	WB.1	WB.2	NB.1	NB.2	NB.3	SB.1	SB.2	SB.3			
Volume Total	117	115	64	36	301	327	102	631	332			
Volume Left	54	115	0	36	0	0	102	0	0			
Volume Right	63	0	64	0	0	177	0	0	17			
cSH	295	263	894	737	1700	1032	1700	1700	1700			
Volume to Capacity	0.40	0.44	0.07	0.05	0.18	0.19	0.10	0.37	0.20			
Queue Length 95th (m)	14.6	16.8	1.8	1.2	0.0	0.0	2.6	0.0	0.0			
Control Delay (s)	25.0	28.9	9.3	10.1	0.0	0.0	8.9	0.0	0.0			
Lane LOS	D	D	A	B	A	A	A	A	A			
Approach Delay (s)	25.0	21.9	A	B	A	A	0.8					
Approach LOS	D	C										
Intersection Summary												
Average Delay	4.0											
Intersection Capacity Utilization	51.0%											
ICU Level of Service	A											
Analysis Period (min)	15											

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	32	0	611	1030	4
Future Volume (Veh/h)	0	32	0	611	1030	4
Sign Control	Stop	Free	Free	Free	Free	Free
Grade	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	35	0	664	1120	4
Pedestrians	4					
Lane Width (m)	3.2					
Walking Speed (m/s)	1.2					
Percent Blockage	0					
Right turn flare (veh)						
Median type						
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked	0.90	1.00	1.00			
vC, conflicting volume	1458	566	1128			
vC1, stage 1 conf vol	1126					
vC2, stage 2 conf vol	332					
vCu, unblocked vol	1279	560	1123			
tC, single (s)	6.8	7.1	4.1			
tC, 2 stage (s)	5.8					
p0 queue free %	3.5	3.4	2.2			
cM capacity (veh/h)	266	452	626			
Direction, Lane #	EB.1	NB.1	NB.2	SB.1	SB.2	
Volume Total	35	221	443	747	377	
Volume Left	0	0	0	0	0	
Volume Right	35	0	0	0	4	
cSH	452	626	1700	1700	1700	
Volume to Capacity	0.08	0.00	0.26	0.44	0.22	
Queue Length 95th (m)	2.0	0.0	0.0	0.0	0.0	
Control Delay (s)	13.6	0.0	0.0	0.0	0.0	
Lane LOS	B	B	A	A	A	
Approach Delay (s)	13.6	0.0	0.0	0.0	0.0	
Approach LOS	B					
Intersection Summary						
Average Delay	0.3					
Intersection Capacity Utilization	38.6%					
ICU Level of Service	A					
Analysis Period (min)	15					

HCM Signalized Intersection Capacity Analysis  
6: Liverpool Rd & Glenanna Rd

19225 | 1294 Kingston Rd  
2028 FT AM: Option 0

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations	4	4	4	8	8	8	2	2	2	2	6	6	
Traffic Volume (vph)	47	138	251	71	87	56	115	376	33	73	658	69	
Future Volume (vph)	47	138	251	71	87	56	115	376	33	73	658	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	5.9	6.7	6.7	6.7	6.7	6.7	6.7	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	1.00	0.95	
Flpb. ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00	0.99	1.00	1.00	
Flpb. ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00	0.99	1.00	1.00	
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)	1658	1773	1513	1675	1717	1658	3353	3353	1639	3410	3410	3410	
Flt Permitted	0.55	1.00	1.00	0.57	1.00	0.35	1.00	0.49	1.00	0.49	1.00	1.00	
Satd. Flow (perm)	965	1773	1513	1008	1717	605	3353	853	3410	853	3410	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	273	77	95	61	125	409	36	79	715	75	
RTOR Reduction (vph)	0	0	185	0	27	0	0	4	0	0	5	0	
Lane Group Flow (vph)	51	150	88	77	129	0	125	441	0	79	785	0	
Conf. Ped. (#/hr)							11	8	8	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	Perm	NA	NA	
Permitted Phases	4		4	8		8		2		6		6	
Actuated Green, G (s)	14.1	14.1	14.1	14.1	14.1	73.3	73.3	73.3	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	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	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	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	3.0	3.0	3.0	
Lane Grp Cap (vph)	136	249	213	142	242	443	2457	625	2499	625	2499	2499	
v/s Ratio Prot	c0.08					0.07		0.13				c0.23	
v/s Ratio Perm	0.05	0.06	0.08			0.21		0.09				0.09	
Uniform Delay, d1	0.38	0.60	0.41	0.54	0.53	0.28	0.18	0.13	0.31	0.13	0.31	0.31	
Progression Factor	1.00	1.00	1.00	0.99	0.98	0.72	0.72	0.72	1.00	1.00	1.00	1.00	
Incremental Delay, d2	1.7	4.1	1.3	4.2	2.2	1.6	0.2	0.4	0.3	0.4	0.3	0.3	
Delay (s)	40.7	44.4	40.5	43.8	41.4	4.8	3.1	4.3	5.0	4.3	5.0	5.0	
Level of Service	D	D	D	D	D	A	A	A	A	A	A	A	
Approach Delay (s)	41.7		41.7		42.2		3.5		4.9		4.9	4.9	
Approach LOS	D		D		D		A		A		A	A	
Intersection Summary													
HCM 2000 Control Delay	16.7											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												
Analysis Period (hr)	0.25												
Analysis Period (days)	0.01												
Analysis Period (years)	0.0003												
Analysis Period (months)	0.003												
Analysis Period (weeks)	0.014												
Analysis Period (days)	0.043												
Analysis Period (hours)	0.25												
Analysis Period (minutes)	15												
Analysis Period (seconds)	900												

Queues  
6: Liverpool Rd & Glenanna Rd

19225 | 1294 Kingston Rd  
2028 FT AM: Option 0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	4	4	4	8	8	8	2	2	2	6	6	6
Traffic Volume (vph)	47	138	251	71	87	56	115	376	33	73	658	69
Future Volume (vph)	47	138	251	71	87	56	115	376	33	73	658	69
Lane Group Flow (vph)	51	150	273	77	156	125	445	79	790	790	790	790
Turn Type	Perm	NA	Perm	Perm	NA	Perm	NA	Perm	NA	Perm	NA	NA
Permitted Phases	4		4	8		8		2		6		6
Detector Phases	4		4	8		8		2		6		6
Switch Phase	4		4	8		8		2		6		6
Minimum Initial (s)	8.0	8.0	8.0	5.0	5.0	5.0	5.0	5.0	5.0	8.0	8.0	8.0
Minimum Split (s)	23.9	23.9	23.9	23.9	23.9	23.9	24.7	24.7	24.7	24.7	24.7	24.7
Total Split (s)	34.0	34.0	34.0	34.0	34.0	34.0	66.0	66.0	66.0	66.0	66.0	66.0
Total Split (%)	34.0%	34.0%	34.0%	34.0%	34.0%	34.0%	66.0%	66.0%	66.0%	66.0%	66.0%	66.0%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	3.7	4.6	4.6	4.6	4.6	4.6	4.6
All-Red Time (s)	2.2	2.2	2.2	2.2	2.2	2.2	2.1	2.1	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	0.0	0.0	0.0
Total Lost Time (s)	5.9	5.9	5.9	5.9	5.9	5.9	6.7	6.7	6.7	6.7	6.7	6.7
LeadLag												
LeadLag Optimize?												
Recall Mode	None	None	None	None	None	None	C-Min	C-Min	C-Min	C-Min	C-Min	C-Min
v/c Ratio	0.38	0.60	0.69	0.55	0.58	0.58	0.28	0.18	0.13	0.32	0.32	0.32
Control Delay	45.4	49.8	19.3	52.8	39.1	5.7	3.3	5.4	5.3	5.4	5.3	5.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	45.4	49.8	19.3	52.8	39.1	5.7	3.3	5.4	5.3	5.4	5.3	5.3
Queue Length 50th (m)	9.6	29.2	10.8	15.3	25.1	5.2	7.6	4.0	23.7	4.0	23.7	23.7
Queue Length 95th (m)	20.1	46.3	35.2	27.9	41.6	10.7	13.9	10.9	41.2	10.9	41.2	41.2
Internal Link Dist (m)							192.1					
Turn Bay Length (m)							24.4					
Base Capacity (vph)	271	498	579	283	505	443	2464	624	2506	624	2506	2506
Stallion Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillover 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	0.19	0.30	0.47	0.27	0.31	0.28	0.18	0.13	0.32	0.18	0.32	0.32
Intersection Summary												
Cycle Length: 100												
Actuated Cycle Length: 100												
Offset: 0 (0%), Referenced to phase 2:NBLT and 6:SBTL, Start of Green												
Natural Cycle: 55												
Control Type: Actuated-Coordinated												
Spills and Phases:	6: Liverpool Rd & Glenanna Rd											
D02 (R)	02.0 s											D04
D06 (R)	06.5 s											D08
D06 (R)	06.5 s											D08



**Weekday PM Peak Hour**

HCM Signalized Intersection Capacity Analysis  
 1: Glenanna Rd & Kingston Rd

19225 | 1294 Kingston Rd  
 2028 FT PM: Option 0



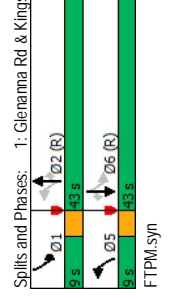
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	24	1218	141	156	614	132	120	177	194	178	199	36
Traffic Volume (vph)	24	1218	141	156	614	132	120	177	194	178	199	36
Future Volume (vph)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Ideal Flow (vphpl)	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2
Lane Width	6.4	6.4	6.4	3.0	6.4	6.4	3.0	7.0	3.0	7.0	3.0	7.0
Total Lost Time (s)	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00	0.90	1.00	1.00	0.91	1.00	1.00	0.84
Frbp. ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	0.96	1.00	1.00	0.97	1.00	1.00
Frt	0.95	1.00	1.00	0.95	1.00	1.00	0.85	1.00	0.85	1.00	1.00	0.85
Flt Protected	1668	3500	1220	1658	3500	1373	1649	1879	1385	1673	1824	1295
Satd. Flow (prot)	0.40	1.00	1.00	0.08	1.00	1.00	0.47	1.00	0.53	1.00	1.00	1.00
Flt Permitted	699	3500	1220	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	1324	153	170	667	143	130	192	211	193	216	39
RTOR Reduction (vph)	0	0	60	0	0	39	0	0	171	0	0	32
Lane Group Flow (vph)	26	1324	93	170	667	104	130	192	40	193	216	7
Conf. Peds. (#/hr)	30	55	55	55	30	91	0%	1%	0%	50	50	0%
Heavy Vehicles (%)	0%	2%	5%	4%	2%	1%	0%	0%	0%	0%	3%	0%
Turn Type	Perm	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm
Permitted Phases	4	4	4	8	8	8	5	2	2	1	6	6
Actuated Green, G (s)	44.5	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	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	0.44	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	6.4	3.0	6.4	6.4	3.0	7.0	3.0	7.0	3.0	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	3.0
Lane Grp Cap (vph)	311	1557	542	282	2110	827	239	325	239	262	315	224
v/s Ratio Prot	c0.38	c0.08	0.19	0.08	0.09	0.03	0.10	0.03	0.04	0.12	0.12	0.12
v/s Ratio Perm	0.04	0.08	0.29	0.08	0.09	0.08	0.09	0.03	0.03	0.13	0.13	0.01
Uniform Delay, d1	0.08	0.85	0.17	0.60	0.32	0.13	0.54	0.59	0.17	0.74	0.69	0.03
Progression Factor	16.0	24.8	16.7	19.7	9.7	8.5	32.4	38.1	35.2	34.7	38.8	34.4
Incremental Delay, d2	0.45	0.49	0.15	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.07	1.00
Delay (s)	0.0	2.0	0.1	3.6	0.1	0.1	2.5	7.7	1.5	10.3	11.5	0.2
Level of Service	A	B	A	C	A	A	C	D	D	D	D	C
Approach Delay (s)	A	B	A	C	A	A	C	D	D	D	D	C
Approach LOS	B	B	B	B	B	B	B	B	B	B	B	D
Intersection Summary												
HCM 2000 Control Delay	21.4 HCM 2000 Level of Service C											
HCM 2000 Volume to Capacity ratio	0.78											
Actuated Cycle Length (s)	100.0 Sum of lost time (s) 19.4											
Intersection Capacity Utilization	86.0% ICU Level of Service E											
Analysis Period (min)	15											
Critical Lane Group	c Critical Lane Group											

1: Glenanna Rd & Kingston Rd

19225 | 1294 Kingston Rd  
 2028 FT PM: Option 0



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	24	1218	141	156	614	132	120	177	194	178	199	36
Traffic Volume (vph)	24	1218	141	156	614	132	120	177	194	178	199	36
Future Volume (vph)	26	1324	153	170	667	143	130	192	211	193	216	39
Lane Group Flow (vph)	26	1324	153	170	667	143	130	192	211	193	216	39
Turn Type	Perm	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm
Permitted Phases	4	4	4	8	8	8	5	2	2	1	6	6
Detector Phase	4	4	4	8	8	8	5	2	2	1	6	6
Switch Phase	4	4	4	8	8	8	5	2	2	1	6	6
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)	24.4	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	39.0	9.0	48.0	48.0	9.0	43.0	43.0	9.0	43.0	43.0
Total Spilt (%)	39.0%	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	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	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	0.0
Total Lost Time (s)	6.4	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	Lag	Lag	Lead	Lead	Lag	Lag	Lag	Lead	Lag	Lag
Lead/Lag Optimize?	None	None	None	None	None	None	None	None	None	None	None	None
Recall Mode	0.08	0.85	0.25	0.59	0.32	0.17	0.49	0.51	0.65	0.69	0.13	1.8
v/s Ratio	9.0	17.4	1.5	25.0	10.9	4.4	32.3	44.9	9.8	41.1	52.1	1.8
Control 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
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	9.0	17.4	1.5	25.0	10.9	4.4	32.3	44.9	9.8	41.1	52.1	1.8
Queue Length 50th (m)	0.9	87.9	0.0	15.7	32.4	3.5	19.9	36.5	0.7	34.6	44.0	0.0
Queue Length 95th (m)	m2.3m#16/19 m4.5 39.7 50.8 13.5 32.0 55.0 19.2 41.0 66.7 1.1 393.2											
Internal Link Dist (m)	523.9											
Turn Bay Length (m)	42.6	60.4	33.0	23.2	25.4	25.4	25.0	27.3	25.0	27.3	416.6	16.5
Base Capacity (vph)	310	1557	603	287	2110	866	265	676	631	296	656	532
Stallion Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillover 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	0.08	0.85	0.25	0.59	0.32	0.17	0.49	0.28	0.33	0.65	0.33	0.07
Intersection Summary												
Cycle Length: 100												
Offset: 0 (0%). Referenced to phase 2:NBL and 6:SBTL, Start of Green												
Natural Cycle: 80												
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.												

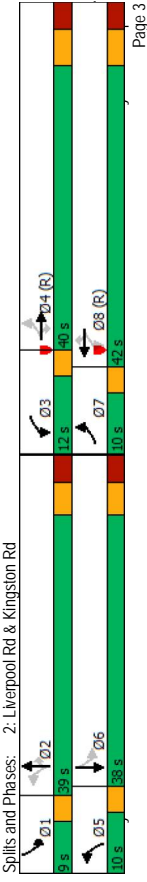


HCM Signalized Intersection Capacity Analysis  
 2: Liverpool Rd & Kingston Rd  
 19225 | 1294 Kingston Rd  
 2028 FT PM: Option 0

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR
Lane Configurations	←	←	←	←	←	←	←	←	←	←	←
Traffic Volume (vph)	244	1069	330	226	525	85	302	934	278	119	378
Future Volume (vph)	244	1069	330	226	525	85	302	934	278	119	378
Ideal Flow (vphpl)	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	3.5	3.2	3.2	3.2	3.5
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
Frbp, ped/bikes	1.00	1.00	0.94	1.00	1.00	0.95	1.00	1.00	0.91	1.00	0.99
Frbp, ped/bikes	0.99	1.00	1.00	1.00	1.00	0.99	1.00	1.00	0.85	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)	1697	3500	1416	1708	3500	1431	1673	3535	1363	1675	4894
Flt Permitted	0.39	1.00	1.00	0.12	1.00	1.00	0.43	1.00	1.00	0.13	1.00
Satd. Flow (perm)	692	3500	1416	208	3500	1431	751	3535	1363	230	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
Adj. Flow (vph)	265	1162	359	246	571	92	328	1015	302	129	411
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	138	0	38
Lane Group Flow (vph)	265	1162	359	246	571	92	328	1015	164	129	468
Conf. Peds. (#/hr)	26	32	32	32	26	34	26	34	48	48	34
Heavy Vehicles (%)	1%	2%	2%	1%	2%	2%	2%	1%	3%	3%	0%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA
Permitted Phases	7	4	4	3	8	8	5	2	2	1	6
Actuated Green, G (s)	40.1	32.6	32.6	44.1	34.6	34.6	38.6	31.6	31.6	36.6	30.6
Effective Green, g (s)	40.1	32.6	32.6	44.1	34.6	34.6	38.6	31.6	31.6	36.6	30.6
Actuated g/C Ratio	0.40	0.33	0.33	0.44	0.35	0.35	0.39	0.32	0.32	0.37	0.31
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)	352	1141	461	234	1211	495	354	1117	430	170	1497
v/s Ratio Prot	0.06	0.33	0.25	0.10	0.16	0.06	0.06	0.29	0.12	0.23	0.10
v/s Ratio Perm	0.24	1.02	0.78	1.05	0.47	0.19	0.93	0.91	0.38	0.76	0.31
Uniform Delay, d1	23.1	33.7	30.4	25.8	25.6	22.9	27.0	32.8	26.6	24.4	26.6
Progression Factor	1.00	1.00	1.00	1.68	1.47	1.50	1.00	1.00	1.00	1.15	1.04
Incremental Delay, d2	8.8	31.3	12.2	72.0	1.3	0.8	29.5	10.7	0.6	17.5	0.1
Delay (s)	31.9	65.0	42.7	115.4	38.8	35.1	56.5	43.5	27.2	45.6	27.7
Level of Service	C	E	D	F	D	D	E	D	C	D	C
Approach Delay (s)	55.6			59.2			43.1			31.4	
Approach LOS	E			E			D			C	
Intersection Summary											
HCM 2000 Control Delay	49.0 HCM 2000 Level of Service										
HCM 2000 Volume to Capacity ratio	1.03										
Actuated Cycle Length (s)	100.0 Sum of lost time (s)										
Intersection Capacity Utilization	93.1% ICU Level of Service										
Analysis Period (min)	15										
c Critical Lane Group											

Queues  
 2: Liverpool Rd & Kingston Rd  
 19225 | 1294 Kingston Rd  
 2028 FT PM: Option 0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR
Lane Configurations	←	←	←	←	←	←	←	←	←	←	←
Traffic Volume (vph)	244	1069	330	226	525	85	302	934	278	119	378
Future Volume (vph)	244	1069	330	226	525	85	302	934	278	119	378
Lane Group Flow (vph)	265	1162	359	246	571	92	328	1015	302	129	506
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA
Projected Phases	7	4	4	4	4	4	8	2	2	1	6
Permitted Phases	4	4	4	4	4	4	8	2	2	2	6
Switch Phase	7	4	4	4	4	4	8	2	2	2	6
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)	10.0	40.0	40.0	12.0	42.0	42.0	10.0	39.0	39.0	9.0	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%
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	None	None	C-Min	None	None	C-Min	None	None	C-Min
v/c Ratio	0.69	1.02	0.78	1.01	0.47	0.19	0.86	0.91	0.53	0.72	0.33
Control Delay	29.0	65.7	43.9	93.1	39.2	35.8	46.3	45.9	13.1	43.8	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	29.0	65.7	43.9	93.1	39.2	35.8	46.3	45.9	13.1	43.8	25.2
Queue Length 50th (m)	31.4	-128.4	65.6	-45.3	60.2	16.7	44.4	103.1	14.8	14.2	22.4
Queue Length 95th (m)	#52.0	#174.6	#111.1	#87.8	77.0	30.7	#87.6	#141.2	41.2	#37.0	35.6
Internal Link Dist (m)	667.5 393.2 242.2										
Turn Bay Length (m)	33.5	49.1	103.2	61.6	46.2	61.6	46.2	51.8	47.9	180	1560
Base Capacity (vph)	382	1141	461	244	1211	495	380	1134	574	180	1560
Stallion 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	0.69	1.02	0.78	1.01	0.47	0.19	0.86	0.90	0.53	0.72	0.32
Intersection Summary											
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.											



HCM Unsignalized Intersection Capacity Analysis  
 4: Liverpool Rd & North Dwy/Main Plaza Dwy

HCM Unsignalized Intersection Capacity Analysis  
 3: Liverpool Rd & South Dwy

19225 | 1294 Kingston Rd  
 2028 FT PM: Option 0

19225 | 1294 Kingston Rd  
 2028 FT PM: Option 0

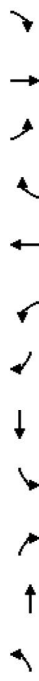
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (veh/h)	40	0	47	123	0	98	100	916	247	76	399	43
Future Volume (Veh/h)	40	0	47	123	0	98	100	916	247	76	399	43
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
Grade	0%	0%	0%	0%	0%	0%	0%	0%	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)	43	0	51	134	0	107	109	996	268	83	434	47
Pedestrians	6			15			1				1	
Lane Width (m)	3.5			3.4			3.4				3.4	
Walking Speed (m/s)	1.2			1.2			1.2				1.2	
Percent Blockage	0			1			0				0	
Right turn flare (veh)												
Median type							TW/TLT				TW/TLT	
Median storage (veh)							2				2	
Upstream signal (m)							140				216	
pX, platoon unblocked	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73
vC, conflicting volume	1454	2126	248	1798	2016	648	487	1279			1279	
vC1, stage 1 conf vol	630	630		1363	1363							
vC2, stage 2 conf vol	824	1497		435	653							
vCu, unblocked vol	881	1803	248	1353	1652	0	487				642	
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	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 %	86	100	93	34	100	86	90				88	
cM capacity (veh/h)	318	133	754	203	203	784	1081				687	
Direction, Lane #	EB.1	WB.1	WB.2	NB.1	NB.2	NB.3	SB.1	SB.2	SB.3			
Volume Total	94	134	107	109	664	600	83	289	192			
Volume Left	43	134	0	109	0	0	83	0	0			
Volume Right	51	0	107	0	0	268	0	0	47			
cSH	463	203	784	1081	1700	1700	687	1700	1700			
Volume to Capacity	0.20	0.66	0.14	0.10	0.39	0.35	0.12	0.17	0.11			
Queue Length 95th (m)	6.0	31.9	3.8	2.7	0.0	0.0	3.3	0.0	0.0			
Control Delay (s)	14.7	51.8	10.3	8.7	0.0	0.0	11.0	0.0	0.0			
Lane LOS	B	F	B	A	B	B	B	B	B			
Approach Delay (s)	14.7	33.4	0.7		1.6							
Approach LOS	B	D										
<b>Intersection Summary</b>												
Average Delay	5.0											
Intersection Capacity Utilization	60.7%											
ICU Level of Service	B											
Analysis Period (min)	15											

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔
Traffic Volume (veh/h)	0	26	0	1263	558	11
Future Volume (Veh/h)	0	26	0	1263	558	11
Sign Control	Stop	Free	Free	Free	Free	Free
Grade	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	28	0	1373	607	12
Pedestrians	4					
Lane Width (m)	3.2					
Walking Speed (m/s)	1.2					
Percent Blockage	0					
Right turn flare (veh)						
Median type				None	TW/TLT	
Median storage (veh)				2		
Upstream signal (m)				59	297	
pX, platoon unblocked	0.72					
vC, conflicting volume	1304	314	623			
vC1, stage 1 conf vol	617					
vC2, stage 2 conf vol	686					
vCu, unblocked vol	653	314	623			
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	96	100			
cM capacity (veh/h)	465	686	965			
Direction, Lane #	EB.1	NB.1	NB.2	SB.1	SB.2	
Volume Total	28	458	915	405	214	
Volume Left	0	0	0	0	0	
Volume Right	28	0	0	0	12	
cSH	686	965	1700	1700	1700	
Volume to Capacity	0.04	0.00	0.54	0.24	0.13	
Queue Length 95th (m)	1.0	0.0	0.0	0.0	0.0	
Control Delay (s)	10.5	0.0	0.0	0.0	0.0	
Lane LOS	B	B	B	B	B	
Approach Delay (s)	10.5	0.0		0.0		
Approach LOS	B					
<b>Intersection Summary</b>						
Average Delay	0.1					
Intersection Capacity Utilization	44.9%					
ICU Level of Service	A					
Analysis Period (min)	15					



HCM Signalized Intersection Capacity Analysis  
 6: Liverpool Rd & Glenanna Rd

19225 | 1294 Kingston Rd  
 2028 FT PM: Option 0



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	45	72	112	54	145	44	348	633	73	67	352	30
Traffic Volume (vph)	45	72	112	54	145	44	348	633	73	67	352	30
Future Volume (vph)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Ideal Flow (vphpl)	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2
Lane Width	5.9	5.9	5.9	5.9	5.9	5.9	6.7	6.7	6.7	6.7	6.7	6.7
Total Lost Time (s)	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	1.00	0.95
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.99	0.99	1.00	0.99	1.00	0.95
Frbp. ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00
Frbp. ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00
Flt Protected	0.95	1.00	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1725	1824	1543	1725	1791	1708	3448	1707	3527	1707	3527	3527
Flt Permitted	0.43	1.00	1.00	0.71	1.00	0.51	1.00	0.35	1.00	0.35	1.00	1.00
Satd. Flow (perm)	788	1824	1543	1282	1791	914	3448	634	3527	634	3527	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	122	59	158	48	378	688	79	73	383	33
RTOR Reduction (vph)	0	0	102	0	13	0	0	6	0	0	4	0
Lane Group Flow (vph)	49	78	20	59	193	0	378	761	0	73	412	0
Conf. Ped. (#/hr)	0%	3%	0%	0%	1%	2%	1%	1%	5%	0%	0%	0%
Heavy Vehicles (%)	0%	3%	0%	0%	1%	2%	1%	1%	5%	0%	0%	0%
Turn Type	Perm	NA	Perm	Perm	NA	Perm	NA	NA	Perm	NA	Perm	NA
Permitted Phases	4		4	8		8		2		6		6
Actuated Green, G (s)	16.0	16.0	16.0	16.0	16.0	16.0	71.4	71.4	71.4	71.4	71.4	71.4
Effective Green, g (s)	16.0	16.0	16.0	16.0	16.0	16.0	71.4	71.4	71.4	71.4	71.4	71.4
Actuated g/C Ratio	0.16	0.16	0.16	0.16	0.16	0.16	0.71	0.71	0.71	0.71	0.71	0.71
Clearance Time (s)	5.9	5.9	5.9	5.9	5.9	5.9	6.7	6.7	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	3.0	3.0	3.0
Lane Grp Cap (vph)	126	291	246	205	286	652	2461	452	2518	452	2518	2518
v/s Ratio Prot	0.04					c0.11		0.22			0.12	
v/s Ratio Perm	0.06		0.01	0.05		c0.41		0.12		0.12		
v/c Ratio	0.39	0.27	0.08	0.29	0.67	0.58	0.31	0.16	0.16	0.16	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	4.6	4.6	4.6
Progression Factor	1.00	1.00	1.00	0.70	0.77	0.74	0.60	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.0	0.5	0.1	0.8	6.0	2.6	0.2	0.8	0.1	0.8	0.1	0.1
Delay (s)	39.6	37.4	35.9	26.6	36.5	7.8	3.4	5.4	4.8	5.4	4.8	4.8
Level of Service	D	D	D	C	D	A	A	A	A	A	A	A
Approach Delay (s)	37.1			34.3			4.8		4.9			4.9
Approach LOS	D			C			A		A			A

Intersection Summary	Value	Level of Service
HCM 2000 Control Delay	12.2	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	67.9%	ICU Level of Service C
Analysis Period (min)	15	
C Critical Lane Group		

Queues  
 6: Liverpool Rd & Glenanna Rd

19225 | 1294 Kingston Rd  
 2028 FT PM: Option 0



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Configurations	45	72	112	54	145	44	348	633	67	352
Traffic Volume (vph)	45	72	112	54	145	44	348	633	67	352
Future Volume (vph)	45	72	112	54	145	44	348	633	67	352
Lane Group Flow (vph)	49	78	122	59	206	378	767	73	416	416
Turn Type	Perm	NA	Perm	Perm	NA	Perm	NA	Perm	NA	Perm
Protected Phases	4		4	8		8		2		6
Permitted Phases	4		4	8		8		2		6
Switch Phase	4		4	8		8		2		6
Minimum Initial (s)	8.0	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	23.9	24.7	24.7	24.7	24.7
Total Split (s)	36.0	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%	36.0%	64.0%	64.0%	64.0%	64.0%
Yellow Time (s)	3.7	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	2.2	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	0.0
Total Lost Time (s)	5.9	5.9	5.9	5.9	5.9	5.9	6.7	6.7	6.7	6.7
LeadLag										
LeadLag Optimize?										
Recall Mode	None	None	None	None	None	None	C-Min	C-Min	C-Min	C-Min
v/c Ratio	0.39	0.27	0.35	0.29	0.69	0.58	0.31	0.16	0.16	0.17
Control Delay	45.0	37.4	9.2	28.1	39.4	9.2	3.6	6.7	6.7	5.1
Queue Delay	0.0	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	9.2	3.6	6.7	6.7	5.1
Queue Length 50th (m)	9.1	14.1	0.0	5.7	32.0	17.9	17.2	4.1	11.9	11.9
Queue Length 95th (m)	19.6	28.9	14.5	23.0	60.5	m/79.9	m/13.6	11.6	21.5	21.5
Internal Link Dist (m)							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	651	2467	453	2521	2521
Stallion Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	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	0.16	0.17

Intersection Summary	Value	Level of Service
Cycle Length: 100		
Actuated Cycle Length: 100		
Offset: 0 (0%), Referenced to phase 2:NBL and 6:SBTL, Start of Green		
Natural Cycle: 60		
Control Type: Actuated-Coordinated		
m Volume for 95th percentile queue is metered by upstream signal.		
Spillover and Phases: 6: Liverpool Rd & Glenanna Rd		
Diagram showing queue lengths and delays for each lane group.		



**Future Total Traffic - Option 1+1A**





**Weekday AM Peak Hour**

HCM Signalized Intersection Capacity Analysis  
 1: Glenanna Rd & Kingston Rd  
 19225 | 1294 Kingston Rd  
 2028 FT AM: Option 1+1A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	10	413	92	96	590	122	52	73	64	190	102	26
Traffic Volume (vph)	10	413	92	96	590	122	52	73	64	190	102	26
Future Volume (vph)	10	413	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	6.4	3.0	6.4	3.0	7.0	3.0	7.0	3.0	7.0	7.0
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frbp, ped/bikes	1.00	1.00	0.91	1.00	1.00	0.96	1.00	1.00	0.93	1.00	1.00	0.93
Frbp, ped/bikes	0.99	1.00	1.00	0.99	1.00	1.00	0.97	1.00	1.00	0.97	1.00	0.97
Fit	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)	1568	3305	1303	1646	3400	1464	1667	1860	1397	1641	1773	1436
Flt Permitted	0.41	1.00	1.00	0.31	1.00	1.00	0.69	1.00	1.00	0.66	1.00	1.00
Satd. Flow (perm)	674	3305	1303	533	3400	1464	1203	1860	1397	1134	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	449	100	104	641	133	57	79	70	207	111	28
RTOR Reduction (vph)	0	0	80	0	0	65	0	0	42	0	0	15
Lane Group Flow (vph)	11	449	20	104	641	68	57	79	28	207	111	13
Conf. Peds. (#/hr)	8	25	25	25	8	35	34	34	34	34	34	35
Heavy Vehicles (%)	9%	8%	8%	4%	5%	1%	0%	1%	3%	2%	6%	0%
Turn Type	Perm	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm
Permitted Phases	4	4	8	8	8	8	5	2	2	1	6	6
Actuated Green, G (s)	20.1	20.1	31.7	31.7	31.7	46.3	40.3	40.3	40.3	54.9	45.9	45.9
Effective Green, g (s)	20.1	20.1	31.7	31.7	31.7	46.3	40.3	40.3	40.3	54.9	45.9	45.9
Actuated g/C Ratio	0.20	0.20	0.32	0.32	0.32	0.46	0.40	0.40	0.40	0.55	0.46	0.46
Clearance Time (s)	6.4	6.4	6.4	3.0	6.4	3.0	7.0	3.0	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	3.0
Lane Grp Cap (vph)	135	664	261	264	1077	464	584	749	562	681	813	659
v/s Ratio Prot	c0.14	0.02	0.09	0.03	c0.19	0.05	0.04	0.01	0.04	c0.04	0.06	0.06
v/s Ratio Perm	0.08	0.68	0.08	0.39	0.60	0.15	0.10	0.11	0.05	0.30	0.14	0.02
Uniform Delay, d1	32.5	36.9	32.4	25.3	28.7	24.5	14.9	18.6	18.2	11.7	15.6	14.8
Progression Factor	0.61	0.81	0.16	1.00	1.00	1.00	1.00	1.00	1.00	0.72	0.82	1.00
Incremental Delay, d2	0.2	2.6	0.1	1.0	0.9	0.1	0.1	0.3	0.2	0.3	0.3	0.1
Delay (s)	20.2	32.4	5.3	26.3	29.6	24.6	15.0	18.9	18.4	8.7	13.1	14.8
Level of Service	C	C	A	C	C	C	B	B	B	A	B	B
Approach Delay (s)	C	C	A	C	C	C	B	B	B	A	B	B
Approach LOS	C	C	A	C	C	C	B	B	B	A	B	B
Intersection Summary												
HCM 2000 Control Delay	23.9 HCM 2000 Level of Service C											
HCM 2000 Volume to Capacity ratio	0.44											
Actuated Cycle Length (s)	100.0 Sum of lost time (s) 19.4											
Intersection Capacity Utilization	54.2% ICU Level of Service A											
Analysis Period (min)	15											
C Critical Lane Group	C											

Queues  
 1: Glenanna Rd & Kingston Rd  
 19225 | 1294 Kingston Rd  
 2028 FT AM: Option 1+1A

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	10	413	92	96	590	122	52	73	64	190	102	26
Traffic Volume (vph)	10	413	92	96	590	122	52	73	64	190	102	26
Future Volume (vph)	10	413	92	96	590	122	52	73	64	190	102	26
Lane Group Flow (vph)	11	449	100	104	641	133	57	79	70	207	111	28
Turn Type	Perm	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm
Permitted Phases	4	4	4	4	4	4	5	2	2	1	6	6
Detector Phase	4	4	4	4	4	4	5	2	2	1	6	6
Switch Phase	4	4	4	4	4	4	5	2	2	1	6	6
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	8.0	5.0	8.0	5.0	8.0	8.0
Minimum Split (s)	24.4	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	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%	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	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	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	0.0
Total Lost Time (s)	6.4	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	Lag	Lead	Lead	Lead	Lead	Lag	Lag	Lag	Lead	Lag
Lead/Lag Optimize?	None	None	None	None	None	None	None	None	None	None	None	None
Recall Mode	0.08	0.68	0.29	0.35	0.61	0.26	0.09	0.10	0.11	0.28	0.13	0.04
v/c Ratio	20.3	34.9	2.8	24.2	31.0	8.8	11.7	23.4	2.9	9.1	15.8	1.6
Control 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
Queue Length	20.3	34.9	2.8	24.2	31.0	8.8	11.7	23.4	2.9	9.1	15.8	1.6
Queue Length 50th (m)	1.0	23.3	0.2	14.4	57.1	5.4	4.7	9.8	0.0	10.6	17.2	0.2
Queue Length 95th (m)	m2.4	24.8	0.0	23.1	65.5	16.5	12.6	24.8	5.5	24.5	32.1	2.3
Internal Link Dist (m)	393.2											
Turn Bay Length (m)	42.6	60.4	33.0	23.2	25.4	25.4	25.4	25.4	25.4	27.3	416.6	16.5
Base Capacity (vph)	219	1077	498	293	1414	664	653	802	660	728	843	737
Stallion 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	0.05	0.42	0.20	0.35	0.45	0.20	0.09	0.10	0.11	0.28	0.13	0.04
Intersection Summary												
Cycle Length: 100												
Actuated Cycle Length: 100												
Offset: 0 (0%), Referenced to phase 2:NBL and 6:SBTL, Start of Green												
Natural Cycle: 70												
Control Type: Actuated-Coordinated												
m Volume for 95th percentile queue is metered by upstream signal.												

HCM Signalized Intersection Capacity Analysis  
 2: Liverpool Rd & Kingston Rd

19225 | 1294 Kingston Rd  
 2028 FT AM: Option 1+1A



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR
Lane Configurations	←	←	←	←	←	←	←	←	←	←	←
Traffic Volume (vph)	101	394	254	178	493	49	215	461	122	85	871
Future Volume (vph)	101	394	254	178	493	49	215	461	122	85	871
Ideal Flow (vphpl)	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	3.5	3.2	3.2	3.2	3.5
Total Lost time (s)	3.0	7.0	3.0	3.0	7.0	3.0	6.9	3.0	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
Frbp, ped/bikes	1.00	1.00	0.96	1.00	1.00	0.96	1.00	1.00	0.95	1.00	0.99
Frbp, ped/bikes	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98
Flt	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	1329	1675	4911
Flt Permitted	0.34	1.00	1.00	0.39	1.00	1.00	0.16	1.00	1.00	0.47	1.00
Satd. Flow (perm)	598	3368	1462	678	3400	1487	283	3500	1329	826	4911
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
Adj. Flow (vph)	110	428	276	193	536	53	234	501	133	92	947
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	14
Lane Group Flow (vph)	110	428	276	193	536	53	234	501	52	92	1048
Conf. Peds. (#/hr)	15	19	9	15	22	15	22	25	25	25	22
Heavy Vehicles (%)	4%	6%	1%	5%	5%	0%	2%	2%	10%	2%	4%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA
Permitted Phases	7	4	4	3	8	8	5	2	2	1	6
Actuated Green, G (s)	32.5	23.3	23.3	35.3	24.7	24.7	49.2	39.4	39.4	41.1	34.3
Effective Green, g (s)	32.5	23.3	23.3	35.3	24.7	24.7	49.2	39.4	39.4	41.1	34.3
Actuated g/C Ratio	0.32	0.23	0.23	0.35	0.25	0.25	0.49	0.39	0.39	0.41	0.34
Clearance Time (s)	3.0	7.0	3.0	3.0	7.0	3.0	6.9	3.0	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)	291	784	340	341	839	367	306	1379	523	397	1684
v/s Ratio Prot	0.03	0.13	0.06	0.16	0.16	0.09	0.14	0.02	0.21	0.02	0.21
v/s Ratio Perm	0.09	0.19	0.14	0.14	0.04	0.28	0.04	0.04	0.08	0.04	0.08
Uniform Delay, d1	0.38	0.55	0.81	0.57	0.64	0.14	0.76	0.36	0.10	0.23	0.62
Progression Factor	1.00	1.00	1.00	2.37	1.84	1.94	1.00	1.00	1.00	0.80	0.79
Incremental Delay, d2	0.8	2.7	18.7	2.0	3.5	0.8	10.8	0.7	0.4	0.3	1.7
Delay (s)	25.4	36.4	55.0	58.6	65.3	57.9	27.9	22.2	19.5	14.9	23.4
Level of Service	C	D	D	E	E	E	C	C	B	B	C
Approach Delay (s)	41.2	41.2	41.2	63.2	63.2	63.2	23.3	23.3	23.3	22.7	22.7
Approach LOS	D	D	D	E	E	E	C	C	C	C	C

Intersection Summary	Value
HCM 2000 Control Delay	35.8
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
Critical Lane Group	C

Queues  
 2: Liverpool Rd & Kingston Rd

19225 | 1294 Kingston Rd  
 2028 FT AM: Option 1+1A



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR
Lane Configurations	←	←	←	←	←	←	←	←	←	←	←
Traffic Volume (vph)	101	394	254	178	493	49	215	461	122	85	871
Future Volume (vph)	101	394	254	178	493	49	215	461	122	85	871
Lane Group Flow (vph)	110	428	276	193	536	53	234	501	133	92	1062
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA
Permitted Phases	7	4	4	3	8	8	5	2	2	1	6
Detector Phase	7	4	4	3	8	8	5	2	2	1	6
Switch Phase	7	4	4	3	8	8	5	2	2	1	6
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?	None	C-Min	C-Min	None	C-Min	C-Min	None	Max	Max	None	Max
Recall Mode	0.35	0.53	0.79	0.52	0.62	0.14	0.75	0.36	0.22	0.21	0.64
v/c Ratio	20.2	35.0	51.7	48.9	63.2	54.4	34.5	24.5	5.6	12.1	24.1
Control Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
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	20.2	35.0	51.7	48.9	63.2	54.4	34.5	24.5	5.6	12.1	24.1
Queue Length 50th (m)	13.4	39.6	52.4	39.1	61.0	0.0	25.9	39.6	0.0	6.8	67.4
Queue Length 95th (m)	22.8	52.1	78.5	60.0	78.5	23.9	73.6	58.7	13.3	13.9	55.8
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	61.6	51.8	30.0	46.2	30.0	166.8
Base Capacity (vph)	348	976	423	376	986	431	311	1377	603	461	1668
Stallion 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	0.32	0.44	0.65	0.51	0.54	0.12	0.75	0.36	0.22	0.20	0.64

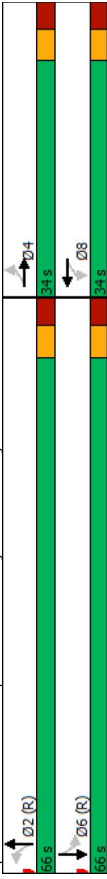
Intersection Summary	Value
Cycle Length: 100	100
Actuated Cycle Length: 100	100
Offset: 13 (13%), Referenced to phase 4:EBTL and 8:WBT, Start of Green	13
Natural Cycle: 75	75
Control Type: Actuated-Coordinated	Actuated-Coordinated
# 95th percentile volume exceeds capacity, queue may be longer.	95th percentile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

Queues  
4: Liverpool Rd & North Dwy/Main Plaza Dwy

HCM Unsignalized Intersection Capacity Analysis  
3: Liverpool Rd & South Dwy

19225 | 1294 Kingston Rd  
2028 FT AM: Option 1+1A

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	50	0	106	0	33	415	94	870
Future Volume (vph)	50	0	106	0	33	415	94	870
Lane Group Flow (vph)	54	63	115	64	36	628	102	963
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Projected Phases	4	4	8	8	2	2	6	6
Permitted Phases	4	4	8	8	2	2	6	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	24.9	24.9
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	0.0
Total Lost Time (s)	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9
LeadLag								
LeadLag Optimize?								
Recall Mode	None	None	None	None	C-Min	C-Min	C-Min	C-Min
v/c Ratio	0.29	0.20	0.63	0.12	0.10	0.26	0.20	0.38
Control Delay	40.5	1.5	54.5	0.4	2.9	1.8	5.5	5.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	40.5	1.5	54.5	0.4	2.9	1.8	5.5	5.1
Queue Length 50th (m)	10.0	0.0	22.4	0.0	0.9	6.3	5.7	29.6
Queue Length 95th (m)	20.4	0.0	38.4	0.0	1.4	3.1	13.3	45.1
Internal Link Dist (m)	19.8		34.1		56.6		192.1	
Turn Bay Length (m)			30.0		30.0		30.0	
Base Capacity (vph)	351	469	348	706	364	2380	522	2507
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillover Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.15	0.13	0.33	0.09	0.10	0.26	0.20	0.38
Intersection Summary								
Cycle Length: 100								
Actuated Cycle Length: 100								
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBTL, Start of Green								
Natural Cycle: 50								
Control Type: Actuated-Coordinated								



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↔	↔	↔	↔	↔
Traffic Volume (veh/h)	0	32	0	611	1030	4
Future Volume (Veh/h)	0	32	0	611	1030	4
Sign Control	Stop	Free	Free	Free	Free	Free
Grade	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	35	0	664	1120	4
Pedestrians	4					
Lane Width (m)	3.2					
Walking Speed (m/s)	1.2					
Percent Blockage	0					
Right turn flare (veh)				None	TWLT	2
Median storage (veh)						
Upstream signal (m)				59	80	
pX, platoon unblocked	0.94	0.93	0.93			
vC, conflicting volume	1458	379	1128			
vC1, stage 1 conf vol	1126					
vC2, stage 2 conf vol	332					
vCu, unblocked vol	905	70	875			
IC, single (s)	6.8	7.1	4.1			
IC, 2 stage (s)	5.8					
IF (s)	3.5	3.4	2.2			
p0 queue free %	100	96	100			
cM capacity (veh/h)	337	887	723			
Direction, Lane #	EB.1	NB.1	NB.2	SB.1	SB.2	SB.3
Volume Total	35	332	332	448	448	228
Volume Left	0	0	0	0	0	0
Volume Right	35	0	0	0	0	4
cSH	887	1700	1700	1700	1700	1700
Volume to Capacity	0.04	0.20	0.20	0.26	0.26	0.13
Queue Length 95th (m)	1.0	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
Lane LOS	A	A	A	A	A	A
Approach Delay (s)	9.2	0.0	0.0	0.0	0.0	0.0
Approach LOS	A	A	A	A	A	A
Intersection Summary						
Average Delay	0.2					
Intersection Capacity Utilization	30.0%					
ICU Level of Service	A					
Analysis Period (min)	15					

Queues  
6: Liverpool Rd & Glenanna Rd

HCM Signalized Intersection Capacity Analysis  
4: Liverpool Rd & North Dwy/Main Plaza Dwy

19225 | 1294 Kingston Rd  
2028 FT AM: Option 1+1A

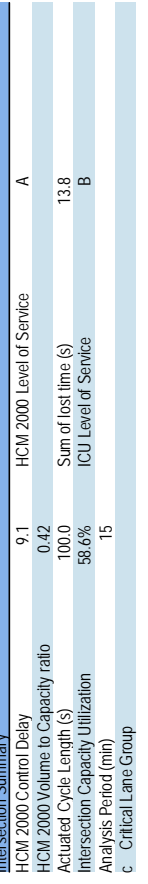
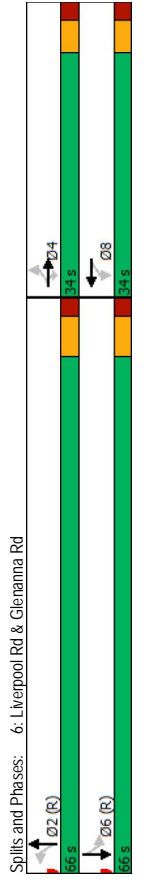


Movement	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Traffic Volume (vph)	47	138	251	71	87	115	376	73	658	
Future Volume (vph)	47	138	251	71	87	115	376	73	658	
Ideal Flow (vphpl)	51	150	273	77	156	125	445	79	790	
Lane Width	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2	3.5
Total Lost Time (s)	6.9	6.9	6.9	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	1.00	1.00	1.00	1.00	1.00	1.00
Frbp, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frbp, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Flt	0.95	1.00	1.00	0.95	1.00	0.95	1.00	0.95	1.00	1.00
Flt Protected	0.95	1.00	1.00	0.95	1.00	0.95	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1722	1382	1705	1575	1720	3269	1663	3487		
Flt Permitted	0.72	1.00	0.72	1.00	0.28	1.00	0.72	1.00	0.41	1.00
Satd. Flow (perm)	1297	1382	1285	1575	508	3269	724	3487		
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	54	0	63	115	0	64	36	451	177	102
RTOR Reduction (vph)	0	54	0	0	55	0	28	0	0	1
Lane Group Flow (vph)	54	9	0	115	9	0	36	600	0	102
Conf. Peds. (#/hr)	1	1	1	1	1	1	1	1	1	1
Heavy Vehicles (%)	0%	0%	14%	1%	0%	0%	4%	0%	2%	5%
Turn Type	Perm	NA	NA	Perm	NA	Perm	NA	Perm	NA	NA
Protected Phases	4			8		2		6		
Permitted Phases	4			8		2		6		
Actuated Green, G (s)	14.3	14.3	14.3	14.3	14.3	71.9	71.9	71.9	71.9	71.9
Effective Green, g (s)	14.3	14.3	14.3	14.3	14.3	71.9	71.9	71.9	71.9	71.9
Actuated g/C Ratio	0.14	0.14	0.14	0.14	0.14	0.72	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	6.9	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
Lane Grip Cap (vph)	185	197		183	225	365	2350	520	2507	
v/s Ratio Prot	0.04	0.01		0.01		0.18		0.14		
v/s Ratio Perm	0.29	0.05		0.63	0.04	0.07		0.20		
Uniform Delay, d1	38.3	37.0		40.3	36.9	4.2	4.8	4.6	5.5	
Progression Factor	1.00	1.00		1.00	1.00	0.42	0.35	0.81	0.78	
Incremental Delay, d2	0.9	0.1		6.6	0.1	0.5	0.3	0.8	0.4	
Delay (s)	39.2	37.1		46.9	37.0	2.3	2.0	4.5	4.7	
Level of Service	D	D		D	D	A	A	A	A	
Approach Delay (s)						43.4	2.0	4.7		
Approach LOS						D	A	A		

Movement	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Traffic Volume (vph)	50	0	58	106	0	59	33	415	163	94
Future Volume (vph)	50	0	58	106	0	59	33	415	163	94
Ideal Flow (vphpl)	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	3.5
Total Lost Time (s)	6.9	6.9	6.9	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	1.00	1.00	1.00	1.00	1.00	1.00
Frbp, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frbp, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Flt	0.95	1.00	1.00	0.95	1.00	0.95	1.00	0.95	1.00	1.00
Flt Protected	0.95	1.00	1.00	0.95	1.00	0.95	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1722	1382	1705	1575	1720	3269	1663	3487		
Flt Permitted	0.72	1.00	0.72	1.00	0.28	1.00	0.72	1.00	0.41	1.00
Satd. Flow (perm)	1297	1382	1285	1575	508	3269	724	3487		
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	54	0	63	115	0	64	36	451	177	102
RTOR Reduction (vph)	0	54	0	0	55	0	28	0	0	1
Lane Group Flow (vph)	54	9	0	115	9	0	36	600	0	102
Conf. Peds. (#/hr)	1	1	1	1	1	1	1	1	1	1
Heavy Vehicles (%)	0%	0%	14%	1%	0%	0%	4%	0%	2%	5%
Turn Type	Perm	NA	NA	Perm	NA	Perm	NA	Perm	NA	NA
Protected Phases	4			8		2		6		
Permitted Phases	4			8		2		6		
Actuated Green, G (s)	14.3	14.3	14.3	14.3	14.3	71.9	71.9	71.9	71.9	71.9
Effective Green, g (s)	14.3	14.3	14.3	14.3	14.3	71.9	71.9	71.9	71.9	71.9
Actuated g/C Ratio	0.14	0.14	0.14	0.14	0.14	0.72	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	6.9	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
Lane Grip Cap (vph)	185	197		183	225	365	2350	520	2507	
v/s Ratio Prot	0.04	0.01		0.01		0.18		0.14		
v/s Ratio Perm	0.29	0.05		0.63	0.04	0.07		0.20		
Uniform Delay, d1	38.3	37.0		40.3	36.9	4.2	4.8	4.6	5.5	
Progression Factor	1.00	1.00		1.00	1.00	0.42	0.35	0.81	0.78	
Incremental Delay, d2	0.9	0.1		6.6	0.1	0.5	0.3	0.8	0.4	
Delay (s)	39.2	37.1		46.9	37.0	2.3	2.0	4.5	4.7	
Level of Service	D	D		D	D	A	A	A	A	
Approach Delay (s)						43.4	2.0	4.7		
Approach LOS						D	A	A		

Intersection Summary	Value	Level
HCM 2000 Control Delay	9.1	HCM 2000 Level of Service
HCM 2000 Volume to Capacity ratio	0.42	
Actuated Cycle Length (s)	100.0	Sum of lost time (s)
Intersection Capacity Utilization	58.6%	ICU Level of Service
Analysis Period (min)	15	
c Critical Lane Group		

Intersection Summary	Value	Level
HCM 2000 Control Delay	9.1	HCM 2000 Level of Service
HCM 2000 Volume to Capacity ratio	0.42	
Actuated Cycle Length (s)	100.0	Sum of lost time (s)
Intersection Capacity Utilization	58.6%	ICU Level of Service
Analysis Period (min)	15	
c Critical Lane Group		



HCM Signalized Intersection Capacity Analysis  
 6: Liverpool Rd & Glenanna Rd

19225 | 1294 Kingston Rd  
 2028 FT AM: Option 1+1A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	←	←	←	←	←	←	←	←	←	←	←	←
Traffic Volume (vph)	47	138	251	71	87	56	115	376	33	73	658	69
Future Volume (vph)	47	138	251	71	87	56	115	376	33	73	658	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	5.9	6.7	6.7	6.7	6.7	6.7	6.7
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frbp. ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00	0.99	1.00	1.00
Frbp. ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00	0.99	1.00	1.00
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)	1658	1773	1513	1675	1717	1658	3353	1639	3410	1639	3410	1639
Flt Permitted	0.55	1.00	1.00	0.57	1.00	0.35	1.00	0.49	1.00	0.49	1.00	1.00
Satd. Flow (perm)	965	1773	1513	1008	1717	605	3353	853	3410	853	3410	853
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	273	77	95	61	125	409	36	79	715	75
RTOR Reduction (vph)	0	0	185	0	27	0	0	4	0	0	5	0
Lane Group Flow (vph)	51	150	88	77	129	0	125	441	0	79	785	0
Confl. Peds. (#/hr)							11	8	8	8	11	0
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	Perm	NA	Perm
Protected Phases	4		4	8	8	2		2		6		6
Permitted Phases	4		4	8	8	2		2		6		6
Actuated Green, G (s)	14.1	14.1	14.1	14.1	14.1	73.3	73.3	73.3	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	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	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	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	3.0	3.0	3.0
Lane Grp Cap (vph)	136	249	213	142	242	443	2457	625	2499	625	2499	625
w/s Ratio Prot	c0.08			0.07				0.13				c0.23
w/s Ratio Perm	0.05		0.06	0.08		0.21		0.09				0.09
v/c Ratio	0.38	0.60	0.41	0.54	0.53	0.28	0.18	0.13	0.31	0.13	0.31	0.31
Uniform Delay, d1	39.0	40.3	39.2	39.9	39.9	4.5	4.1	3.9	4.6	3.9	4.6	4.6
Progression Factor	1.00	1.00	1.00	0.99	0.98	0.62	0.62	0.62	0.62	0.62	0.62	0.62
Incremental Delay, d2	1.7	4.1	1.3	4.2	2.2	1.6	0.2	0.4	0.3	0.4	0.3	0.3
Delay (s)	40.7	44.4	40.5	43.8	41.4	4.4	2.7	4.3	5.0	4.3	5.0	5.0
Level of Service	D	D	D	D	D	A	A	A	A	A	A	A
Approach Delay (s)			41.7		42.2		3.1		4.9		4.9	
Approach LOS			D		D		A		A		A	
<b>Intersection Summary</b>												
HCM 2000 Control Delay	16.6 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	62.5% ICU Level of Service B											
Analysis Period (min)	15											
c Critical Lane Group												



**Weekday PM Peak Hour**



HCM Signalized Intersection Capacity Analysis  
 1: Glenanna Rd & Kingston Rd

19225 | 1294 Kingston Rd  
 2028 FT.PM: Option 1+1A (Optimized)



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	←	←	←	←	←	←	←	←	←	←	←	←
Traffic Volume (vph)	24	1218	141	156	614	132	120	177	194	178	199	36
Future Volume (vph)	24	1218	141	156	614	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	6.4	3.0	6.4	6.4	7.0	7.0	3.0	7.0	3.0	7.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frbp, ped/bikes	1.00	1.00	0.83	1.00	1.00	0.90	1.00	1.00	0.91	1.00	1.00	0.84
Frbp, ped/bikes	0.97	1.00	1.00	1.00	1.00	0.96	1.00	1.00	0.97	1.00	1.00	0.85
Flt	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	0.95	1.00	1.00	0.85
Satd. Flow (prot)	1668	3500	1220	1658	3500	1373	1649	1879	1385	1673	1824	1295
Flt Permitted	0.40	1.00	1.00	0.08	1.00	1.00	0.47	1.00	0.53	1.00	1.00	1.00
Satd. Flow (perm)	699	3500	1220	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	1324	153	170	667	143	130	192	211	193	216	39
RTOR Reduction (vph)	0	0	60	0	0	39	0	0	171	0	0	32
Lane Group Flow (vph)	26	1324	93	170	667	104	130	192	40	193	216	7
Conf. Peds. (#/hr)	30	55	55	30	91	30	91	50	50	50	50	91
Heavy Vehicles (%)	0%	2%	5%	4%	2%	1%	0%	0%	0%	1%	0%	3%
Turn Type	Perm	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm
Permitted Phases	4	4	4	8	8	8	5	2	2	1	6	6
Actuated Green, G (s)	44.5	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	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	0.44	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	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	3.0
Lane Grp Cap (vph)	311	1557	542	282	2110	827	239	325	239	262	315	224
v/s Ratio Prot	c0.38	c0.08	0.19	0.08	0.19	0.08	0.03	0.10	0.03	c0.04	0.12	0.12
v/s Ratio Perm	0.04	0.08	0.29	0.08	0.29	0.08	0.09	0.03	0.03	c0.13	0.01	0.01
Uniform Delay, d1	16.0	24.8	16.7	19.7	9.7	8.5	32.4	38.1	35.2	34.7	38.8	34.4
Progression Factor	0.48	0.54	0.19	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.05	1.06
Incremental Delay, d2	0.1	2.2	2.1	3.6	0.1	2.5	7.7	1.5	10.3	11.5	0.2	0.2
Delay (s)	7.8	15.7	3.3	23.3	9.8	8.6	34.9	45.8	36.7	46.9	52.7	34.6
Level of Service	A	B	A	C	A	A	C	D	D	D	D	C
Approach Delay (s)	14.3			12.0			39.5				48.6	
Approach LOS	B			B			D				D	
Intersection Summary												
HCM 2000 Control Delay	22.0 HCM 2000 Level of Service C											
HCM 2000 Volume to Capacity ratio	0.78											
Actuated Cycle Length (s)	100.0 Sum of lost time (s) 19.4											
Intersection Capacity Utilization	85.0% ICU Level of Service E											
Analysis Period (min)	15											
C Critical Lane Group												

Queues  
 1: Glenanna Rd & Kingston Rd

19225 | 1294 Kingston Rd  
 2028 FT.PM: Option 1+1A (Optimized)

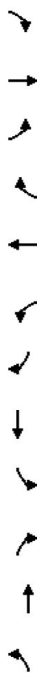


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	←	←	←	←	←	←	←	←	←	←	←	←
Traffic Volume (vph)	24	1218	141	156	614	132	120	177	194	178	199	36
Future Volume (vph)	24	1218	141	156	614	132	120	177	194	178	199	36
Lane Group Flow (vph)	26	1324	153	170	667	143	130	192	211	193	216	39
Turn Type	Perm	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm
Permitted Phases	4	4	4	8	8	8	5	2	2	1	6	6
Detector Phase	4	4	4	8	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)	24.4	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	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%	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	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	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	0.0
Total Lost Time (s)	6.4	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	Lag	Lead	Lead	Lead	Lead	Lag	Lag	Lag	Lead	Lag
Lead/Lag Optimize?	None	None	None	None	None	None	None	C-Min	C-Min	None	C-Min	C-Min
Recall Mode	0.08	0.85	0.25	0.59	0.32	0.17	0.49	0.59	0.51	0.65	0.69	0.13
v/s Ratio	9.7	19.0	1.9	25.0	10.9	4.4	32.3	44.9	9.8	40.6	51.9	1.5
Control 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
Queue Delay	9.7	19.0	1.9	25.0	10.9	4.4	32.3	44.9	9.8	40.6	51.9	1.5
Queue Length 50th (m)	0.9	143.6	0.0	15.7	32.4	3.5	19.9	36.5	0.7	34.0	43.9	0.0
Queue Length 95th (m)	m2.8m#181.2	m6.5	39.7	50.8	13.5	32.0	55.0	19.2	41.4	66.6	0.0	0.0
Internal Link Dist (m)	393.2											
Turn Bay Length (m)	42.6	60.4	33.0	23.2	25.4	25.4	25.0	27.3	25.0	27.3	16.5	16.5
Base Capacity (vph)	310	1557	603	287	2110	866	265	676	631	296	656	532
Stallion Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillover 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	0.08	0.85	0.25	0.59	0.32	0.17	0.49	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:NBL and 6:SBTL, Start of Green												
Natural Cycle: 80												
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.												
Spills and Phases: 1: Glenanna Rd & Kingston Rd												



HCM Signalized Intersection Capacity Analysis  
 2: Liverpool Rd & Kingston Rd

19225 | 1294 Kingston Rd  
 2028 FT.PM: Option 1+1A (Optimized)



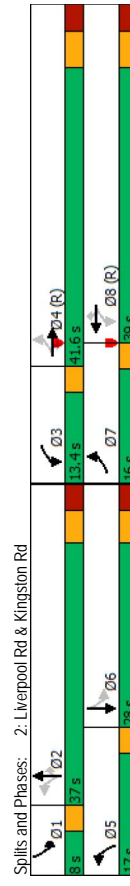
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR
Lane Configurations	←	←	←	←	←	←	←	←	←	←	←
Traffic Volume (vph)	244	1069	330	226	525	85	302	934	278	119	378
Future Volume (vph)	244	1069	330	226	525	85	302	934	278	119	378
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.5	3.2	3.2	3.5	3.2	3.5	3.2	3.2	3.2	3.5
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
Frbp, ped/bikes	1.00	1.00	0.94	1.00	1.00	0.95	1.00	1.00	0.91	1.00	0.99
Frbp, ped/bikes	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97
Flt	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	1678	3535	1363	1672	4894
Flt Permitted	0.34	1.00	1.00	0.12	1.00	1.00	0.36	1.00	1.00	0.19	1.00
Satd. Flow (perm)	601	3500	1416	222	3500	1431	634	3535	1363	332	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
Adj. Flow (vph)	265	1162	359	246	571	92	328	1015	302	129	411
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	152	0	38
Lane Group Flow (vph)	265	1162	359	246	571	92	328	1015	150	129	468
Conf. Peds. (#/hr)	26	32	32	32	26	34	34	26	48	48	34
Heavy Vehicles (%)	1%	2%	2%	1%	2%	2%	2%	1%	3%	3%	0%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA
Permitted Phases	7	4	3	8	8	8	5	2	2	1	6
Actuated Green, G (s)	46.4	34.2	34.2	42.8	32.4	32.4	38.1	30.1	30.1	26.2	21.2
Effective Green, g (s)	46.4	34.2	34.2	42.8	32.4	32.4	38.1	30.1	30.1	26.2	21.2
Actuated g/C Ratio	0.46	0.34	0.34	0.43	0.32	0.32	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)	412	1197	484	249	1134	463	386	1064	410	153	1037
v/s Ratio Prot	c0.08	c0.33	c0.10	0.16	0.16	c0.12	c0.29	0.04	0.10	0.18	0.10
v/s Ratio Perm	0.22	0.25	0.32	0.06	0.21	0.06	0.21	0.11	0.11	0.18	0.18
Uniform Delay, d1	0.64	0.97	0.74	0.99	0.50	0.20	0.85	0.95	0.36	0.84	0.45
Progression Factor	1.00	1.00	1.00	1.37	1.44	1.45	1.00	1.00	1.00	1.05	0.98
Incremental Delay, d2	3.4	19.9	9.8	52.2	1.5	0.9	15.9	17.5	0.6	31.9	0.3
Delay (s)	20.9	52.3	38.9	87.0	40.9	36.4	40.4	51.8	28.0	66.3	34.0
Level of Service	C	D	D	F	D	D	D	D	C	E	C
Approach Delay (s)	44.9	D	D	52.9	D	D	45.1	D	D	40.6	D
Approach LOS	D	D	D	D	D	D	D	D	D	D	D
Intersection Summary											
HCM 2000 Control Delay	45.9 HCM 2000 Level of Service										
HCM 2000 Volume to Capacity ratio	0.99										
Actuated Cycle Length (s)	100.0										
Intersection Capacity Utilization	93.1%										
Analysis Period (min)	15										
Critical Lane Group	c Critical Lane Group										

Queues  
 2: Liverpool Rd & Kingston Rd

19225 | 1294 Kingston Rd  
 2028 FT.PM: Option 1+1A (Optimized)



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR
Lane Configurations	←	←	←	←	←	←	←	←	←	←	←
Traffic Volume (vph)	244	1069	330	226	525	85	302	934	278	119	378
Future Volume (vph)	244	1069	330	226	525	85	302	934	278	119	378
Lane Group Flow (vph)	265	1162	359	246	571	92	328	1015	302	129	506
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA
Projected Phases	7	4	4	4	4	4	8	2	2	2	6
Permitted Phases	4	4	4	4	4	4	8	2	2	2	6
Switch Phase	7	4	4	4	4	4	8	2	2	2	6
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	41.6	41.6	13.4	39.0	39.0	17.0	37.0	37.0	8.0	28.0
Total Spill (%)	16.0%	41.6%	41.6%	13.4%	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?	None	C-Min	None	None	C-Min	None	None	C-Min	None	None	C-Min
Recall Mode	0.61	0.97	0.74	0.95	0.50	0.20	0.80	0.95	0.54	0.78	0.47
v/s Ratio	20.1	53.1	40.0	74.9	41.6	37.8	38.0	53.6	12.5	54.3	32.2
Control Delay	0.1	0.0	0.0	0.0	0.0	0.0	0.0	7.8	0.0	0.0	0.0
Queue Delay	0.1	0.0	0.0	0.0	0.0	0.0	0.0	7.8	0.0	0.0	0.0
Total Delay	29.3	121.8	63.9	40.7	62.9	41.6	37.8	38.0	61.4	12.5	54.3
Queue Length 50th (m)	29.3	121.8	63.9	40.7	62.9	41.6	37.8	38.0	61.4	12.5	54.3
Queue Length 95th (m)	46.2	#168.4	#102.0	#83.1	78.2	31.3	#84.4	#149.2	39.1	#41.0	45.8
Internal Link Dist (m)	667.5										
Turn Bay Length (m)	33.5	49.1	103.2	61.6	46.2	46.2	51.8	30.0	51.8	30.0	30.0
Base Capacity (vph)	451	1197	484	259	1134	463	411	1064	562	166	1074
Stallout Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	10	0	0	0	0	0	0	0	49	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.60	0.97	0.74	0.95	0.50	0.20	0.80	1.00	0.54	0.78	0.47
Intersection Summary											
Cycle Length: 100											
Actual 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.											



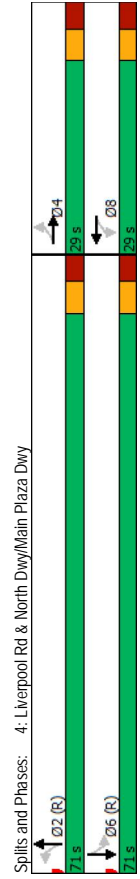
Queues  
4: Liverpool Rd & North Dwy/Main Plaza Dwy

HCM Unsignalized Intersection Capacity Analysis  
3: Liverpool Rd & South Dwy

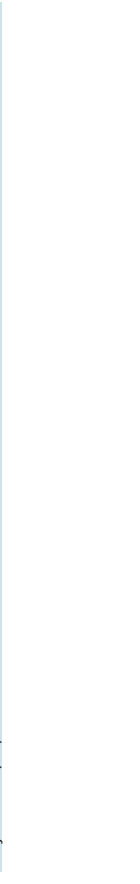
19225 | 1294 Kingston Rd  
2028 FT.PM: Option 1+1A (Optimized)

19225 | 1294 Kingston Rd  
2028 FT.PM: Option 1+1A (Optimized)

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	40	0	123	0	100	916	76	399
Future Volume (vph)	40	0	123	0	100	916	76	399
Lane Group Flow (vph)	43	51	134	107	109	1264	83	481
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Projected Phases	4	4	8	8	2	2	6	6
Permitted Phases	4	4	8	8	2	2	6	6
Detector Phase								
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	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	0.0
Total Lost Time (s)	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9
LeadLag								
LeadLag Optimize?								
Recall Mode	None	None	None	None	C-Min	C-Min	C-Min	C-Min
v/c Ratio	0.22	0.08	0.66	0.30	0.18	0.52	0.35	0.20
Control Delay	37.6	0.3	54.8	6.0	2.6	3.9	10.8	4.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.7	0.0	0.0
Total Delay	37.6	0.3	54.8	6.0	2.6	4.6	10.8	4.5
Queue Length 50th (m)	7.8	0.0	26.1	0.0	1.8	9.2	5.4	11.1
Queue Length 95th (m)	16.8	0.0	43.0	9.3	m5.3	m120.0	15.6	17.1
Internal Link Dist (m)	19.8		34.1		56.6		192.1	
Turn Bay Length (m)			30.0		30.0		30.0	
Base Capacity (vph)	275	695	289	447	607	2414	240	2442
Stallion Cap Reductn	0	0	0	0	0	724	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.16	0.07	0.46	0.24	0.18	0.75	0.35	0.20
<b>Intersection Summary</b>								
Cycle Length: 100								
Actuated Cycle Length: 100								
Offset: 0 (0%), Referenced to phase 2:NBL and 6:SBTL, Start of Green								
Natural Cycle: 60								
Control Type: Actuated-Coordinated								
m Volume for 95th percentile queue is metered by upstream signal.								



Movement	EBL	EBT	NBL	NBT	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔
Traffic Volume (veh/h)	0	26	0	1263	558	11
Future Volume (Veh/h)	0	26	0	1263	558	11
Sign Control	Stop	Free	Free	Free	Free	Free
Grade	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	28	0	1373	607	12
Pedestrians	4					
Lane Width (m)	3.2					
Walking Speed (m/s)	1.2					
Percent Blockage	0					
Right turn flare (veh)				None	TWLT	2
Median storage (veh)						
Upstream signal (m)	0.72			59	80	
pX, platoon unblocked						
vC, conflicting volume	1304	212	623			
vC1, stage 1 conf vol	617					
vC2, stage 2 conf vol	686					
vC3, unblocked vol	633	212	623			
IC, single (s)	6.8	6.9	4.1			
IC, 2 stage (s)	5.8					
IF (s)	3.5	3.3	2.2			
p0 queue free %	100	96	100			
cM capacity (veh/h)	466	797	965			
<b>Direction, Lane #</b>						
Volume Total	28	686	686	243	243	133
Volume Left	0	0	0	0	0	0
Volume Right	28	0	0	0	0	12
cSH	797	1700	1700	1700	1700	1700
Volume to Capacity	0.04	0.40	0.40	0.14	0.14	0.08
Queue Length 95th (m)	0.9	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	9.7	0.0	0.0	0.0	0.0	0.0
Lane LOS	A					
Approach Delay (s)	9.7	0.0		0.0		
Approach LOS	A					
<b>Intersection Summary</b>						
Average Delay	0.1					
Intersection Capacity Utilization	38.2%					
ICU Level of Service	A					
Analysis Period (min)	15					



Queues  
6: Liverpool Rd & Glenanna Rd

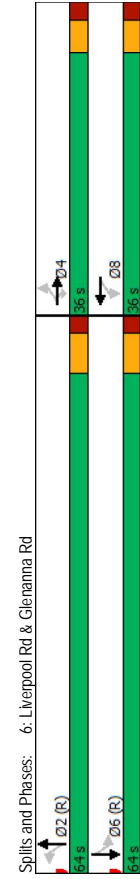
HCM Signalized Intersection Capacity Analysis  
4: Liverpool Rd & North Dwy/Main Plaza Dwy

19225 | 1294 Kingston Rd  
2028 FT.PM: Option 1+1A (Optimized)



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT	SBR
Lane Configurations	4	4	4	8	8	8	2	2	6	6	6
Traffic Volume (vph)	45	72	112	54	145	348	633	67	352	352	43
Future Volume (vph)	45	72	112	54	145	348	633	67	352	352	43
Ideal Flow (vphpl)	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
Total Lost Time (s)	6.9	6.9	6.9	6.9	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	1.00	1.00	1.00	0.95	1.00	1.00	0.95
Frbp, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00	0.99
Frbp, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00	0.99
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	0.95	1.00	0.95
Satd. Flow (prot)	1722	1575	1722	1560	1722	1560	1710	3385	1716	3443	1716
Flt Permitted	0.69	1.00	1.00	0.72	1.00	0.72	1.00	0.48	1.00	0.19	1.00
Satd. Flow (perm)	1247	1575	1247	1312	1560	1247	859	3385	340	3443	340
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
Adj. Flow (vph)	43	0	51	134	0	107	109	996	268	83	434
RTOR Reduction (vph)	0	43	0	0	91	0	0	20	0	0	7
Lane Group Flow (vph)	43	8	0	134	16	0	109	1244	0	83	474
Conf. Peds. (#/hr)	1	0	1	1	1	1	6	15	15	15	6
Heavy Vehicles (%)	0%	0%	0%	0%	0%	1%	0%	1%	0%	0%	2%
Turn Type	Perm	NA	NA	Perm	NA	NA	Perm	NA	NA	Perm	NA
Protected Phases	4	4	4	8	8	8	2	2	6	6	6
Permitted Phases	4	4	4	8	8	8	2	2	6	6	6
Actuated Green, G (s)	15.4	15.4	15.4	15.4	15.4	15.4	70.8	70.8	70.8	70.8	70.8
Effective Green, g (s)	15.4	15.4	15.4	15.4	15.4	15.4	70.8	70.8	70.8	70.8	70.8
Actuated g/C Ratio	0.15	0.15	0.15	0.15	0.15	0.15	0.71	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	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	3.0	3.0	3.0	3.0
Lane Grip Cap (vph)	192	242	202	240	202	240	608	2396	240	2437	2437
v/s Ratio Prot	0.03	0.00	0.00	0.01	0.01	0.01	c0.37	c0.37	0.14	0.14	0.14
v/s Ratio Perm	0.22	0.03	0.06	0.07	0.07	0.07	0.13	0.13	0.24	0.24	0.24
Uniform Delay, d1	37.1	36.0	39.9	36.2	39.9	36.2	4.9	5.2	0.35	0.35	0.19
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.37	0.49	0.86	0.86	0.81
Incremental Delay, d2	0.6	0.1	0.1	0.1	0.1	0.1	0.3	0.4	3.9	3.9	0.2
Delay (s)	37.7	36.0	47.8	36.3	47.8	36.3	2.1	3.7	8.7	8.7	4.2
Level of Service	D	D	D	D	D	D	A	A	A	A	A
Approach Delay (s)	36.8	36.8	42.7	36.8	42.7	36.8	3.6	3.6	4.9	4.9	4.9
Approach LOS	D	D	D	D	D	D	A	A	A	A	A

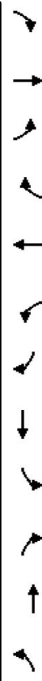
Intersection Summary	9.4	HCM 2000 Level of Service	A
HCM 2000 Control Delay	9.4	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	13.8
Intersection Capacity Utilization	68.5%	ICU Level of Service	C
Analysis Period (min)	15		
C Critical Lane Group			



Spills and Phases:	6: Liverpool Rd & Glenanna Rd
Cycle Length: 100	
Actuated Cycle Length: 100	
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBTL, Start of Green	
Natural Cycle: 60	
Control Type: Actuated-Coordinated	

HCM Signalized Intersection Capacity Analysis  
 6: Liverpool Rd & Glenanna Rd

19225 | 1294 Kingston Rd  
 2028 FT.PM: Option 1+1A (Optimized)



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	45	72	112	54	145	44	348	633	73	67	352	30
Future Volume (vph)	45	72	112	54	145	44	348	633	73	67	352	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	5.9	6.7	6.7	6.7	6.7	6.7	6.7
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frbp. ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00	0.99	1.00
Frbp. ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.98	1.00	1.00	0.99	1.00
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)	1725	1824	1543	1725	1791	1708	3448	1707	3527	1707	3527	30
Flt Permitted	0.43	1.00	1.00	0.71	1.00	0.51	1.00	0.35	1.00	0.35	1.00	1.00
Satd. Flow (perm)	788	1824	1543	1282	1791	914	3448	634	3527	634	3527	30
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	122	59	158	48	378	688	79	73	383	33
RTOR Reduction (vph)	0	0	102	0	13	0	0	6	0	0	4	0
Lane Group Flow (vph)	49	78	20	59	193	0	378	761	0	73	412	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	Perm	NA	NA
Protected Phases	4		4	8		8		2		6		6
Permitted Phases	4		4	8		8		2		6		6
Actuated Green, G (s)	16.0	16.0	16.0	16.0	16.0	16.0	71.4	71.4	71.4	71.4	71.4	71.4
Effective Green, g (s)	16.0	16.0	16.0	16.0	16.0	16.0	71.4	71.4	71.4	71.4	71.4	71.4
Actuated g/C Ratio	0.16	0.16	0.16	0.16	0.16	0.16	0.71	0.71	0.71	0.71	0.71	0.71
Clearance Time (s)	5.9	5.9	5.9	5.9	5.9	5.9	6.7	6.7	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	3.0	3.0	3.0
Lane Grp Cap (vph)	126	291	246	205	286	652	2461	452	2518	452	2518	2518
w/s Ratio Prot	0.04			c0.11		c0.11		0.22		0.12		0.12
w/s Ratio Perm	0.06		0.01	0.05		0.05		0.41		0.12		0.12
v/c Ratio	0.39	0.27	0.08	0.29	0.67	0.58	0.31	0.58	0.31	0.16	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	4.6	4.6	4.6
Progression Factor	1.00	1.00	1.00	0.70	0.77	0.50	0.44	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.0	0.5	0.1	0.8	6.0	3.3	0.3	0.8	0.1	0.8	0.1	0.1
Delay (s)	39.6	37.4	35.9	26.8	36.6	6.8	2.6	5.4	4.8	5.4	4.8	4.8
Level of Service	D	D	D	C	D	A	A	A	A	A	A	A
Approach Delay (s)			37.1		34.4		4.0		4.9		4.9	
Approach LOS			D		C		A		A		A	

Intersection Summary	
HCM 2000 Control Delay	11.8 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	67.9% ICU Level of Service C
Analysis Period (min)	15
c Critical Lane Group	



## **Future Total Traffic - Option 2**



**Weekday AM Peak Hour**

HCM Signalized Intersection Capacity Analysis  
 1: Glenanna Rd & Kingston Rd  
 2028 FT AM: Option 2

Queues  
 1: Glenanna Rd & Kingston Rd  
 2028 FT AM: Option 2

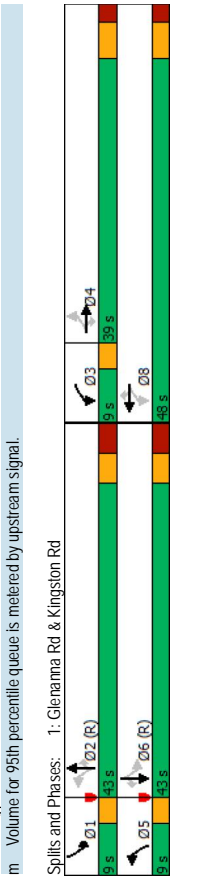


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR
Lane Configurations	10	411	92	96	590	122	52	73	64	190	102
Traffic Volume (vph)	10	411	92	96	590	122	52	73	64	190	102
Future Volume (vph)	10	411	92	96	590	122	52	73	64	190	102
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5
Total Lost time (s)	6.4	6.4	6.4	3.0	6.4	3.0	7.0	3.0	7.0	3.0	7.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frbp. ped/bikes	1.00	1.00	0.91	1.00	1.00	0.96	1.00	1.00	0.93	1.00	0.93
Frbp. ped/bikes	0.99	1.00	1.00	0.99	1.00	1.00	0.97	1.00	1.00	0.97	1.00
Fit	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	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
Satd. Flow (prot)	1568	3305	1303	1646	3400	1464	1667	1860	1397	1641	1773
Flt Permitted	0.41	1.00	1.00	0.31	1.00	1.00	0.69	1.00	1.00	0.66	1.00
Satd. Flow (perm)	674	3305	1303	534	3400	1464	1203	1860	1397	1134	1773
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
Adj. Flow (vph)	11	447	100	104	641	133	57	79	70	207	111
RTOR Reduction (vph)	0	0	80	0	0	65	0	0	42	0	15
Lane Group Flow (vph)	11	447	20	104	641	68	57	79	28	207	111
Conf. Peds. (#/hr)	8	25	25	25	8	35	34	34	34	34	35
Heavy Vehicles (%)	9%	8%	8%	4%	5%	1%	0%	1%	3%	2%	6%
Turn Type	Perm	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm	pm-pt	NA
Permitted Phases	4		4	8	8	2	5	2	2	1	6
Actuated Green, G (s)	20.0	20.0	20.0	31.6	31.6	31.6	46.4	40.4	40.4	55.0	46.0
Effective Green, g (s)	20.0	20.0	20.0	31.6	31.6	31.6	46.4	40.4	40.4	55.0	46.0
Actuated g/C Ratio	0.20	0.20	0.20	0.32	0.32	0.32	0.46	0.40	0.40	0.55	0.46
Clearance Time (s)	6.4	6.4	6.4	3.0	6.4	3.0	7.0	3.0	7.0	3.0	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)	134	661	260	264	1074	462	586	751	564	682	815
v/s Ratio Prot	c0.14		0.03	c0.19	0.03	0.01	0.04		0.04	c0.04	0.06
v/s Ratio Perm	0.02	0.02	0.09	0.05	0.05	0.04	0.02	0.02	0.02	c0.13	0.01
Uniform Delay, d1	0.08	0.68	0.08	0.39	0.60	0.15	0.10	0.11	0.05	0.30	0.14
Progression Factor	0.61	0.81	0.16	1.00	1.00	1.00	1.00	1.00	1.00	0.72	0.81
Incremental Delay, d2	0.3	2.6	0.1	1.0	0.9	0.1	0.1	0.3	0.2	0.3	0.3
Delay (s)	20.2	32.5	5.2	26.4	29.7	24.7	14.9	18.8	18.3	8.6	13.0
Level of Service	C	C	A	C	C	C	B	B	B	A	B
Approach Delay (s)	C	27.3	C	C	28.6	C	17.6	B	B	10.5	B
Approach LOS	C		C	C		C		B	B		B

Queues  
 1: Glenanna Rd & Kingston Rd  
 2028 FT AM: Option 2



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR
Lane Configurations	10	411	92	96	590	122	52	73	64	190	102
Traffic Volume (vph)	10	411	92	96	590	122	52	73	64	190	102
Future Volume (vph)	10	411	92	96	590	122	52	73	64	190	102
Ideal Flow (vphpl)	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
Total Lost time (s)	6.4	6.4	6.4	3.0	6.4	3.0	7.0	3.0	7.0	3.0	7.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frbp. ped/bikes	1.00	1.00	0.91	1.00	1.00	0.96	1.00	1.00	0.93	1.00	0.93
Frbp. ped/bikes	0.99	1.00	1.00	0.99	1.00	1.00	0.97	1.00	1.00	0.97	1.00
Fit	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	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
Satd. Flow (prot)	1568	3305	1303	1646	3400	1464	1667	1860	1397	1641	1773
Flt Permitted	0.41	1.00	1.00	0.31	1.00	1.00	0.69	1.00	1.00	0.66	1.00
Satd. Flow (perm)	674	3305	1303	534	3400	1464	1203	1860	1397	1134	1773
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
Adj. Flow (vph)	11	447	100	104	641	133	57	79	70	207	111
RTOR Reduction (vph)	0	0	80	0	0	65	0	0	42	0	15
Lane Group Flow (vph)	11	447	20	104	641	68	57	79	28	207	111
Conf. Peds. (#/hr)	8	25	25	25	8	35	34	34	34	34	35
Heavy Vehicles (%)	9%	8%	8%	4%	5%	1%	0%	1%	3%	2%	6%
Turn Type	Perm	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm	pm-pt	NA
Permitted Phases	4		4	8	8	2	5	2	2	1	6
Actuated Green, G (s)	20.0	20.0	20.0	31.6	31.6	31.6	46.4	40.4	40.4	55.0	46.0
Effective Green, g (s)	20.0	20.0	20.0	31.6	31.6	31.6	46.4	40.4	40.4	55.0	46.0
Actuated g/C Ratio	0.20	0.20	0.20	0.32	0.32	0.32	0.46	0.40	0.40	0.55	0.46
Clearance Time (s)	6.4	6.4	6.4	3.0	6.4	3.0	7.0	3.0	7.0	3.0	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)	134	661	260	264	1074	462	586	751	564	682	815
v/s Ratio Prot	c0.14		0.03	c0.19	0.03	0.01	0.04		0.04	c0.04	0.06
v/s Ratio Perm	0.02	0.02	0.09	0.05	0.05	0.04	0.02	0.02	0.02	c0.13	0.01
Uniform Delay, d1	0.08	0.68	0.08	0.39	0.60	0.15	0.10	0.11	0.05	0.30	0.14
Progression Factor	0.61	0.81	0.16	1.00	1.00	1.00	1.00	1.00	1.00	0.72	0.81
Incremental Delay, d2	0.3	2.6	0.1	1.0	0.9	0.1	0.1	0.3	0.2	0.3	0.3
Delay (s)	20.2	32.5	5.2	26.4	29.7	24.7	14.9	18.8	18.3	8.6	13.0
Level of Service	C	C	A	C	C	C	B	B	B	A	B
Approach Delay (s)	C	27.3	C	C	28.6	C	17.6	B	B	10.5	B
Approach LOS	C		C	C		C		B	B		B



Spillover and Phases: 1: Glenanna Rd & Kingston Rd

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



HCM Signalized Intersection Capacity Analysis  
 2: Liverpool Rd & Kingston Rd  
 19225 | 1294 Kingston Rd  
 2028 FT AM: Option 2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR
Lane Configurations	←	←	←	←	←	←	←	←	←	←	←
Traffic Volume (vph)	102	394	254	178	493	49	215	455	122	83	867
Future Volume (vph)	102	394	254	178	493	49	215	455	122	83	867
Ideal Flow (vphpl)	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	3.5	3.2	3.5	3.2	3.5
Total Lost time (s)	3.0	7.0	3.0	3.0	7.0	3.0	6.9	6.9	3.0	6.9	3.2
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
Frbp, ped/bikes	1.00	1.00	0.96	1.00	1.00	0.96	1.00	1.00	0.95	1.00	0.99
Frbp, ped/bikes	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98
Flt	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	1329	1675	4912
Flt Permitted	0.34	1.00	1.00	0.40	1.00	1.00	0.16	1.00	1.00	0.47	1.00
Satd. Flow (perm)	596	3368	1462	682	3400	1487	287	3500	1329	830	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
Adj. Flow (vph)	111	428	276	193	536	53	234	495	133	90	942
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	14
Lane Group Flow (vph)	111	428	276	193	536	53	234	495	52	90	1041
Conf. Peds. (#/hr)	15	19	9	15	22	15	22	25	25	25	22
Heavy Vehicles (%)	4%	6%	1%	5%	5%	0%	2%	2%	10%	2%	4%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA
Permitted Phases	4	4	8	8	8	8	2	2	2	6	6
Actuated Green, G (s)	32.7	23.4	23.4	35.3	24.7	24.7	49.1	39.4	39.4	41.0	34.3
Effective Green, g (s)	32.7	23.4	23.4	35.3	24.7	24.7	49.1	39.4	39.4	41.0	34.3
Actuated g/C Ratio	0.33	0.23	0.23	0.35	0.25	0.25	0.49	0.39	0.39	0.41	0.34
Clearance Time (s)	3.0	7.0	3.0	3.0	7.0	3.0	6.9	6.9	3.0	6.9	3.0
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)	293	788	342	342	839	367	306	1379	523	396	1684
v/s Ratio Prot	0.04	0.13	0.06	0.16	0.16	0.09	0.14	0.02	0.21	0.02	0.21
v/s Ratio Perm	0.09	0.19	0.14	0.14	0.04	0.28	0.04	0.08	0.04	0.08	0.08
Uniform Delay, d1	0.38	0.54	0.81	0.56	0.64	0.14	0.76	0.36	0.10	0.23	0.62
Progression Factor	24.5	33.6	36.2	23.9	33.7	29.4	17.0	21.4	19.1	18.4	27.4
Incremental Delay, d2	0.8	2.7	18.2	2.0	3.5	0.8	10.8	0.7	0.4	0.3	1.6
Delay (s)	25.3	36.3	54.4	58.5	65.3	57.7	27.9	22.1	19.5	14.7	23.2
Level of Service	C	D	D	E	E	E	C	C	B	B	C
Approach Delay (s)	40.9			63.1			23.3				22.5
Approach LOS	D			E			C				C
Intersection Summary											
HCM 2000 Control Delay	35.7 HCM 2000 Level of Service										
HCM 2000 Volume to Capacity ratio	0.77										
Actuated Cycle Length (s)	100.0										
Intersection Capacity Utilization	74.3%										
Analysis Period (min)	15										
c Critical Lane Group											

Queues  
 2: Liverpool Rd & Kingston Rd  
 19225 | 1294 Kingston Rd  
 2028 FT AM: Option 2

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR
Lane Configurations	←	←	←	←	←	←	←	←	←	←	←
Traffic Volume (vph)	102	394	254	178	493	49	215	455	122	83	867
Future Volume (vph)	102	394	254	178	493	49	215	455	122	83	867
Lane Group Flow (vph)	111	428	276	193	536	53	234	495	133	90	1055
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA
Projected Phases	7	4	4	3	8	8	5	2	2	6	6
Permitted Phases	4	4	4	3	8	8	5	2	2	1	6
Switch Phase	7	4	4	3	8	8	5	2	2	1	6
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	None	None	C-Min	None	None	None	None	None	None
v/c Ratio	0.35	0.53	0.79	0.52	0.62	0.14	0.75	0.36	0.22	0.20	0.63
Control Delay	20.2	35.0	51.7	48.8	63.3	54.2	34.2	24.4	5.6	11.9	23.8
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	20.2	35.0	51.7	48.8	63.3	54.2	34.2	24.4	5.6	11.9	23.8
Queue Length 50th (m)	13.6	39.6	52.4	39.1	61.0	0.0	25.9	39.0	0.0	6.6	66.4
Queue Length 95th (m)	23.0	52.1	78.5	59.9	78.5	24.0	73.0	58.1	13.3	13.5	54.5
Internal Link Dist (m)	667.5										
Turn Bay Length (m)	33.5	49.1	103.2	61.6	46.2	61.6	46.2	51.8	30.0	30.0	30.0
Base Capacity (vph)	347	976	423	378	986	431	311	1379	604	463	1673
Stallion 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	0.32	0.44	0.65	0.51	0.54	0.12	0.75	0.36	0.22	0.19	0.63
Intersection Summary											
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.											
Spills and Phases: 2: Liverpool Rd & Kingston Rd											
Diagram showing lane groups and phases with cycle times: 12.5 s, 36 s, 1.4 s, 36 s, 1.4 s, 36 s, 1.4 s, 36 s, 1.4 s, 36 s, 1.4 s, 36 s.											



Queues  
4: Liverpool Rd & North Dwy/Main Plaza Dwy

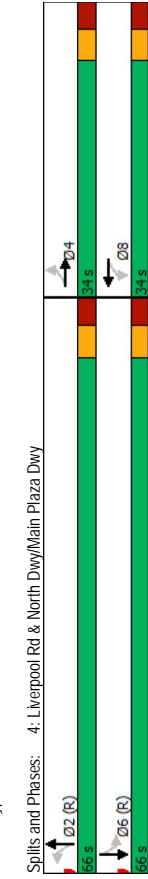
HCM Unsignalized Intersection Capacity Analysis  
3: Liverpool Rd & South Dwy

19225 | 1294 Kingston Rd  
2028 FT AM: Option 2



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	51	0	106	0	28	415	94	866
Future Volume (vph)	51	0	106	0	28	415	94	866
Lane Group Flow (vph)	55	55	115	64	30	628	102	961
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Projected Phases	4	4	8	8	2	2	6	6
Permitted Phases	4	4	8	8	2	2	6	6
Detector Phase								
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	24.9	24.9
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	0.0
Total Lost Time (s)	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9
LeadLag								
LeadLag Optimize?								
Recall Mode	None	None	None	None	C-Min	C-Min	C-Min	C-Min
v/c Ratio	0.30	0.18	0.63	0.12	0.08	0.26	0.20	0.38
Control Delay	40.8	1.3	54.6	0.4	2.8	1.9	5.4	5.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	40.8	1.3	54.6	0.4	2.8	1.9	5.4	5.1
Queue Length 50th (m)	10.2	0.0	22.4	0.0	0.8	6.4	5.7	29.3
Queue Length 95th (m)	20.6	0.0	38.5	0.0	1.3	3.3	13.2	44.5
Internal Link Dist (m)	19.8		34.1		56.6		192.1	
Turn Bay Length (m)			30.0		30.0		30.0	
Base Capacity (vph)	351	470	350	706	366	2383	522	2510
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.16	0.12	0.33	0.09	0.08	0.26	0.20	0.38

Intersection Summary  
Cycle Length: 100  
Actuated Cycle Length: 100  
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBTL, Start of Green  
Natural Cycle: 50  
Control Type: Actuated-Coordinated



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↔	↔	↔	↔	↔
Traffic Volume (veh/h)	0	31	0	606	1023	0
Future Volume (Veh/h)	0	31	0	606	1023	0
Sign Control	Stop	Free	Free	Free	Free	Free
Grade	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	34	0	659	1112	0
Pedestrians	4					
Lane Width (m)	3.2					
Walking Speed (m/s)	1.2					
Percent Blockage	0					
Right turn flare (veh)				None	TW/LTL	2
Median storage (veh)						
Upstream signal (m)				59	80	
pX, platoon unblocked	0.94	0.93	0.93			
vC, conflicting volume	1446	375	1116			
vC1, stage 1 conf vol	1116					
vC2, stage 2 conf vol	330					
vCu, unblocked vol	901	71	867			
IC, 1 stage (s)	6.8	7.1	4.1			
IC, 2 stage (s)	5.8					
IF (s)	3.5	3.4	2.2			
p0 queue free %	100	96	100			
cM capacity (veh/h)	340	887	729			
Direction, Lane #	EB.1	NB.1	NB.2	SB.1	SB.2	SB.3
Volume Total	34	330	330	371	371	371
Volume Left	0	0	0	0	0	0
Volume Right	34	0	0	0	0	0
cSH	887	1700	1700	1700	1700	1700
Volume to Capacity	0.04	0.19	0.22	0.22	0.22	0.22
Queue Length 95th (m)	1.0	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
Lane LOS	A	A	A	A	A	A
Approach Delay (s)	9.2	0.0	0.0	0.0	0.0	0.0
Approach LOS	A	A	A	A	A	A
Intersection Summary						
Average Delay			0.2			
Intersection Capacity Utilization			29.8%			
ICU Level of Service			A			
Analysis Period (min)			15			

Queues  
6: Liverpool Rd & Glenanna Rd

HCM Signalized Intersection Capacity Analysis  
4: Liverpool Rd & North Dwy/Main Plaza Dwy

2028 FT AM: Option 2

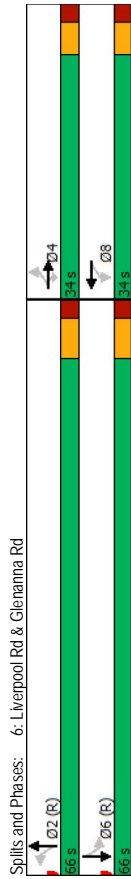
2028 FT AM: Option 2

Movement	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations	←	←	←	←	←	←	←	←	←	←
Traffic Volume (vph)	47	138	250	70	87	113	381	73	658	18
Future Volume (vph)	47	138	250	70	87	113	381	73	658	18
Ideal Flow (vphpl)	51	150	272	76	156	123	448	79	790	1900
Lane Width	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2	3.5
Total Lost time (s)	6.9	6.9	6.9	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	1.00	1.00	1.00	1.00	1.00	1.00
Frbp, ped/bikes	1.00	0.99	1.00	1.00	0.99	1.00	0.98	1.00	1.00	0.95
Frbp, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Flt Protected	0.95	1.00	0.85	1.00	0.85	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1722	1382	1705	1575	1720	3269	1663	3485		
Flt Permitted	0.72	1.00	0.72	1.00	0.28	1.00	0.41	1.00		
Satd. Flow (perm)	1297	1382	1294	1575	509	3269	724	3485		
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	55	0	55	115	0	64	30	451	177	102
RTOR Reduction (vph)	0	47	0	0	55	0	28	0	0	1
Lane Group Flow (vph)	55	8	0	115	9	0	30	600	0	102
Conf. Peds. (#/hr)	1	1	1	1	1	1	4	14	14	4
Heavy Vehicles (%)	0%	0%	14%	1%	0%	0%	4%	0%	2%	5%
Turn Type	Perm	NA	NA	Perm	NA	Perm	NA	Perm	NA	NA
Protected Phases	4			8		2		6		
Permitted Phases	4			8		2		6		
Actuated Green, G (s)	14.2	14.2	14.2	14.2	14.2	72.0	72.0	72.0	72.0	72.0
Effective Green, g (s)	14.2	14.2	14.2	14.2	14.2	72.0	72.0	72.0	72.0	72.0
Actuated g/C Ratio	0.14	0.14	0.14	0.14	0.14	0.72	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	6.9	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
Lane Grp Cap (vph)	184	196	183	223	366	2353	521	2509		
v/s Ratio Prot	0.01			0.01		0.18		0.14		
v/s Ratio Perm	0.04			0.09		0.06		0.20		
Uniform Delay, d1	38.4	37.0	40.4	37.0	42	4.8	4.6	5.4		
Progression Factor	1.00	1.00	1.00	1.00	0.42	0.36	0.81	0.78		
Incremental Delay, d2	0.9	0.1	6.6	0.1	0.4	0.3	0.8	0.4		
Delay (s)	39.4	37.1	47.0	37.1	2.2	2.0	4.5	4.6		
Level of Service	D	D	D	D	A	A	A	A		
Approach Delay (s)	38.2		43.5		2.0		4.6			
Approach LOS	D		D		A		A			
<b>Intersection Summary</b>										
HCM 2000 Control Delay	9.1									
HCM 2000 Volume to Capacity ratio	0.42									
Actuated Cycle Length (s)	100.0									
Intersection Capacity Utilization	58.6%									
Analysis Period (min)	15									
Critical Lane Group	C									

Spills and Phases: 6: Liverpool Rd & Glenanna Rd

2028 FT AM: Option 2

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations	←	←	←	←	←	←	←	←	←	←
Traffic Volume (vph)	47	138	250	70	87	113	381	73	658	18
Future Volume (vph)	47	138	250	70	87	113	381	73	658	18
Ideal Flow (vphpl)	51	150	272	76	156	123	448	79	790	1900
Lane Width	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2	3.5
Total Lost time (s)	6.9	6.9	6.9	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	1.00	1.00	1.00	1.00	1.00	1.00
Frbp, ped/bikes	1.00	0.99	1.00	1.00	0.99	1.00	0.98	1.00	1.00	0.95
Frbp, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Flt Protected	0.95	1.00	0.85	1.00	0.85	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1722	1382	1705	1575	1720	3269	1663	3485		
Flt Permitted	0.72	1.00	0.72	1.00	0.28	1.00	0.41	1.00		
Satd. Flow (perm)	1297	1382	1294	1575	509	3269	724	3485		
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	55	0	55	115	0	64	30	451	177	102
RTOR Reduction (vph)	0	47	0	0	55	0	28	0	0	1
Lane Group Flow (vph)	55	8	0	115	9	0	30	600	0	102
Conf. Peds. (#/hr)	1	1	1	1	1	1	4	14	14	4
Heavy Vehicles (%)	0%	0%	14%	1%	0%	0%	4%	0%	2%	5%
Turn Type	Perm	NA	NA	Perm	NA	Perm	NA	Perm	NA	NA
Protected Phases	4			8		2		6		
Permitted Phases	4			8		2		6		
Actuated Green, G (s)	14.2	14.2	14.2	14.2	14.2	72.0	72.0	72.0	72.0	72.0
Effective Green, g (s)	14.2	14.2	14.2	14.2	14.2	72.0	72.0	72.0	72.0	72.0
Actuated g/C Ratio	0.14	0.14	0.14	0.14	0.14	0.72	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	6.9	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
Lane Grp Cap (vph)	184	196	183	223	366	2353	521	2509		
v/s Ratio Prot	0.01			0.01		0.18		0.14		
v/s Ratio Perm	0.04			0.09		0.06		0.20		
Uniform Delay, d1	38.4	37.0	40.4	37.0	42	4.8	4.6	5.4		
Progression Factor	1.00	1.00	1.00	1.00	0.42	0.36	0.81	0.78		
Incremental Delay, d2	0.9	0.1	6.6	0.1	0.4	0.3	0.8	0.4		
Delay (s)	39.4	37.1	47.0	37.1	2.2	2.0	4.5	4.6		
Level of Service	D	D	D	D	A	A	A	A		
Approach Delay (s)	38.2		43.5		2.0		4.6			
Approach LOS	D		D		A		A			
<b>Intersection Summary</b>										
HCM 2000 Control Delay	9.1									
HCM 2000 Volume to Capacity ratio	0.42									
Actuated Cycle Length (s)	100.0									
Intersection Capacity Utilization	58.6%									
Analysis Period (min)	15									
Critical Lane Group	C									



HCM Signalized Intersection Capacity Analysis  
 6: Liverpool Rd & Glenanna Rd

19225 | 1294 Kingston Rd  
 2028 FT AM: Option 2



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	381	31	73	658	69
Future Volume (vph)	47	138	250	70	87	56	113	381	31	73	658	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	5.9	6.7	6.7	6.7	6.7	6.7	6.7
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frbp. ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00	0.99	1.00	1.00
Frbp. ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00	0.99	1.00	1.00
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)	1658	1773	1513	1675	1717	1658	3358	1639	3410	1639	3410	3410
Flt Permitted	0.55	1.00	1.00	0.57	1.00	0.35	1.00	0.49	1.00	0.49	1.00	1.00
Satd. Flow (perm)	963	1773	1513	1006	1717	605	3358	850	3410	850	3410	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	414	34	79	715	75
RTOR Reduction (vph)	0	0	185	0	28	0	0	4	0	0	5	0
Lane Group Flow (vph)	51	150	87	76	128	0	123	444	0	79	785	0
Confl. Peds. (#/hr)							11		8		8	
Heavy Vehicles (%)	4%	6%	2%	3%	3%	3%	3%	4%	14%	4%	3%	0%
Turn Type	Perm	NA	Perm	Perm	NA	NA	Perm	NA	NA	Perm	NA	NA
Protected Phases	4		4	8	8		2			6		6
Permitted Phases	4		4	8	8		2			6		6
Actuated Green, G (s)	14.0	14.0	14.0	14.0	14.0	14.0	73.4	73.4	34	73.4	73.4	73.4
Effective Green, g (s)	14.0	14.0	14.0	14.0	14.0	14.0	73.4	73.4	34	73.4	73.4	73.4
Actuated g/C Ratio	0.14	0.14	0.14	0.14	0.14	0.14	0.73	0.73	0.73	0.73	0.73	0.73
Clearance Time (s)	5.9	5.9	5.9	5.9	5.9	5.9	6.7	6.7	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	3.0	3.0	3.0
Lane Grp Cap (vph)	134	248	211	140	240	444	2464	623	2502	623	2502	2502
w/s Ratio Prot	c0.08				0.07		0.13			0.09		c0.23
w/s Ratio Perm	0.05		0.06	0.08		0.20						0.09
v/c Ratio	0.38	0.60	0.41	0.54	0.54	0.28	0.18	0.13	0.31	0.13	0.31	0.31
Uniform Delay, d1	39.1	40.4	39.2	40.0	40.0	4.4	4.1	3.9	4.6	3.9	4.6	4.6
Progression Factor	1.00	1.00	1.00	1.01	1.00	0.63	0.63	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.8	4.1	1.3	4.2	2.3	1.5	0.2	0.4	0.3	0.4	0.3	0.3
Delay (s)	40.9	44.5	40.6	44.7	42.2	4.3	2.7	4.3	4.9	4.3	4.9	4.9
Level of Service	D	D	D	D	D	A	A	A	A	A	A	A
Approach Delay (s)			41.9		43.0		3.1		4.9		4.9	
Approach LOS			D		D		A		A		A	
<b>Intersection Summary</b>												
HCM 2000 Control Delay	16.7 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	62.4% ICU Level of Service B											
Analysis Period (min)	15											
c Critical Lane Group												

The background features several thick, overlapping, curved grey lines that sweep across the page from the top and right towards the bottom left, creating a sense of motion and depth.

**Weekday PM Peak Hour**

HCM Signalized Intersection Capacity Analysis  
 1: Glenanna Rd & Kingston Rd  
 2028 FT AM: Option 2

Queues  
 1: Glenanna Rd & Kingston Rd  
 2028 FT AM: Option 2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR
Lane Configurations	10	411	92	96	590	122	52	73	64	190	102
Traffic Volume (vph)	10	411	92	96	590	122	52	73	64	190	102
Future Volume (vph)	10	411	92	96	590	122	52	73	64	190	102
Ideal Flow (vphpl)	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
Total Lost time (s)	6.4	6.4	6.4	3.0	6.4	3.0	7.0	3.0	7.0	3.0	7.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frbp, ped/bikes	1.00	1.00	0.91	1.00	1.00	0.96	1.00	1.00	0.93	1.00	0.93
Frbp, ped/bikes	0.99	1.00	1.00	0.99	1.00	1.00	0.97	1.00	1.00	0.97	1.00
Fit	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	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
Satd. Flow (prot)	1568	3305	1303	1646	3400	1464	1667	1860	1397	1641	1773
Flt Permitted	0.41	1.00	1.00	0.31	1.00	1.00	0.69	1.00	1.00	0.66	1.00
Satd. Flow (perm)	674	3305	1303	534	3400	1464	1203	1860	1397	1134	1773
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
Adj. Flow (vph)	11	447	100	104	641	133	57	79	70	207	111
RTOR Reduction (vph)	0	0	80	0	0	65	0	0	42	0	15
Lane Group Flow (vph)	11	447	20	104	641	68	57	79	28	207	111
Conf. Peds. (#/hr)	8	25	25	25	8	35	34	34	34	34	35
Heavy Vehicles (%)	9%	8%	8%	4%	5%	1%	0%	1%	3%	2%	6%
Turn Type	Perm	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm	pm-pt	NA
Permitted Phases	4	4	8	8	8	2	2	2	2	6	6
Actuated Green, G (s)	20.0	20.0	31.6	31.6	31.6	46.4	40.4	40.4	40.4	55.0	46.0
Effective Green, g (s)	20.0	20.0	31.6	31.6	31.6	46.4	40.4	40.4	40.4	55.0	46.0
Actuated g/C Ratio	0.20	0.20	0.32	0.32	0.32	0.46	0.40	0.40	0.40	0.55	0.46
Clearance Time (s)	6.4	6.4	6.4	3.0	6.4	3.0	7.0	3.0	7.0	3.0	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)	134	661	260	264	1074	462	586	751	564	682	815
v/s Ratio Prot	c0.14	0.03	c0.19	0.03	c0.19	0.01	0.04	0.01	0.04	c0.04	0.06
v/s Ratio Perm	0.02	0.02	0.09	0.05	0.05	0.04	0.02	0.02	0.02	c0.13	0.01
Uniform Delay, d1	0.08	0.68	0.08	0.39	0.60	0.15	0.10	0.11	0.05	0.30	0.14
Progression Factor	0.61	0.81	0.16	1.00	1.00	1.00	1.00	1.00	1.00	0.72	0.81
Incremental Delay, d2	0.3	2.6	0.1	1.0	0.9	0.1	0.1	0.3	0.2	0.3	0.3
Delay (s)	20.2	32.5	5.2	26.4	29.7	24.7	14.9	18.8	18.3	8.6	13.0
Level of Service	C	C	A	C	C	C	B	B	B	A	B
Approach Delay (s)	C	27.3	C	C	28.6	C	17.6	B	B	10.5	B
Approach LOS	C	C	C	C	C	C	B	B	B	B	B
Intersection Summary											
HCM 2000 Control Delay	23.9 HCM 2000 Level of Service C										
HCM 2000 Volume to Capacity ratio	0.44										
Actuated Cycle Length (s)	100.0 Sum of lost time (s) 19.4										
Intersection Capacity Utilization	54.2% ICU Level of Service A										
Analysis Period (min)	15										
C Critical Lane Group	C										

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR
Lane Configurations	10	411	92	96	590	122	52	73	64	190	102
Traffic Volume (vph)	10	411	92	96	590	122	52	73	64	190	102
Future Volume (vph)	10	411	92	96	590	122	52	73	64	190	102
Lane Group Flow (vph)	11	447	100	104	641	133	57	79	70	207	111
Turn Type	Perm	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm	pm-pt	NA
Permitted Phases	4	4	4	4	8	8	2	2	2	6	6
Detector Phase	4	4	4	4	8	8	2	2	2	6	6
Switch Phase	4	4	4	4	8	8	2	2	2	6	6
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	24.4	8.0	24.4	24.4	8.0	25.4	25.4	8.0	25.4
Total Split (s)	39.0	39.0	39.0	9.0	48.0	48.0	9.0	43.0	43.0	9.0	43.0
Total Split (%)	39.0%	39.0%	39.0%	9.0%	48.0%	48.0%	9.0%	43.0%	43.0%	9.0%	43.0%
Yellow Time (s)	4.2	4.2	4.2	3.0	4.2	4.2	3.0	3.3	3.3	3.0	3.3
All-Red Time (s)	2.2	2.2	2.2	0.0	2.2	2.2	0.0	3.7	3.7	0.0	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	6.4	3.0	6.4	3.0	7.0	3.0	7.0	3.0	7.0
Lead/Lag	Lag	Lag	Lag	Lead	Lead	Lead	Lag	Lag	Lag	Lead	Lag
Lead/Lag Optimize?	None	None	None	None	None	None	None	None	None	None	None
Recall Mode	0.08	0.68	0.29	0.35	0.61	0.26	0.09	0.10	0.11	0.28	0.13
v/s Ratio	20.3	34.9	2.8	24.2	31.0	8.8	11.7	23.3	2.8	9.0	15.7
Control Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Queue Delay	20.3	34.9	2.8	24.2	31.0	8.8	11.7	23.3	2.8	9.0	15.7
Total Delay	1.0	23.4	0.2	14.5	57.2	5.4	4.6	9.8	0.0	10.6	17.2
Queue Length 50th (m)	m2.4	24.7	0.1	23.2	65.6	16.5	12.5	24.7	5.4	26.0	32.5
Queue Length 95th (m)	393.2			523.9			174.6			416.6	
Internal Link Dist (m)	42.6	60.4	33.0	23.2	25.4	25.4	25.0	27.3	25.0	27.3	16.5
Turn Bay Length (m)	219	1077	498	293	1414	664	654	802	660	728	843
Base Capacity (vph)	0	0	0	0	0	0	0	0	0	0	0
Stallion Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillover 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	0.42	0.20	0.35	0.45	0.20	0.09	0.10	0.11	0.28	0.13
Intersection Summary											
Cycle Length: 100											
Actuated Cycle Length: 100											
Offset: 0 (0%), Referenced to phase 2:NBL and 6:SBLT, Start of Green											
Natural Cycle: 70											
Control Type: Actuated-Coordinated											
m Volume for 95th percentile queue is metered by upstream signal.											

HCM Signalized Intersection Capacity Analysis  
 2: Liverpool Rd & Kingston Rd  
 19225 | 1294 Kingston Rd  
 2028 FT AM: Option 2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR
Lane Configurations	←	←	←	←	←	←	←	←	←	←	←
Traffic Volume (vph)	102	394	254	178	493	49	215	455	122	83	867
Future Volume (vph)	102	394	254	178	493	49	215	455	122	83	867
Ideal Flow (vphpl)	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	3.5	3.2	3.5	3.2	3.5
Total Lost time (s)	3.0	7.0	3.0	3.0	7.0	3.0	6.9	6.9	3.0	6.9	3.2
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
Frbp, ped/bikes	1.00	1.00	0.96	1.00	1.00	0.96	1.00	1.00	0.95	1.00	0.99
Frbp, ped/bikes	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98
Flt	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	1329	1675	4912
Flt Permitted	0.34	1.00	1.00	0.40	1.00	1.00	0.16	1.00	1.00	0.47	1.00
Satd. Flow (perm)	596	3368	1462	682	3400	1487	287	3500	1329	830	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
Adj. Flow (vph)	111	428	276	193	536	53	234	495	133	90	942
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	14
Lane Group Flow (vph)	111	428	276	193	536	53	234	495	52	90	1041
Conf. Peds. (#/hr)	15	19	9	15	25	15	22	25	25	25	22
Heavy Vehicles (%)	4%	6%	1%	5%	5%	0%	2%	2%	10%	2%	4%
Turn Type	pm-pt	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm	pm-pt	NA
Permitted Phases	7	4	4	3	8	8	2	5	2	1	6
Actuated Green, G (s)	32.7	23.4	23.4	35.3	24.7	24.7	49.1	39.4	39.4	41.0	34.3
Effective Green, g (s)	32.7	23.4	23.4	35.3	24.7	24.7	49.1	39.4	39.4	41.0	34.3
Actuated g/C Ratio	0.33	0.23	0.23	0.35	0.25	0.25	0.49	0.39	0.39	0.41	0.34
Clearance Time (s)	3.0	7.0	3.0	3.0	7.0	3.0	6.9	6.9	3.0	6.9	3.0
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)	293	788	342	342	839	367	306	1379	523	396	1684
v/s Ratio Prot	0.04	0.13	0.06	0.16	0.16	0.09	0.14	0.09	0.14	0.02	0.21
v/s Ratio Perm	0.09	0.19	0.14	0.14	0.04	0.28	0.04	0.28	0.04	0.08	0.08
Uniform Delay, d1	0.38	0.54	0.81	0.56	0.64	0.14	0.76	0.36	0.10	0.23	0.62
Progression Factor	1.00	1.00	1.00	2.36	1.84	1.93	1.00	1.00	1.00	0.79	0.79
Incremental Delay, d2	0.8	2.7	18.2	2.0	3.5	0.8	10.8	0.7	0.4	0.3	1.6
Delay (s)	25.3	36.3	54.4	58.5	65.3	57.7	27.9	22.1	19.5	14.7	23.2
Level of Service	C	D	D	E	E	E	C	C	B	B	C
Approach Delay (s)	40.9			63.1			23.3				22.5
Approach LOS	D			E			C				C
Intersection Summary											
HCM 2000 Control Delay	35.7 HCM 2000 Level of Service										
HCM 2000 Volume to Capacity ratio	0.77										
Actuated Cycle Length (s)	100.0										
Intersection Capacity Utilization	74.3%										
Analysis Period (min)	15										
c Critical Lane Group											

Queues  
 2: Liverpool Rd & Kingston Rd  
 19225 | 1294 Kingston Rd  
 2028 FT AM: Option 2

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR
Lane Configurations	←	←	←	←	←	←	←	←	←	←	←
Traffic Volume (vph)	102	394	254	178	493	49	215	455	122	83	867
Future Volume (vph)	102	394	254	178	493	49	215	455	122	83	867
Lane Group Flow (vph)	111	428	276	193	536	53	234	495	133	90	1055
Turn Type	pm-pt	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm	pm-pt	NA
Projected Phases	7	4	4	3	8	8	2	5	2	1	6
Permitted Phases	4	4	4	3	8	8	2	2	2	1	6
Switch Phase	7	4	4	3	8	8	2	2	2	1	6
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	None	None	C-Min	None	None	None	None	None	Max
v/c Ratio	0.35	0.53	0.79	0.52	0.62	0.14	0.75	0.36	0.22	0.20	0.63
Control Delay	20.2	35.0	51.7	48.8	63.3	54.2	34.2	24.4	5.6	11.9	23.8
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	20.2	35.0	51.7	48.8	63.3	54.2	34.2	24.4	5.6	11.9	23.8
Queue Length 50th (m)	13.6	39.6	52.4	39.1	61.0	0.0	25.9	39.0	0.0	6.6	66.4
Queue Length 95th (m)	23.0	52.1	78.5	59.9	78.5	24.0	73.0	58.1	13.3	13.5	54.5
Internal Link Dist (m)	667.5										
Turn Bay Length (m)	33.5	49.1	103.2	61.6	46.2	61.6	46.2	51.8	30.0	30.0	30.0
Base Capacity (vph)	347	976	423	378	986	431	311	1379	604	463	1673
Stallion Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillover 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	0.32	0.44	0.65	0.51	0.54	0.12	0.75	0.36	0.22	0.19	0.63
Intersection Summary											
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.											
Spills and Phases: 2: Liverpool Rd & Kingston Rd											
Diagram showing lane groups and phases with cycle times: 12.5 s, 36 s, 1.4 s, 36 s, 1.4 s, 36 s, 1.4 s, 36 s, 1.4 s, 36 s, 1.4 s, 36 s.											

Queues  
4: Liverpool Rd & North Dwy/Main Plaza Dwy

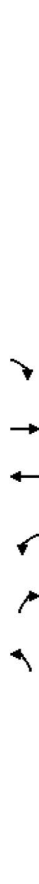
HCM Unsignalized Intersection Capacity Analysis  
3: Liverpool Rd & South Dwy

19225 | 1294 Kingston Rd  
2028 FT AM: Option 2



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	51	0	106	0	28	415	94	866
Future Volume (vph)	51	0	106	0	28	415	94	866
Lane Group Flow (vph)	55	55	115	64	30	628	102	961
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Projected Phases	4	4	8	8	2	2	6	6
Permitted Phases	4	4	8	8	2	2	6	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	24.9	24.9
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	0.0
Total Lost Time (s)	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9
LeadLag								
LeadLag Optimize?								
Recall Mode	None	None	None	None	C-Min	C-Min	C-Min	C-Min
v/c Ratio	0.30	0.18	0.63	0.12	0.08	0.26	0.20	0.38
Control Delay	40.8	1.3	54.6	0.4	2.8	1.9	5.4	5.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	40.8	1.3	54.6	0.4	2.8	1.9	5.4	5.1
Queue Length 50th (m)	10.2	0.0	22.4	0.0	0.8	6.4	5.7	29.3
Queue Length 95th (m)	20.6	0.0	38.5	0.0	1.3	3.3	13.2	44.5
Internal Link Dist (m)	19.8		34.1		56.6		192.1	
Turn Bay Length (m)			30.0		30.0		30.0	
Base Capacity (vph)	351	470	350	706	366	2383	522	2510
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.16	0.12	0.33	0.09	0.08	0.26	0.20	0.38

Intersection Summary  
Cycle Length: 100  
Actuated Cycle Length: 100  
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBTL, Start of Green  
Natural Cycle: 50  
Control Type: Actuated-Coordinated



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔
Traffic Volume (veh/h)	0	31	0	606	1023	0
Future Volume (Veh/h)	0	31	0	606	1023	0
Sign Control	Stop	Free	Free	Free	Free	Free
Grade	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	34	0	659	1112	0
Pedestrians	4					
Lane Width (m)	3.2					
Walking Speed (m/s)	1.2					
Percent Blockage	0					
Right turn flare (veh)				None	TWLT	2
Median storage (veh)						
Upstream signal (m)				59	80	
pX, platoon unblocked	0.94	0.93	0.93			
vC, conflicting volume	1446	375	1116			
vC1, stage 1 conf vol	1116					
vC2, stage 2 conf vol	330					
vCu, unblocked vol	901	71	867			
IC, single (s)	6.8	7.1	4.1			
IC, 2 stage (s)	5.8					
IF (s)	3.5	3.4	2.2			
p0 queue free %	100	96	100			
cM capacity (veh/h)	340	887	729			
Direction, Lane #	EB.1	NB.1	NB.2	SB.1	SB.2	SB.3
Volume Total	34	330	330	371	371	371
Volume Left	0	0	0	0	0	0
Volume Right	34	0	0	0	0	0
cSH	887	1700	1700	1700	1700	1700
Volume to Capacity	0.04	0.19	0.22	0.22	0.22	0.22
Queue Length 95th (m)	1.0	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
Lane LOS	A	A	A	A	A	A
Approach Delay (s)	9.2	0.0	0.0	0.0	0.0	0.0
Approach LOS	A	A	A	A	A	A
Intersection Summary						
Average Delay			0.2			
Intersection Capacity Utilization			29.8%			
ICU Level of Service			A			
Analysis Period (min)			15			

Intersection Summary  
Average Delay  
Intersection Capacity Utilization  
Analysis Period (min)



Queues  
6: Liverpool Rd & Glenanna Rd

HCM Signalized Intersection Capacity Analysis  
4: Liverpool Rd & North Dwy/Main Plaza Dwy

19225 | 1294 Kingston Rd  
2028 FT AM: Option 2



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	51	0	51	106	0	59	28	415	163	94	866	18
Future Volume (vph)	51	0	51	106	0	59	28	415	163	94	866	18
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	6.9	6.9	6.9	6.9	6.9
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frbp, ped/bikes	1.00	0.99	1.00	1.00	0.99	1.00	1.00	0.98	1.00	1.00	0.98	1.00
Frbp, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Flt Protected	0.95	1.00	0.95	1.00	0.85	1.00	0.95	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1722	1382	1705	1575	1720	3269	1663	3485				
Flt Permitted	0.72	1.00	0.72	1.00	0.28	1.00	0.41	1.00				
Satd. Flow (perm)	1297	1382	1294	1575	509	3269	724	3485				
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)	55	0	55	115	0	64	30	451	177	102	941	20
RTOR Reduction (vph)	0	47	0	0	55	0	28	0	0	0	1	0
Lane Group Flow (vph)	55	8	0	115	9	0	30	600	0	102	960	0
Conf. Peds. (#/hr)	1	1	1	1	1	1	4	14	14	14	4	4
Heavy Vehicles (%)	0%	0%	14%	1%	0%	0%	0%	4%	0%	2%	2%	5%
Turn Type	Perm	NA	NA	Perm	NA	NA	Perm	NA	NA	Perm	NA	NA
Protected Phases	4			8			2			6		
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	14.2	14.2	14.2	14.2	14.2	72.0	72.0	72.0	72.0	72.0	72.0	72.0
Effective Green, g (s)	14.2	14.2	14.2	14.2	14.2	72.0	72.0	72.0	72.0	72.0	72.0	72.0
Actuated g/C Ratio	0.14	0.14	0.14	0.14	0.14	0.72	0.72	0.72	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	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	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	184	196	183	223	366	2353	521	2509				
v/s Ratio Prot	0.01			0.01			0.18					
v/s Ratio Perm	0.04			0.09			0.06					
v/c Ratio	0.30	0.04	0.63	0.04	0.08	0.25	0.20	0.38				
Uniform Delay, d1	38.4	37.0	40.4	37.0	4.2	4.8	4.6	5.4				
Progression Factor	1.00	1.00	1.00	1.00	0.42	0.36	0.81	0.78				
Incremental Delay, d2	0.9	0.1	6.6	0.1	0.4	0.3	0.8	0.4				
Delay (s)	39.4	37.1	47.0	37.1	2.2	2.0	4.5	4.6				
Level of Service	D	D	D	D	D	A	A	A				
Approach Delay (s)					43.5		2.0					
Approach LOS					D		A					
<b>Intersection Summary</b>												
HCM 2000 Control Delay	9.1											A
HCM 2000 Volume to Capacity ratio	0.42											
Actuated Cycle Length (s)	100.0											13.8
Intersection Capacity Utilization	58.6%											B
Analysis Period (min)	15											
c Critical Lane Group												

Queues  
6: Liverpool Rd & Glenanna Rd

HCM Signalized Intersection Capacity Analysis  
4: Liverpool Rd & North Dwy/Main Plaza Dwy

19225 | 1294 Kingston Rd  
2028 FT AM: Option 2



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	47	138	250	70	87	113	381	73	381	73	658	
Future Volume (vph)	47	138	250	70	87	113	381	73	381	73	658	
Ideal Flow (vphpl)	51	150	272	76	156	123	448	79	790			
Lane Type	Perm	Perm	Perm	Perm	Perm	Perm	Perm	Perm	Perm	Perm	Perm	Perm
Protected Phases	4			8			2			6		
Permitted Phases	4			8			2			6		
Switch Phase	4			8			2			6		
Minimum Initial (s)	8.0	8.0	8.0	5.0	5.0	5.0	5.0	8.0	8.0	8.0	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	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	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%	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	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	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	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	6.7	6.7	6.7
Lead/Lag												
Lead/Lag Optimize?												
Recall Mode	None	None	None	None	None	None	None	None	None	None	None	None
v/c Ratio	0.38	0.60	0.69	0.54	0.58	0.28	0.18	0.13	0.32			
Control Delay	45.5	49.9	19.1	53.4	39.6	5.1	2.9	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	19.1	53.4	39.6	5.1	2.9	5.3	5.3			
Queue Length 50th (m)	9.6	29.2	10.6	15.1	25.0	3.8	6.6	4.0	23.7			
Queue Length 95th (m)	20.1	46.4	35.2	28.7	42.7	12.2	16.4	10.9	41.1			
Internal Link Dist (m)						416.6			478.0			
Turn Bay Length (m)	22.0			24.3		24.4			46.2			
Base Capacity (vph)	270	498	579	282	505	444	2468	623	2507			
Stallion 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			
<b>Intersection Summary</b>												
Cycle Length: 100												
Actuated Cycle Length: 100												
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBTL, Start of Green												
Natural Cycle: 55												
Control Type: Actuated-Coordinated												



Spills and Phases:	6: Liverpool Rd & Glenanna Rd
D2 (R)	34.5
D6 (R)	34.5



HCM Signalized Intersection Capacity Analysis  
 6: Liverpool Rd & Glenanna Rd

19225 | 1294 Kingston Rd  
 2028 FT AM: Option 2



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	381	31	73	658	69
Future Volume (vph)	47	138	250	70	87	56	113	381	31	73	658	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	5.9	6.7	6.7	6.7	6.7	6.7	6.7
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frbp. ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00	0.99	1.00	1.00
Frbp. ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00	0.99	1.00	1.00
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)	1658	1773	1513	1675	1717	1658	3358	1639	3410	1639	3410	1639
Flt Permitted	0.55	1.00	1.00	0.57	1.00	0.35	1.00	0.49	1.00	0.49	1.00	0.49
Satd. Flow (perm)	963	1773	1513	1006	1717	605	3358	850	3410	850	3410	850
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	414	34	79	715	75
RTOR Reduction (vph)	0	0	185	0	28	0	0	4	0	0	5	0
Lane Group Flow (vph)	51	150	87	76	128	0	123	444	0	79	785	0
Confl. Peds. (#/hr)							11		8		8	
Heavy Vehicles (%)	4%	6%	2%	3%	3%	3%	3%	4%	14%	4%	3%	0%
Turn Type	Perm	NA	Perm	Perm	NA	NA	Perm	NA	NA	Perm	NA	NA
Protected Phases	4		4	8	8		2		2		6	
Permitted Phases	4		4	8	8		2		2		6	
Actuated Green, G (s)	14.0	14.0	14.0	14.0	14.0	14.0	73.4	73.4	34	79	715	73.4
Effective Green, g (s)	14.0	14.0	14.0	14.0	14.0	14.0	73.4	73.4	34	79	715	73.4
Actuated g/C Ratio	0.14	0.14	0.14	0.14	0.14	0.14	0.73	0.73	0.73	0.73	0.73	0.73
Clearance Time (s)	5.9	5.9	5.9	5.9	5.9	5.9	6.7	6.7	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	3.0	3.0	3.0
Lane Grp Cap (vph)	134	248	211	140	240	240	444	2464	623	2502	623	2502
w/s Ratio Prot	c0.08				0.07		0.13				c0.23	
w/s Ratio Perm	0.05		0.06	0.08		0.20			0.09			
v/c Ratio	0.38	0.60	0.41	0.54	0.54	0.28	0.18	0.13	0.31	0.13	0.31	0.31
Uniform Delay, d1	39.1	40.4	39.2	40.0	40.0	4.4	4.1	3.9	4.6	3.9	4.6	4.6
Progression Factor	1.00	1.00	1.00	1.01	1.00	0.63	0.63	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.8	4.1	1.3	4.2	2.3	1.5	0.2	0.4	0.3	0.4	0.3	0.3
Delay (s)	40.9	44.5	40.6	44.7	42.2	4.3	2.7	4.3	4.9	4.3	4.9	4.9
Level of Service	D	D	D	D	D	A	A	A	A	A	A	A
Approach Delay (s)		41.9			43.0		3.1		4.9			
Approach LOS		D			D		A		A			
<b>Intersection Summary</b>												
HCM 2000 Control Delay	16.7 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	62.4% ICU Level of Service B											
Analysis Period (min)	15											
c Critical Lane Group												



## **Future Total Traffic - Option 3**



**Weekday AM Peak Hour**

HCM Signalized Intersection Capacity Analysis  
 1: Glenanna Rd & Kingston Rd  
 2028 FT AM: Option 3

Queues  
 1: Glenanna Rd & Kingston Rd  
 2028 FT AM: Option 3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	10	413	92	96	590	122	52	73	64	190	102	26
Traffic Volume (vph)	10	413	92	96	590	122	52	73	64	190	102	26
Future Volume (vph)	10	413	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	6.4	3.0	6.4	3.0	7.0	3.0	7.0	3.0	7.0	7.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frbp. ped/bikes	1.00	1.00	0.91	1.00	1.00	0.96	1.00	1.00	0.93	1.00	1.00	0.93
Frbp. ped/bikes	0.99	1.00	1.00	0.99	1.00	1.00	0.97	1.00	1.00	0.97	1.00	0.97
Fit	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	0.95
Satd. Flow (prot)	1568	3305	1303	1646	3400	1464	1667	1860	1397	1641	1773	1436
Flt Permitted	0.41	1.00	1.00	0.31	1.00	1.00	0.69	1.00	1.00	0.66	1.00	1.00
Satd. Flow (perm)	674	3305	1303	533	3400	1464	1203	1860	1397	1134	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	449	100	104	641	133	57	79	70	207	111	28
RTOR Reduction (vph)	0	0	80	0	0	65	0	0	42	0	0	15
Lane Group Flow (vph)	11	449	20	104	641	68	57	79	28	207	111	13
Conf. Peds. (#/hr)	8	25	25	25	8	35	34	34	34	34	34	35
Heavy Vehicles (%)	9%	8%	8%	4%	5%	1%	0%	1%	3%	2%	6%	0%
Turn Type	Perm	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm
Permitted Phases	4	4	8	8	8	5	2	2	2	6	6	6
Actuated Green, G (s)	20.1	20.1	31.7	31.7	31.7	46.3	40.3	40.3	40.3	54.9	45.9	45.9
Effective Green, g (s)	20.1	20.1	31.7	31.7	31.7	46.3	40.3	40.3	40.3	54.9	45.9	45.9
Actuated g/C Ratio	0.20	0.20	0.32	0.32	0.32	0.46	0.40	0.40	0.40	0.55	0.46	0.46
Clearance Time (s)	6.4	6.4	6.4	3.0	6.4	3.0	7.0	3.0	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	3.0
Lane Grp Cap (vph)	135	664	261	264	1077	464	584	749	562	681	813	659
v/s Ratio Prot	c0.14	0.02	0.03	c0.19	0.05	0.04	0.01	0.04	0.02	c0.04	0.06	0.06
v/s Ratio Perm	0.08	0.68	0.08	0.39	0.60	0.15	0.10	0.11	0.05	0.30	0.14	0.02
Uniform Delay, d1	32.5	36.9	32.4	25.3	28.7	24.5	14.9	18.6	18.2	11.7	15.6	14.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.62	0.76
Incremental Delay, d2	0.3	2.7	0.1	1.0	0.9	0.1	0.1	0.3	0.2	0.3	0.3	0.1
Delay (s)	32.7	39.7	32.5	26.3	29.6	24.6	15.0	18.9	18.4	7.5	12.3	14.8
Level of Service	C	D	C	C	C	C	B	B	B	A	B	B
Approach Delay (s)	38.3			28.5			17.6			9.6		
Approach LOS	D			C			B			A		
Intersection Summary												
HCM 2000 Control Delay	26.8 HCM 2000 Level of Service C											
HCM 2000 Volume to Capacity ratio	0.44											
Actuated Cycle Length (s)	100.0 Sum of lost time (s) 19.4											
Intersection Capacity Utilization	54.2% ICU Level of Service A											
Analysis Period (min)	15											
C Critical Lane Group												

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	10	413	92	96	590	122	52	73	64	190	102	26
Traffic Volume (vph)	10	413	92	96	590	122	52	73	64	190	102	26
Future Volume (vph)	10	413	92	96	590	122	52	73	64	190	102	26
Lane Group Flow (vph)	11	449	100	104	641	133	57	79	70	207	111	28
Turn Type	Perm	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm
Permitted Phases	4	4	4	4	4	4	4	4	4	4	4	4
Detector Phase	4	4	4	4	4	4	4	4	4	4	4	4
Switch Phase	4	4	4	4	4	4	4	4	4	4	4	4
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)	24.4	24.4	24.4	8.0	24.4	8.0	25.4	25.4	25.4	8.0	25.4	25.4
Total Split (s)	39.0	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%	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	4.2	3.0	4.2	3.0	3.3	3.3	3.3	3.0	3.3	3.3
All-Red Time (s)	2.2	2.2	2.2	0.0	2.2	0.0	2.2	0.0	2.2	0.0	2.2	0.0
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	0.0
Total Lost Time (s)	6.4	6.4	6.4	3.0	6.4	3.0	7.0	3.0	7.0	3.0	7.0	7.0
Lead/Lag	Lag	Lag	Lag	Lead	Lead	Lead	Lag	Lag	Lag	Lead	Lag	Lag
Lead/Lag Optimize?	None	None	None	None	None	None	None	None	None	None	None	None
Recall Mode	0.08	0.68	0.29	0.35	0.61	0.26	0.09	0.10	0.11	0.28	0.13	0.04
v/s Ratio	32.4	42.3	7.6	24.2	31.0	8.8	11.7	23.4	2.9	8.0	14.8	1.6
Control 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
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	32.4	42.3	7.6	24.2	31.0	8.8	11.7	23.4	2.9	8.0	14.8	1.6
Queue Length 50th (m)	1.9	45.6	0.0	14.4	57.1	5.4	4.7	9.8	0.0	9.1	16.4	0.2
Queue Length 95th (m)	6.6	58.4	11.4	23.1	65.5	16.5	12.6	24.8	5.5	20.7	31.8	2.3
Internal Link Dist (m)	393.2 174.6											
Turn Bay Length (m)	42.6	60.4	33.0	23.2	25.4	25.4	25.4	25.4	25.0	27.3	416.6	16.5
Base Capacity (vph)	219	1077	498	293	1414	664	653	802	660	728	843	737
Stallion 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	0.05	0.42	0.20	0.35	0.45	0.20	0.09	0.10	0.11	0.28	0.13	0.04
Intersection Summary												
Cycle Length: 100												
Actuated Cycle Length: 100												
Offset: 0 (0%), Referenced to phase 2:NBL and 6:SBTL, Start of Green												
Natural Cycle: 70												
Control Type: Actuated-Coordinated												

HCM Signalized Intersection Capacity Analysis  
 2: Liverpool Rd & Kingston Rd  
 19225 | 1294 Kingston Rd  
 2028 FT AM: Option 3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR
Lane Configurations	→	→	→	←	←	←	←	←	←	←	←
Traffic Volume (vph)	101	394	254	178	493	49	215	461	122	85	871
Future Volume (vph)	101	394	254	178	493	49	215	461	122	85	871
Ideal Flow (vphpl)	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	3.5	3.2	3.5	3.2	3.5
Total Lost time (s)	3.0	7.0	3.0	7.0	3.0	7.0	3.0	7.0	3.0	7.0	3.0
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
Frbp. ped/bikes	1.00	1.00	1.00	1.00	1.00	0.96	1.00	1.00	0.94	1.00	0.99
Frbp. ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99
Fit	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	1451	1638	3400	1478	1691	3500	1315	1672	4906
Flt Permitted	0.30	1.00	1.00	0.40	1.00	1.00	0.76	1.00	1.00	0.47	1.00
Satd. Flow (perm)	514	3368	1451	685	3400	1478	283	3500	1315	824	4906
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
Adj. Flow (vph)	110	428	276	193	536	53	234	501	133	92	947
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	75	0
Lane Group Flow (vph)	110	428	276	193	536	53	234	501	58	92	1052
Conf. Peds. (#/hr)	15	19	9	15	22	15	22	25	25	25	22
Heavy Vehicles (%)	4%	6%	1%	5%	5%	0%	2%	2%	10%	2%	4%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA
Permitted Phases	7	4	4	3	8	8	5	2	2	1	6
Actuated Green, G (s)	40.9	30.3	30.3	40.7	30.2	30.2	66.3	54.5	54.5	53.2	44.4
Effective Green, g (s)	40.9	30.3	30.3	40.7	30.2	30.2	66.3	54.5	54.5	53.2	44.4
Actuated g/C Ratio	0.33	0.24	0.24	0.33	0.24	0.24	0.53	0.44	0.44	0.43	0.36
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)	266	822	354	305	828	359	365	1538	577	413	1756
v/s Ratio Prot	0.04	0.13	c0.05	0.16	c0.10	0.14	c0.10	0.14	0.02	0.02	0.21
v/s Ratio Perm	0.10	c0.19	0.15	0.04	c0.24	0.04	c0.24	0.04	0.04	0.08	0.08
Uniform Delay, d1	0.41	0.52	0.78	0.63	0.65	0.15	0.64	0.33	0.10	0.22	0.60
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.0	2.4	15.6	4.2	3.9	0.9	3.8	0.6	0.4	0.3	1.5
Delay (s)	31.4	42.9	59.3	36.5	46.0	37.7	22.1	23.3	20.7	21.7	34.0
Level of Service	C	D	E	D	D	D	C	C	C	C	C
Approach Delay (s)	46.9	D	D	43.1	D	D	22.6	C	C	33.1	C
Approach LOS	D	D	D	D	D	D	C	C	C	C	C
Intersection Summary											
HCM 2000 Control Delay	35.8 HCM 2000 Level of Service D										
HCM 2000 Volume to Capacity ratio	0.70										
Actuated Cycle Length (s)	124.0 Sum of lost time (s)										
Intersection Capacity Utilization	74.4% ICU Level of Service D										
Analysis Period (min)	15										
c Critical Lane Group											

Queues  
 2: Liverpool Rd & Kingston Rd  
 19225 | 1294 Kingston Rd  
 2028 FT AM: Option 3

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR
Lane Configurations	→	→	→	←	←	←	←	←	←	←	←
Traffic Volume (vph)	101	394	254	178	493	49	215	461	122	85	871
Future Volume (vph)	101	394	254	178	493	49	215	461	122	85	871
Lane Group Flow (vph)	110	428	276	193	536	53	234	501	133	92	1062
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA
Projected Phases	7	4	4	3	8	8	5	2	2	1	6
Permitted Phases	4	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)	16.0	55.0	55.0	13.5	55.0	55.0	16.0	45.0	45.0	8.0	37.0
Total Split (%)	12.9%	44.4%	44.4%	10.9%	44.4%	44.4%	12.9%	36.3%	36.3%	6.5%	29.8%
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	None	None	C-Min	None	None	Max	None	Max	None
v/c Ratio	0.39	0.52	0.78	0.59	0.65	0.15	0.62	0.33	0.20	0.21	0.60
Control Delay	27.5	41.9	58.1	33.8	45.4	35.7	24.4	25.3	5.5	16.3	35.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5
Total Delay	27.5	41.9	58.1	33.8	45.4	35.7	24.4	25.3	5.5	16.3	36.1
Queue Length 50th (m)	18.4	50.2	66.5	34.1	65.6	10.8	28.9	43.2	0.0	10.3	79.5
Queue Length 95th (m)	27.4	59.4	88.8	45.7	77.4	20.3	58.8	69.2	14.4	22.7	115.7
Internal Link Dist (m)	667.5 393.2 242.2										
Turn Bay Length (m)	33.5	49.1	103.2	61.6	46.2	51.8	30.0	30.0	30.0	30.0	116.1
Base Capacity (vph)	314	1371	590	326	1316	572	375	1537	652	435	1765
Stallion Cap Reductn	0	0	0	0	0	0	0	0	0	0	287
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	0.35	0.31	0.47	0.59	0.41	0.09	0.62	0.33	0.20	0.21	0.72
Intersection Summary											
Cycle Length: 124											
Offset: 13 (10%), 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.											
Spills and Phases: 2: Liverpool Rd & Kingston Rd											

HCM Signalized Intersection Capacity Analysis  
 4: Liverpool Rd & North Dwy/Main Plaza Dwy

19225 | 1294 Kingston Rd  
 2028 FT AM: Option 3



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	50	0	90	106	0	59	33	415	163	94	866	20
Traffic Volume (vph)	50	0	90	106	0	59	33	415	163	94	866	20
Future Volume (vph)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Ideal Flow (vphpl)	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2
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	6.9	6.9	6.9	6.9	6.9
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frbp. ped/bikes	1.00	0.99	1.00	1.00	0.99	1.00	0.98	1.00	0.98	1.00	1.00	1.00
Frbp. ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Flt	0.95	1.00	0.85	1.00	0.85	1.00	0.95	1.00	0.95	1.00	1.00	1.00
Flt Protected	1722	1302	1705	1575	1720	3269	1663	3483				
Satd. Flow (prot)	0.72	1.00	0.69	1.00	0.28	1.00	0.41	1.00				
Flt Permitted	1297	1302	1245	1575	507	3269	724	3483				
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)	54	0	98	115	0	64	36	451	177	102	941	22
RTOR Reduction (vph)	0	84	0	55	0	0	29	0	0	0	1	0
Lane Group Flow (vph)	54	14	0	115	9	0	36	599	0	102	962	0
Conf. Peds. (#/hr)	1	1	1	1	1	1	4	14	14	14	14	4
Heavy Vehicles (%)	0%	0%	21%	1%	0%	0%	0%	4%	0%	2%	2%	5%
Turn Type	Perm	NA	NA	Perm	NA	NA	Perm	NA	NA	Perm	NA	NA
Protected Phases	4			8			2			6		
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	14.5	14.5	14.5	14.5	14.5	14.5	71.7	71.7	71.7	71.7	71.7	71.7
Effective Green, g (s)	14.5	14.5	14.5	14.5	14.5	14.5	71.7	71.7	71.7	71.7	71.7	71.7
Actuated g/C Ratio	0.14	0.14	0.14	0.14	0.14	0.14	0.72	0.72	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	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	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	188	188	180	228	363	2343	519	2497				
v/s Ratio Prot	0.01			0.01			0.18			0.28		
v/s Ratio Perm	0.04			0.09			0.07			0.14		
Uniform Delay, d1	0.29	0.08	0.64	0.04	0.10	0.26	0.20	0.39		0.20		
Progression Factor	38.1	37.0	40.3	36.8	4.3	4.9	4.7	5.5		4.7		
Incremental Delay, d2	0.8	0.2	7.2	0.1	0.5	0.3	0.8	0.4		0.8		
Delay (s)	39.0	37.1	47.5	36.8	4.9	5.2	4.6	4.7		4.6		
Level of Service	D	D	D	D	D	D	A	A		A		
Approach Delay (s)	37.8		43.7		5.2		4.7			4.7		
Approach LOS	D		D		A		A			A		
Intersection Summary												
HCM 2000 Control Delay	10.7 HCM 2000 Level of Service B											
HCM 2000 Volume to Capacity ratio	0.43											
Actuated Cycle Length (s)	100.0 Sum of lost time (s) 13.8											
Intersection Capacity Utilization	58.6% ICU Level of Service B											
Analysis Period (min)	15											
Critical Lane Group	c Critical Lane Group											

Queues  
 4: Liverpool Rd & North Dwy/Main Plaza Dwy



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	50	0	90	106	0	59	33	415	163	94	866	20
Traffic Volume (vph)	50	0	90	106	0	59	33	415	163	94	866	20
Future Volume (vph)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Group Flow (vph)	54	98	115	64	36	628	102	962				
Turn Type	Perm	NA	NA	Perm	NA	NA	Perm	NA	NA	Perm	NA	NA
Protected Phases	4			8			2			6		
Permitted Phases	4			8			2			6		
Switch Phase	4			8			2			6		
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)	24.9	24.9	24.9	24.9	24.9	24.9	24.9	24.9	24.9	24.9	24.9	24.9
Total Split (s)	34.0	34.0	34.0	34.0	34.0	34.0	34.0	34.0	34.0	34.0	34.0	34.0
Total Split (%)	34.0%	34.0%	34.0%	34.0%	34.0%	34.0%	34.0%	34.0%	34.0%	34.0%	34.0%	34.0%
Yellow Time (s)	3.7	3.7	3.7	3.7	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	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	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	6.9	6.9	6.9	6.9	6.9
Lead/Lag												
Lead/Lag Optimize?												
Recall Mode	None	None	None	None	None	None	None	None	None	None	None	None
v/c Ratio	0.29	0.33	0.64	0.12	0.10	0.26	0.20	0.39		0.20		
Control Delay	40.1	5.7	55.2	0.4	6.3	4.8	5.6	5.2		5.6		
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0		
Total Delay	40.1	5.7	55.2	0.4	6.3	4.8	5.6	5.2		5.6		
Queue Length 50th (m)	10.0	0.0	22.4	0.0	1.9	16.4	5.8	29.6		5.8		
Queue Length 95th (m)	20.3	7.6	38.5	0.0	6.6	29.5	13.3	45.3		13.3		
Internal Link Dist (m)			19.8			34.1		192.1				
Turn Bay Length (m)						30.0		30.0				
Base Capacity (vph)	351	448	337	706	363	2373	520	2499		520		
Stallion 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	0.15	0.22	0.34	0.09	0.10	0.26	0.20	0.39		0.20		
Intersection Summary												
Cycle Length: 100												
Actuated Cycle Length: 100												
Offset: 0 (0%), Referenced to phase 2:NBL and 6:SBTL, Start of Green												
Natural Cycle: 55												
Control Type: Actuated-Coordinated												
Spills and Phases: 4: Liverpool Rd & North Dwy/Main Plaza Dwy												

HCM Signalized Intersection Capacity Analysis  
 6: Liverpool Rd & Glenanna Rd

Queues  
 6: Liverpool Rd & Glenanna Rd

19225 | 1294 Kingston Rd  
 2028 FT AM: Option 3

19225 | 1294 Kingston Rd  
 2028 FT AM: Option 3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR
Lane Configurations	4	4	4	8	8	8	2	2	2	2	6
Traffic Volume (vph)	47	138	251	71	87	56	115	376	33	73	658
Future Volume (vph)	47	138	251	71	87	56	115	376	33	73	658
Ideal Flow (vphpl)	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
Total Lost Time (s)	5.9	5.9	5.9	5.9	5.9	5.9	6.7	6.7	6.7	6.7	6.7
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95
Frbp, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00	0.99	1.00
Frbp, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00	0.99	1.00
Flt Protected	0.95	1.00	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1658	1773	1513	1675	1717	1658	3353	1639	3410	1639	3410
Flt Permitted	0.55	1.00	1.00	0.57	1.00	0.35	1.00	0.49	1.00	0.49	1.00
Satd. Flow (perm)	965	1773	1513	1008	1717	605	3353	853	3410	853	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
Adj. Flow (vph)	51	150	273	77	95	61	125	409	36	79	715
RTOR Reduction (vph)	0	0	185	0	27	0	0	4	0	0	5
Lane Group Flow (vph)	51	150	88	77	129	0	125	441	0	79	785
Conf. Peds. (#/hr)							11	8	8	8	11
Heavy Vehicles (%)	4%	6%	2%	3%	3%	3%	3%	4%	14%	4%	3%
Turn Type	Perm	NA	Perm	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Permitted Phases	4		4	8		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	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	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	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	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	3.0	3.0
Lane Grp Cap (vph)	136	249	213	142	242	443	2457	625	2499	625	2499
v/s Ratio Prot	c0.08					0.07		0.13			c0.23
v/s Ratio Perm	0.05	0.06	0.08			0.21		0.09			0.09
Uniform Delay, d1	0.38	0.60	0.41	0.54	0.53	0.28	0.18	0.13	0.31	0.13	0.31
Progression Factor	1.00	1.00	1.00	0.99	0.99	0.79	0.82	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.7	4.1	1.3	4.2	2.2	1.6	0.2	0.4	0.3	0.4	0.3
Delay (s)	40.7	44.4	40.5	43.9	41.5	5.1	3.5	4.3	5.0	4.3	5.0
Level of Service	D	D	D	D	D	A	A	A	A	A	A
Approach Delay (s)	41.7		42.3		42.3	3.9		4.9		4.9	
Approach LOS	D		D		D	A		A		A	
<b>Intersection Summary</b>											
HCM 2000 Control Delay	16.8 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	WBR	NBL	NBT	NBR	SBL	SBR
Lane Configurations	4	4	4	8	8	8	2	2	2	2	6
Traffic Volume (vph)	47	138	251	71	87	56	115	376	33	73	658
Future Volume (vph)	47	138	251	71	87	56	115	376	33	73	658
Lane Group Flow (vph)	51	150	273	77	156	125	445	79	790	790	790
Turn Type	Perm	NA	Perm	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases	4		4	8		8		2		6	
Permitted Phases	4		4	8		8		2		6	
Switch Phase	4		4	8		8		2		6	
Minimum Initial (s)	8.0	8.0	8.0	5.0	5.0	5.0	5.0	5.0	8.0	8.0	8.0
Minimum Split (s)	23.9	23.9	23.9	23.9	23.9	23.9	24.7	24.7	24.7	24.7	24.7
Total Split (s)	34.0	34.0	34.0	34.0	34.0	34.0	66.0	66.0	66.0	66.0	66.0
Total Split (%)	34.0%	34.0%	34.0%	34.0%	34.0%	34.0%	66.0%	66.0%	66.0%	66.0%	66.0%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	3.7	4.6	4.6	4.6	4.6	4.6
All-Red Time (s)	2.2	2.2	2.2	2.2	2.2	2.2	2.1	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	0.0	0.0
Total Lost Time (s)	5.9	5.9	5.9	5.9	5.9	5.9	6.7	6.7	6.7	6.7	6.7
LeadLag											
LeadLag Optimize?											
Recall Mode	None	None	None	None	None	None	C-Min	C-Min	C-Min	C-Min	C-Min
v/c Ratio	0.38	0.60	0.69	0.55	0.58	0.58	0.28	0.18	0.13	0.32	0.32
Control Delay	45.4	49.8	19.3	52.9	39.2	6.1	3.8	5.4	5.4	5.3	5.3
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	45.4	49.8	19.3	52.9	39.2	6.1	3.8	5.4	5.3	5.3	5.3
Queue Length 50th (m)	9.6	29.2	10.8	15.4	25.2	5.3	9.2	4.0	23.7	4.0	23.7
Queue Length 95th (m)	20.1	46.3	35.2	27.9	41.6	13.3	17.7	10.9	41.2	10.9	41.2
Internal Link Dist (m)							192.1				478.0
Turn Bay Length (m)	22.0		24.3		24.3		24.4		46.2		
Base Capacity (vph)	271	498	579	283	505	443	2464	624	2506	624	2506
Stallion 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	0.19	0.30	0.47	0.27	0.31	0.28	0.18	0.13	0.32	0.32	0.32
<b>Intersection Summary</b>											
Cycle Length: 100											
Actuated Cycle Length: 100											
Offset: 0 (0%), Referenced to phase 2:NBLT and 6:SBLT, Start of Green											
Natural Cycle: 55											
Control Type: Actuated-Coordinated											
<b>Spills and Phases: 6: Liverpool Rd &amp; Glenanna Rd</b>											

The background features several thick, overlapping, curved grey lines that sweep across the page from the top and bottom edges towards the center. These lines create a sense of motion and depth, with some lines crossing over others.

**Weekday PM Peak Hour**



HCM Signalized Intersection Capacity Analysis  
 1: Glenanna Rd & Kingston Rd  
 2028 FT AM: Option 3

Queues  
 1: Glenanna Rd & Kingston Rd  
 2028 FT AM: Option 3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	10	413	92	96	590	122	52	73	64	190	102	26
Traffic Volume (vph)	10	413	92	96	590	122	52	73	64	190	102	26
Future Volume (vph)	10	413	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	6.4	3.0	6.4	3.0	7.0	3.0	7.0	3.0	7.0	7.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frbp, ped/bikes	1.00	1.00	0.91	1.00	1.00	0.96	1.00	1.00	0.93	1.00	1.00	0.93
Frbp, ped/bikes	0.99	1.00	1.00	0.99	1.00	1.00	0.97	1.00	1.00	0.97	1.00	0.97
Fit	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	0.95
Satd. Flow (prot)	1568	3305	1303	1646	3400	1464	1667	1860	1397	1641	1773	1436
Flt Permitted	0.41	1.00	1.00	0.31	1.00	1.00	0.69	1.00	1.00	0.66	1.00	1.00
Satd. Flow (perm)	674	3305	1303	533	3400	1464	1203	1860	1397	1134	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	449	100	104	641	133	57	79	70	207	111	28
RTOR Reduction (vph)	0	0	80	0	0	65	0	0	42	0	0	15
Lane Group Flow (vph)	11	449	20	104	641	68	57	79	28	207	111	13
Conf. Peds. (#/hr)	8	25	25	25	8	35	34	34	34	34	34	35
Heavy Vehicles (%)	9%	8%	8%	4%	5%	1%	0%	1%	3%	2%	6%	0%
Turn Type	Perm	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm
Permitted Phases	4	4	8	8	8	5	2	2	2	6	6	6
Actuated Green, G (s)	20.1	20.1	31.7	31.7	31.7	46.3	40.3	40.3	40.3	54.9	45.9	45.9
Effective Green, g (s)	20.1	20.1	31.7	31.7	31.7	46.3	40.3	40.3	40.3	54.9	45.9	45.9
Actuated g/C Ratio	0.20	0.20	0.32	0.32	0.32	0.46	0.40	0.40	0.40	0.55	0.46	0.46
Clearance Time (s)	6.4	6.4	6.4	3.0	6.4	3.0	7.0	3.0	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	3.0
Lane Grp Cap (vph)	135	664	261	264	1077	464	584	749	562	681	813	659
v/s Ratio Prot	c0.14	0.02	0.03	c0.19	0.05	0.04	0.01	0.04	0.02	c0.04	0.06	0.06
v/s Ratio Perm	0.08	0.68	0.08	0.39	0.60	0.15	0.10	0.11	0.05	0.30	0.14	0.02
Uniform Delay, d1	32.5	36.9	32.4	25.3	28.7	24.5	14.9	18.6	18.2	11.7	15.6	14.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.62	0.76
Incremental Delay, d2	0.3	2.7	0.1	1.0	0.9	0.1	0.1	0.3	0.2	0.3	0.3	0.1
Delay (s)	32.7	39.7	32.5	26.3	29.6	24.6	15.0	18.9	18.4	7.5	12.3	14.8
Level of Service	C	D	C	C	C	C	B	B	B	A	B	B
Approach Delay (s)	38.3			28.5			17.6			9.6		
Approach LOS	D			C			B			A		
<b>Intersection Summary</b>												
HCM 2000 Control Delay	26.8 HCM 2000 Level of Service C											
HCM 2000 Volume to Capacity ratio	0.44											
Actuated Cycle Length (s)	100.0 Sum of lost time (s) 19.4											
Intersection Capacity Utilization	54.2% ICU Level of Service A											
Analysis Period (min)	15											
c Critical Lane Group												

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	10	413	92	96	590	122	52	73	64	190	102	26
Traffic Volume (vph)	10	413	92	96	590	122	52	73	64	190	102	26
Future Volume (vph)	10	413	92	96	590	122	52	73	64	190	102	26
Lane Group Flow (vph)	11	449	100	104	641	133	57	79	70	207	111	28
Turn Type	Perm	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm
Permitted Phases	4	4	8	8	8	5	2	2	2	6	6	6
Detector Phase	4	4	4	4	4	3	8	8	8	5	2	1
Switch Phase	4	4	4	4	4	3	8	8	8	5	2	1
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	8.0	8.0	8.0
Minimum Split (s)	24.4	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	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%	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	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	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	0.0
Total Lost Time (s)	6.4	6.4	6.4	3.0	6.4	3.0	7.0	3.0	7.0	3.0	7.0	7.0
Lead/Lag	LAG	LAG	LAG	LEAD	LEAD	LEAD	LAG	LAG	LAG	LEAD	LAG	LAG
Lead/Lag Optimize?	None	None	None	None	None	None	None	None	None	None	None	None
Recall Mode	0.08	0.68	0.29	0.35	0.61	0.26	0.09	0.10	0.11	0.28	0.13	0.04
v/c Ratio	32.4	42.3	7.6	24.2	31.0	8.8	11.7	23.4	2.9	8.0	14.8	1.6
Control 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
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	32.4	42.3	7.6	24.2	31.0	8.8	11.7	23.4	2.9	8.0	14.8	1.6
Queue Length 50th (m)	1.9	45.6	0.0	14.4	57.1	5.4	4.7	9.8	0.0	9.1	16.4	0.2
Queue Length 95th (m)	6.6	58.4	11.4	23.1	65.5	16.5	12.6	24.8	5.5	20.7	31.8	2.3
Internal Link Dist (m)	393.2 174.6											
Turn Bay Length (m)	42.6	60.4	33.0	23.2	25.4	25.4	25.4	25.0	27.3	416.6	16.5	16.5
Base Capacity (vph)	219	1077	498	293	1414	664	653	802	660	728	843	737
Stallion Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillover 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	0.05	0.42	0.20	0.35	0.45	0.20	0.09	0.10	0.11	0.28	0.13	0.04
<b>Intersection Summary</b>												
Cycle Length: 100												
Actuated Cycle Length: 100												
Offset: 0 (0%), Referenced to phase 2:NBL and 6:SBTL, Start of Green												
Natural Cycle: 70												
Control Type: Actuated-Coordinated												

HCM Signalized Intersection Capacity Analysis  
 2: Liverpool Rd & Kingston Rd  
 19225 | 1294 Kingston Rd  
 2028 FT AM: Option 3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR
Lane Configurations	→	→	→	←	←	←	←	←	←	←	←
Traffic Volume (vph)	101	394	254	178	493	49	215	461	122	85	871
Future Volume (vph)	101	394	254	178	493	49	215	461	122	85	871
Ideal Flow (vphpl)	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	3.5	3.2	3.5	3.2	3.5
Total Lost Time (s)	3.0	7.0	3.0	7.0	3.0	7.0	3.0	7.0	3.0	7.0	3.0
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
Frbp. ped/bikes	1.00	1.00	1.00	1.00	1.00	0.96	1.00	1.00	0.94	1.00	0.99
Frbp. ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99
Fit	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	1451	1638	3400	1478	1691	3500	1315	1672	4906
Flt Permitted	0.30	1.00	1.00	0.40	1.00	1.00	0.16	1.00	1.00	0.47	1.00
Satd. Flow (perm)	514	3368	1451	685	3400	1478	283	3500	1315	824	4906
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
Adj. Flow (vph)	110	428	276	193	536	53	234	501	133	92	947
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	75	0
Lane Group Flow (vph)	110	428	276	193	536	53	234	501	58	92	1052
Conf. Peds. (#/hr)	15	19	9	15	22	15	22	25	25	25	22
Heavy Vehicles (%)	4%	6%	1%	5%	5%	0%	2%	2%	10%	2%	4%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA
Permitted Phases	7	4	4	3	8	8	5	2	2	1	6
Actuated Green, G (s)	40.9	30.3	30.3	40.7	30.2	30.2	66.3	54.5	54.5	53.2	44.4
Effective Green, g (s)	40.9	30.3	30.3	40.7	30.2	30.2	66.3	54.5	54.5	53.2	44.4
Actuated g/C Ratio	0.33	0.24	0.24	0.33	0.24	0.24	0.53	0.44	0.44	0.43	0.36
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)	266	822	354	305	828	359	365	1538	577	413	1756
v/s Ratio Prot	0.04	0.13	c0.05	0.16	c0.10	0.14	c0.10	0.14	0.02	0.02	0.21
v/s Ratio Perm	0.10	c0.19	0.15	0.04	c0.24	0.04	c0.24	0.04	0.04	0.08	0.08
Uniform Delay, d1	0.41	0.52	0.78	0.63	0.65	0.15	0.64	0.33	0.10	0.22	0.60
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.0	2.4	15.6	4.2	3.9	0.9	3.8	0.6	0.4	0.3	1.5
Delay (s)	31.4	42.9	59.3	36.5	46.0	37.7	22.1	23.3	20.7	21.7	34.0
Level of Service	C	D	E	D	D	D	C	C	C	C	C
Approach Delay (s)	46.9	D	D	43.1	D	D	22.6	C	C	33.1	C
Approach LOS	D	D	D	D	D	D	C	C	C	C	C
<b>Intersection Summary</b>											
HCM 2000 Control Delay	35.8 HCM 2000 Level of Service D										
HCM 2000 Volume to Capacity ratio	0.70										
Actuated Cycle Length (s)	124.0 Sum of lost time (s)										
Intersection Capacity Utilization	74.4% ICU Level of Service D										
Analysis Period (min)	15										
c Critical Lane Group											

Queues  
 2: Liverpool Rd & Kingston Rd  
 19225 | 1294 Kingston Rd  
 2028 FT AM: Option 3

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR	
Lane Configurations	→	→	→	←	←	←	←	←	←	←	←	
Traffic Volume (vph)	101	394	254	178	493	49	215	461	122	85	871	
Future Volume (vph)	101	394	254	178	493	49	215	461	122	85	871	
Lane Group Flow (vph)	110	428	276	193	536	53	234	501	133	92	1062	
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Projected Phases	7	4	4	3	8	8	5	2	2	1	6	
Permitted Phases	4	4	4	3	8	8	5	2	2	1	6	
Switch Phase	7	4	4	3	8	8	5	2	2	1	6	
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)	16.0	55.0	55.0	13.5	55.0	55.0	16.0	45.0	45.0	8.0	37.0	
Total Split (%)	12.9%	44.4%	44.4%	10.9%	44.4%	44.4%	12.9%	36.3%	36.3%	6.5%	29.8%	
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?	None	C-Min	None	None	C-Min	None	None	C-Min	None	None	Max	
Recall Mode	0.39	0.52	0.78	0.59	0.65	0.15	0.62	0.33	0.20	0.21	0.60	
v/c Ratio	27.5	41.9	58.1	33.8	45.4	35.7	24.4	25.3	5.5	16.3	35.7	
Control Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	
Queue Delay	27.5	41.9	58.1	33.8	45.4	35.7	24.4	25.3	5.5	16.3	36.1	
Total Delay	18.4	50.2	66.5	34.1	65.6	10.8	28.9	43.2	0.0	10.3	79.5	
Queue Length 50th (m)	27.4	59.4	88.8	45.7	77.4	20.3	58.8	69.2	14.4	22.7	115.7	
Queue Length 95th (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	30.0	30.0	30.0	30.0	30.0	
Base Capacity (vph)	314	1371	590	326	1316	572	375	1537	652	435	1765	
Stallion Cap Reductn	0	0	0	0	0	0	0	0	0	0	287	
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	0.35	0.31	0.47	0.59	0.41	0.09	0.62	0.33	0.20	0.21	0.72	
<b>Intersection Summary</b>												
Cycle Length: 124												
Offset: 13 (10%), 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.												
<b>Spills and Phases: 2: Liverpool Rd &amp; Kingston Rd</b>												
Ø1	Ø2	Ø3	Ø4 (R)	Ø5	Ø6	Ø7	Ø8 (R)					
16.5 s	19.5 s	13.5 s	55 s	16.5 s	37.5 s	16.5 s	55 s					

HCM Signalized Intersection Capacity Analysis  
 4: Liverpool Rd & North Dwy/Main Plaza Dwy

19225 | 1294 Kingston Rd  
 2028 FT AM: Option 3



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	50	0	90	106	0	59	33	415	163	94	866	20
Traffic Volume (vph)	50	0	90	106	0	59	33	415	163	94	866	20
Future Volume (vph)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Ideal Flow (vphpl)	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2
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	6.9	6.9	6.9	6.9	6.9
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frbp. ped/bikes	1.00	0.99	1.00	1.00	0.99	1.00	1.00	0.98	1.00	1.00	0.98	1.00
Frbp. ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Flt	0.95	1.00	0.85	1.00	0.85	1.00	0.95	1.00	0.95	1.00	0.95	1.00
Flt Protected	1722	1302	1705	1575	1720	3269	1663	3483				
Satd. Flow (prot)	0.72	1.00	0.69	1.00	0.28	1.00	0.41	1.00				
Flt Permitted	1297	1302	1245	1575	507	3269	724	3483				
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)	54	0	98	115	0	64	36	451	177	102	941	22
RTOR Reduction (vph)	0	84	0	55	0	0	29	0	0	0	1	0
Lane Group Flow (vph)	54	14	0	115	9	0	36	599	0	102	962	0
Conf. Peds. (#/hr)	1	1	1	1	1	1	4	14	14	14	14	4
Heavy Vehicles (%)	0%	0%	21%	1%	0%	0%	4%	0%	2%	2%	5%	5%
Turn Type	Perm	NA	NA	Perm	NA	Perm	NA	NA	Perm	NA	Perm	NA
Protected Phases	4			8			2			6		
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	14.5	14.5	14.5	14.5	14.5	14.5	71.7	71.7	71.7	71.7	71.7	71.7
Effective Green, g (s)	14.5	14.5	14.5	14.5	14.5	14.5	71.7	71.7	71.7	71.7	71.7	71.7
Actuated g/C Ratio	0.14	0.14	0.14	0.14	0.14	0.14	0.72	0.72	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	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	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	188	188	180	228	363	2343	519	2497				
v/s Ratio Prot	0.01			0.01			0.18			0.28		
v/s Ratio Perm	0.04			0.09			0.07			0.14		
Uniform Delay, d1	0.29	0.08	0.64	0.04	0.10	0.26	0.20	0.39		0.20		
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.81		0.78		
Incremental Delay, d2	0.8	0.2	7.2	0.1	0.5	0.3	0.8	0.4		0.8		
Delay (s)	39.0	37.1	47.5	36.8	49.5	5.2	4.6	4.7		4.6		
Level of Service	D	D	D	D	D	A	A	A		A		
Approach Delay (s)	37.8		43.7		5.2		4.7			4.7		
Approach LOS	D		D		A		A			A		
Intersection Summary												
HCM 2000 Control Delay	10.7 HCM 2000 Level of Service B											
HCM 2000 Volume to Capacity ratio	0.43											
Actuated Cycle Length (s)	100.0 Sum of lost time (s) 13.8											
Intersection Capacity Utilization	58.6% ICU Level of Service B											
Analysis Period (min)	15											
Critical Lane Group	c Critical Lane Group											

Queues  
 4: Liverpool Rd & North Dwy/Main Plaza Dwy



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	50	0	90	106	0	59	33	415	163	94	866	20
Traffic Volume (vph)	50	0	90	106	0	59	33	415	163	94	866	20
Future Volume (vph)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Group Flow (vph)	54	98	115	64	36	628	102	962				
Turn Type	Perm	NA	NA	Perm	NA	Perm	NA	NA	Perm	NA	Perm	NA
Protected Phases	4			8			2			6		
Permitted Phases	4			8			2			6		
Switch Phase	4			8			2			6		
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)	24.9	24.9	24.9	24.9	24.9	24.9	24.9	24.9	24.9	24.9	24.9	24.9
Total Split (s)	34.0	34.0	34.0	34.0	34.0	34.0	34.0	34.0	34.0	34.0	34.0	34.0
Total Split (%)	34.0%	34.0%	34.0%	34.0%	34.0%	34.0%	34.0%	34.0%	34.0%	34.0%	34.0%	34.0%
Yellow Time (s)	3.7	3.7	3.7	3.7	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	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	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	6.9	6.9	6.9	6.9	6.9
Lead/Lag												
Lead/Lag Optimize?												
Recall Mode	None	None	None	None	None	None	None	None	None	None	None	None
v/c Ratio	0.29	0.33	0.64	0.12	0.10	0.26	0.20	0.39		0.20		
Control Delay	40.1	5.7	55.2	0.4	6.3	4.8	5.6	5.2		5.6		
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0		
Total Delay	40.1	5.7	55.2	0.4	6.3	4.8	5.6	5.2		5.6		
Queue Length 50th (m)	10.0	0.0	22.4	0.0	1.9	16.4	5.8	29.6		5.8		
Queue Length 95th (m)	20.3	7.6	38.5	0.0	6.6	29.5	13.3	45.3		13.3		
Internal Link Dist (m)			19.8			34.1		192.1				
Turn Bay Length (m)						30.0		30.0				
Base Capacity (vph)	351	448	337	706	363	2373	520	2499		520		
Stallion 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	0.15	0.22	0.34	0.09	0.10	0.26	0.20	0.39		0.20		
Intersection Summary												
Cycle Length: 100												
Actuated Cycle Length: 100												
Offset: 0 (0%), Referenced to phase 2:NBL and 6:SBTL, Start of Green												
Natural Cycle: 55												
Control Type: Actuated-Coordinated												
Spills and Phases: 4: Liverpool Rd & North Dwy/Main Plaza Dwy												

HCM Signalized Intersection Capacity Analysis  
 6: Liverpool Rd & Glenanna Rd

Queues  
 6: Liverpool Rd & Glenanna Rd

19225 | 1294 Kingston Rd  
 2028 FT AM: Option 3

19225 | 1294 Kingston Rd  
 2028 FT AM: Option 3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR
Lane Configurations	4	4	4	8	8	8	2	2	2	2	6
Traffic Volume (vph)	47	138	251	71	87	56	115	376	33	73	658
Future Volume (vph)	47	138	251	71	87	56	115	376	33	73	658
Ideal Flow (vphpl)	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
Total Lost Time (s)	5.9	5.9	5.9	5.9	5.9	5.9	6.7	6.7	6.7	6.7	6.7
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95
Frbp, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	0.99	1.00	1.00
Frbp, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	0.99	1.00	1.00
Flt Protected	0.95	1.00	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1658	1773	1513	1675	1717	1658	3353	1639	3410	1639	3410
Flt Permitted	0.55	1.00	1.00	0.57	1.00	0.35	1.00	0.49	1.00	0.49	1.00
Satd. Flow (perm)	965	1773	1513	1008	1717	605	3353	853	3410	853	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
Adj. Flow (vph)	51	150	273	77	95	61	125	409	36	79	715
RTOR Reduction (vph)	0	0	185	0	27	0	0	4	0	0	5
Lane Group Flow (vph)	51	150	88	77	129	0	125	441	0	79	785
Conf. Peds. (#/hr)							11	8	8	8	11
Heavy Vehicles (%)	4%	6%	2%	3%	3%	3%	3%	4%	14%	4%	3%
Turn Type	Perm	NA	Perm	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Permitted Phases	4	4	4	8	8	8	2	2	2	6	6
Actuated Green, G (s)	14.1	14.1	14.1	14.1	14.1	73.3	73.3	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	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	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	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	3.0	3.0
Lane Grp Cap (vph)	136	249	213	142	242	443	2457	625	2499	625	2499
v/s Ratio Prot	c0.08			0.07		0.13					c0.23
v/s Ratio Perm	0.05	0.06	0.08		0.21					0.09	
Uniform Delay, d1	0.38	0.60	0.41	0.54	0.53	0.28	0.18	0.13	0.31	0.13	0.31
Progression Factor	1.00	1.00	1.00	0.99	0.99	0.79	0.82	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.7	4.1	1.3	4.2	2.2	1.6	0.2	0.4	0.3	0.4	0.3
Delay (s)	40.7	44.4	40.5	43.9	41.5	5.1	3.5	4.3	5.0	4.3	5.0
Level of Service	D	D	D	D	D	A	A	A	A	A	A
Approach Delay (s)	41.7			42.3		3.9		4.9		4.9	
Approach LOS	D			D		A		A		A	
<b>Intersection Summary</b>											
HCM 2000 Control Delay	16.8 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	A										

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR
Lane Configurations	4	4	4	8	8	8	2	2	2	6	6
Traffic Volume (vph)	47	138	251	71	87	56	115	376	33	73	658
Future Volume (vph)	47	138	251	71	87	56	115	376	33	73	658
Lane Group Flow (vph)	51	150	273	77	129	0	125	441	0	79	790
Turn Type	Perm	NA	Perm	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Permitted Phases	4	4	4	8	8	8	2	2	2	6	6
Switch Phase	4	4	4	8	8	8	2	2	2	6	6
Minimum Initial (s)	8.0	8.0	8.0	5.0	5.0	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	23.9	24.7	24.7	24.7	24.7	24.7
Total Split (s)	34.0	34.0	34.0	34.0	34.0	34.0	66.0	66.0	66.0	66.0	66.0
Total Split (%)	34.0%	34.0%	34.0%	34.0%	34.0%	34.0%	66.0%	66.0%	66.0%	66.0%	66.0%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	3.7	4.6	4.6	4.6	4.6	4.6
All-Red Time (s)	2.2	2.2	2.2	2.2	2.2	2.2	2.1	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	0.0	0.0
Total Lost Time (s)	5.9	5.9	5.9	5.9	5.9	5.9	6.7	6.7	6.7	6.7	6.7
LeadLag											
LeadLag Optimize?											
Recall Mode	None	None	None	None	None	None	C-Min	C-Min	C-Min	C-Min	C-Min
v/c Ratio	0.38	0.60	0.69	0.55	0.58	0.28	0.18	0.13	0.32	0.13	0.32
Control Delay	45.4	49.8	19.3	52.9	39.2	6.1	3.8	5.4	5.3	5.4	5.3
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	45.4	49.8	19.3	52.9	39.2	6.1	3.8	5.4	5.3	5.4	5.3
Queue Length 50th (m)	9.6	29.2	10.8	15.4	25.2	5.3	9.2	4.0	23.7	9.2	23.7
Queue Length 95th (m)	20.1	46.3	35.2	27.9	41.6	13.3	17.7	10.9	41.2	17.7	41.2
Internal Link Dist (m)	107.2										
Turn Bay Length (m)	22.0										
Base Capacity (vph)	271	498	579	283	505	443	2464	624	2506	624	2506
Stallion 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	0.19	0.30	0.47	0.27	0.31	0.28	0.18	0.13	0.32	0.13	0.32
<b>Intersection Summary</b>											
Cycle Length: 100											
Actuated Cycle Length: 100											
Offset: 0 (0%), Referenced to phase 2:NBL and 6:SBLT, Start of Green											
Natural Cycle: 55											
Control Type: Actuated-Coordinated											
<b>Spills and Phases: 6: Liverpool Rd &amp; Glenanna Rd</b>											



**Future Total Traffic - Option 4**



Phasing Plan 1

Protected Phase By Approach



**Weekday AM Peak Hour**



HCM Signalized Intersection Capacity Analysis  
 1: Glenanna Rd & Kingston Rd  
 19225 | 1294 Kingston Rd  
 2028 FT AM: Option 4/Spill Apr

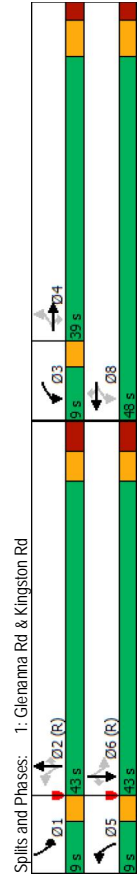


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	10	413	92	96	590	122	52	73	64	190	102	26
Traffic Volume (vph)	10	413	92	96	590	122	52	73	64	190	102	26
Future Volume (vph)	10	413	92	96	590	122	52	73	64	190	102	26
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	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	6.4	3.0	6.4	3.0	7.0	3.0	7.0	3.0	7.0	7.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frbp, ped/bikes	1.00	1.00	0.91	1.00	1.00	0.96	1.00	1.00	0.93	1.00	1.00	0.93
Frbp, ped/bikes	0.99	1.00	1.00	0.99	1.00	1.00	0.97	1.00	1.00	0.97	1.00	0.97
Fit	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	0.95
Satd. Flow (prot)	1568	3305	1303	1646	3400	1464	1667	1860	1397	1641	1773	1436
Flt Permitted	0.41	1.00	1.00	0.31	1.00	1.00	0.69	1.00	1.00	0.66	1.00	1.00
Satd. Flow (perm)	674	3305	1303	533	3400	1464	1203	1860	1397	1134	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	449	100	104	641	133	57	79	70	207	111	28
RTOR Reduction (vph)	0	0	0	0	0	65	0	0	42	0	0	15
Lane Group Flow (vph)	11	449	100	104	641	68	57	79	28	207	111	13
Conf. Peds. (#/hr)	8	25	25	25	8	35	34	34	34	34	34	35
Heavy Vehicles (%)	9%	8%	8%	4%	5%	1%	0%	1%	3%	2%	6%	0%
Turn Type	Perm	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm
Permitted Phases	4	4	8	8	8	5	2	2	2	6	6	6
Actuated Green, G (s)	20.1	20.1	31.7	31.7	31.7	46.3	40.3	40.3	40.3	54.9	45.9	45.9
Effective Green, g (s)	20.1	20.1	31.7	31.7	31.7	46.3	40.3	40.3	40.3	54.9	45.9	45.9
Actuated g/C Ratio	0.20	0.20	0.32	0.32	0.32	0.46	0.40	0.40	0.40	0.55	0.46	0.46
Clearance Time (s)	6.4	6.4	3.0	6.4	3.0	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	3.0
Lane Grp Cap (vph)	135	664	261	264	1077	464	584	749	562	681	813	659
v/s Ratio Prot	c0.14	0.03	c0.19	0.03	c0.19	0.01	0.04	0.01	0.04	c0.04	0.06	0.06
v/s Ratio Perm	0.02	0.08	0.09	0.09	0.05	0.04	0.02	0.02	0.02	c0.13	0.01	0.01
Uniform Delay, d1	0.08	0.68	0.38	0.39	0.60	0.15	0.10	0.11	0.05	0.30	0.14	0.02
Progression Factor	1.39	1.28	1.31	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.58	0.65
Incremental Delay, d2	0.2	2.6	0.9	1.0	0.9	0.1	0.1	0.3	0.2	0.3	0.3	0.1
Delay (s)	45.5	49.7	46.0	26.3	29.6	24.6	15.0	18.9	18.4	7.0	10.5	14.8
Level of Service	D	D	D	C	C	C	B	B	B	A	B	B
Approach Delay (s)	49.0			28.5			17.6			8.8		
Approach LOS	D			C			B			A		
Intersection Summary												
HCM 2000 Control Delay	29.7 HCM 2000 Level of Service C											
HCM 2000 Volume to Capacity ratio	0.44											
Actuated Cycle Length (s)	100.0 Sum of lost time (s) 19.4											
Intersection Capacity Utilization	54.2% ICU Level of Service A											
Analysis Period (min)	15											
c Critical Lane Group	C											

Queues  
 1: Glenanna Rd & Kingston Rd  
 19225 | 1294 Kingston Rd  
 2028 FT AM: Option 4/Spill Apr



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	10	413	92	96	590	122	52	73	64	190	102	26
Traffic Volume (vph)	10	413	92	96	590	122	52	73	64	190	102	26
Future Volume (vph)	10	413	92	96	590	122	52	73	64	190	102	26
Lane Group Flow (vph)	11	449	100	104	641	133	57	79	70	207	111	28
Turn Type	Perm	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm
Permitted Phases	4	4	4	4	4	8	8	2	2	6	6	6
Detector Phase	4	4	4	4	4	8	8	5	2	2	1	6
Switch Phase	4	4	4	4	4	8	8	5	2	2	1	6
Minimum Initial (s)	5.0	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	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	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%	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	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	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	0.0
Total Lost Time (s)	6.4	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	Lag	Lag	Lag	Lead	Lag	Lag	Lag	Lead	Lag	Lag
Lead/Lag Optimize?	None	None	None	None	None	None	None	None	None	None	None	None
Recall Mode	0.08	0.68	0.38	0.35	0.61	0.26	0.09	0.10	0.11	0.28	0.13	0.04
v/s Ratio	44.7	52.2	48.9	24.2	31.0	8.8	11.7	23.4	2.9	7.5	12.6	0.2
Control 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
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	44.7	52.2	48.9	24.2	31.0	8.8	11.7	23.4	2.9	7.5	12.6	0.2
Queue Length 50th (m)	2.0	46.6	19.0	14.4	57.1	5.4	4.7	9.8	0.0	9.7	7.0	0.2
Queue Length 95th (m)	m5.7	66.7	36.6	23.1	65.5	16.5	12.6	24.8	5.5	20.3	18.2	0.0
Internal Link Dist (m)	393.2											
Turn Bay Length (m)	42.6	60.4	33.0	33.0	23.2	25.4	25.4	25.0	27.3	416.6	16.5	16.5
Base Capacity (vph)	219	1077	424	293	1414	664	653	802	660	728	843	737
Stallion 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	0.05	0.42	0.24	0.35	0.45	0.20	0.09	0.10	0.11	0.28	0.13	0.04
Intersection Summary												
Cycle Length: 100												
Actuated Cycle Length: 100												
Offset: 5 (9%), Referenced to phase 2:NBL and 6:SBTL, Start of Green												
Natural Cycle: 70												
Control Type: Actuated-Coordinated												
m Volume for 95th percentile queue is metered by upstream signal.												





HCM Signalized Intersection Capacity Analysis  
 2: Liverpool Rd & Kingston Rd

19225 | 1294 Kingston Rd  
 2028 FT AM: Option 4 Spill Appr



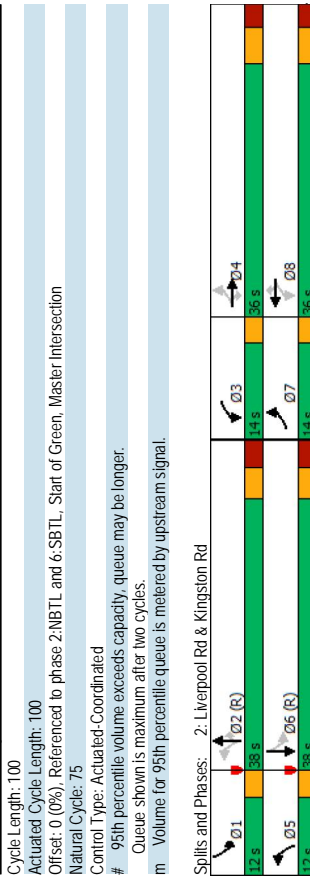
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	←	←	←	←	←	←	←	←	←	←	←	←
Traffic Volume (vph)	101	394	254	178	493	49	215	461	122	85	871	106
Future Volume (vph)	101	394	254	178	493	49	215	461	122	85	871	106
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.5	3.2	3.2	3.5	3.2	3.5	3.2	3.5	3.2	3.5	3.2
Total Lost time (s)	3.0	7.0	3.0	7.0	3.0	7.0	3.0	7.0	3.0	7.0	3.0	7.0
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	1.00
Frbp. ped/bikes	1.00	1.00	0.96	1.00	1.00	0.96	1.00	1.00	0.95	1.00	0.99	1.00
Frbp. ped/bikes	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98	1.00
Flt	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)	1653	3368	1462	1638	3400	1487	1690	3500	1329	1675	4911	607
Flt Permitted	0.35	1.00	1.00	0.39	1.00	1.00	0.16	1.00	1.00	0.47	1.00	0.47
Satd. Flow (perm)	607	3368	1462	679	3400	1487	281	3500	1329	826	4911	607
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)	110	428	276	193	536	53	234	501	133	92	947	115
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	81	0	15
Lane Group Flow (vph)	110	428	276	193	536	53	234	501	52	92	1047	0
Conf. Peds. (#/hr)	15	19	9	15	22	15	22	25	10%	25	25	4%
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	NA
Permitted Phases	4	4	4	3	8	8	8	2	2	2	6	6
Actuated Green, G (s)	32.8	23.6	23.6	35.8	25.1	25.1	48.8	39.0	39.0	40.8	40.8	34.0
Effective Green, g (s)	32.8	23.6	23.6	35.8	25.1	25.1	48.8	39.0	39.0	40.8	34.0	34.0
Actuated g/C Ratio	0.33	0.24	0.24	0.36	0.25	0.25	0.49	0.39	0.39	0.41	0.34	0.34
Clearance Time (s)	3.0	7.0	3.0	7.0	3.0	7.0	3.0	7.0	3.0	7.0	3.0	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	3.0
Lane Grp Cap (vph)	295	794	345	345	853	373	303	1365	518	394	1669	1669
v/s Ratio Prot	0.03	0.13	0.06	0.16	0.16	0.09	0.14	0.09	0.14	0.02	0.21	0.21
v/s Ratio Perm	0.09	0.19	0.14	0.14	0.04	0.29	0.04	0.29	0.04	0.08	0.08	0.08
Uniform Delay, d1	0.37	0.54	0.80	0.56	0.63	0.14	0.77	0.37	0.10	0.23	0.63	0.63
Progression Factor	24.4	33.4	36.0	23.5	33.3	29.1	17.3	21.7	19.4	18.5	27.7	27.7
Incremental Delay, d2	0.8	0.7	12.5	1.9	1.4	0.2	11.6	0.8	0.4	0.0	0.2	0.2
Delay (s)	25.2	34.1	48.4	13.9	13.2	10.4	28.9	22.5	19.7	7.0	10.4	10.4
Level of Service	C	C	D	B	B	B	C	C	C	B	A	B
Approach Delay (s)	C	37.8	D	B	B	B	23.8	C	C	B	10.1	B
Approach LOS	D			B	B	B		C	C			
Intersection Summary												
HCM 2000 Control Delay	20.3 HCM 2000 Level of Service C											
HCM 2000 Volume to Capacity ratio	0.78											
Actuated Cycle Length (s)	100.0 Sum of lost time (s) 19.9											
Intersection Capacity Utilization	72.3% ICU Level of Service C											
Analysis Period (min)	15											
C Critical Lane Group												

Queues  
 2: Liverpool Rd & Kingston Rd

19225 | 1294 Kingston Rd  
 2028 FT AM: Option 4 Spill Appr



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	
Lane Configurations	←	←	←	←	←	←	←	←	←	←	←	
Traffic Volume (vph)	101	394	254	178	493	49	215	461	122	85	871	
Future Volume (vph)	101	394	254	178	493	49	215	461	122	85	871	
Lane Group Flow (vph)	110	428	276	193	536	53	234	501	133	92	1062	
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Projected Phases	7	4	4	3	8	8	8	2	2	2	6	
Permitted Phases	4	4	4	3	8	8	8	2	2	2	6	
Switch Phase	7	4	4	3	8	8	8	2	2	2	6	
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?	None	Min	None	Min	Min	None	C-Max	C-Max	C-Max	None	C-Max	
Recall Mode	0.34	0.54	0.80	0.52	0.63	0.14	0.75	0.36	0.22	0.21	0.63	
v/c Ratio	20.2	35.3	53.0	14.4	15.0	10.5	34.6	24.4	5.6	5.3	10.5	
Control Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
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	20.2	35.3	53.0	14.4	15.0	10.5	34.6	24.4	5.6	5.3	10.5	
Queue Length 50th (m)	13.4	39.6	52.4	5.6	21.5	1.9	25.9	39.6	0.0	3.2	13.0	
Queue Length 95th (m)	22.8	52.1	78.5	17.2	26.6	5.7	73.8	88.7	13.3	m2.5	m8.5	
Internal Link Dist (m)	667.5 393.2 242.2											
Turn Bay Length (m)	33.5	49.1	103.2	61.6	46.2	61.6	46.2	51.8	30.9	30.9	46.2	
Base Capacity (vph)	348	976	423	375	986	431	310	1387	607	464	1687	
Stallion 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	0.32	0.44	0.65	0.51	0.54	0.12	0.75	0.36	0.22	0.20	0.63	
Intersection Summary												
Cycle Length: 100												
Offset: 0 (0%). Referenced to phase 2:NBL and 6:SBTL, Start of Green, Master Intersection												
Natural Cycle: 75												
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.												

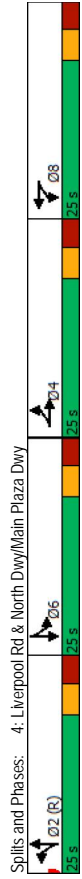


Queues  
 4: Liverpool Rd & North Dwy/Main Plaza Dwy

HCM Unsignalized Intersection Capacity Analysis  
 3: Liverpool Rd & South Dwy

19225 | 1294 Kingston Rd  
 2028 FT AM: Option 4 Split Appr

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	50	0	106	0	33	474	94	960
Future Volume (vph)	50	0	106	0	33	474	94	960
Lane Group Flow (vph)	54	63	115	64	36	692	102	1065
Turn Type	Split	NA	Split	NA	Split	NA	Split	NA
Projected Phases	4	4	8	8	2	2	6	6
Permitted Phases	4	4	8	8	2	2	6	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	24.9	24.9
Total Split (s)	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0
Total Split (%)	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%
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	0.0
Total Lost Time (s)	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9
LeadLag								
LeadLag Optimize?								
Recall Mode	None	None	None	None	C-Min	C-Min	Min	Min
v/c Ratio	0.32	0.46	0.56	0.34	0.06	0.59	0.33	1.69
Control Delay	45.5	52.4	51.4	43.9	37.1	39.9	36.8	343.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	45.5	52.4	51.4	43.9	37.1	39.9	36.8	343.2
Queue Length 50th (m)	10.4	12.3	22.5	12.2	6.7	73.7	19.0	-170.8
Queue Length 95th (m)	21.7	24.8	38.7	24.2	17.3	#102.2	35.8	#213.2
Internal Link Dist (m)		38.1		37.6		80.8		167.9
Turn Bay Length (m)					30.0		30.0	
Base Capacity (vph)	312	249	309	284	601	1169	306	632
Stallion Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.17	0.25	0.37	0.23	0.06	0.59	0.33	1.69



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↔	↔	↔	↔	↔
Traffic Volume (veh/h)	0	32	0	611	1030	0
Future Volume (Veh/h)	0	32	0	611	1030	0
Sign Control	Stop	Free	Free	Free	Free	Free
Grade	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	35	0	664	1120	0
Pedestrians	4					
Lane Width (m)	3.2					
Walking Speed (m/s)	1.2					
Percent Blockage	0					
Right turn flare (veh)				None	TWLT	2
Median storage (veh)						
Upstream signal (m)				59	105	
pX, platoon unblocked	0.88	0.83	0.83			
vC, conflicting volume	1456	564	1124			
vC1, stage 1 conf vol	1124					
vC2, stage 2 conf vol	332					
vCu, unblocked vol	726	52	729			
IC, 1 stage (s)	6.8	7.1	4.1			
IC, 2 stage (s)	5.8					
p0 queue free %	100	96	100			
cM capacity (veh/h)	356	810	728			
Direction, Lane #	EB.1	NB.1	NB.2	SB.1	SB.2	
Volume Total	35	332	332	560	560	
Volume Left	0	0	0	0	0	
Volume Right	35	0	0	0	0	
cSH	810	1700	1700	1700	1700	
Volume to Capacity	0.04	0.20	0.20	0.33	0.33	
Queue Length 95th (m)	1.1	0.0	0.0	0.0	0.0	
Control Delay (s)	9.6	0.0	0.0	0.0	0.0	
Lane LOS	A	A	A	A	A	
Approach Delay (s)	9.6	0.0	0.0	0.0	0.0	
Approach LOS	A	A	A	A	A	
Intersection Summary						
Average Delay	0.2					
Intersection Capacity Utilization	38.5%					
ICU Level of Service	A					
Analysis Period (min)	15					

Queues  
6: Liverpool Rd & Glenanna Rd

HCM Signalized Intersection Capacity Analysis  
4: Liverpool Rd & North Dwy/Main Plaza Dwy

19225 | 1294 Kingston Rd  
2028 FT AM: Option 4 Split Appr



Movement	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT	
Lane Configurations	←	←	←	←	←	←	←	←	←	
Traffic Volume (vph)	47	138	251	71	87	115	376	73	658	
Future Volume (vph)	47	138	251	71	87	115	376	73	658	
Ideal Flow (vphpl)	51	150	273	77	156	125	445	79	790	
Lane Width	Perm	Perm	Perm	Perm	Perm	NA	Perm	NA	Perm	
Total Lost Time (s)	3.7	3.7	3.7	3.7	3.7	4.6	4.6	4.6	4.6	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	54	0	63	115	0	64	36	515	177	
RTOR Reduction (vph)	0	0	0	0	0	0	0	28	0	
Lane Group Flow (vph)	54	63	0	115	64	0	36	664	0	
Conf. Peds. (#/hr)	1	1	1	1	1	1	1	14	14	
Heavy Vehicles (%)	0%	0%	14%	1%	0%	0%	0%	4%	2%	
Turn Type	Split	NA	NA	Split	NA	Split	NA	Split	NA	
Protected Phases	4	4	4	8	8	2	2	6	6	
Permitted Phases	8,8	8,8	12,0	12,0	12,0	33,5	33,5	18,1	18,1	
Actuated Green, G (s)	8,8	8,8	12,0	12,0	12,0	33,5	33,5	18,1	18,1	
Effective Green, g (s)	0,09	0,09	0,12	0,12	0,12	0,34	0,34	0,18	0,18	
Actuated g/C Ratio	6,9	6,9	6,9	6,9	6,9	6,9	6,9	6,9	6,9	
Clearance Time (s)	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	
Vehicle Extension (s)	151	121	204	188	204	577	1097	306	630	
Lane Grp Cap (vph)	0,03	c0,05	c0,07	0,04	0,02	c0,20	c0,20	0,06	c0,31	
v/s Ratio Prot	0,36	0,52	0,56	0,34	0,34	0,06	0,61	0,33	1,69	
v/s Ratio Perm	42,9	43,6	41,5	40,4	22,6	27,7	41,0	35,7	41,0	
Uniform Delay, d1	1,00	1,00	1,00	1,00	1,00	1,36	1,37	0,94	0,96	
Progression Factor	1,5	4,0	3,5	1,1	0,2	2,4	0,6	316,2	355,4	
Incremental Delay, d2	44,4	47,6	45,1	41,5	30,9	40,4	34,0	35,4	35,4	
Delay (s)	D	D	D	D	D	C	D	C	F	
Level of Service	D	D	D	D	D	D	D	C	F	
Approach Delay (s)	46,1	46,1	43,8	39,9	39,9	39,9	327,3	327,3	327,3	
Approach LOS	D	D	D	D	D	D	F	F	F	
<b>Intersection Summary</b>										
HCM 2000 Control Delay	193,6					HCM 2000 Level of Service				
HCM 2000 Volume to Capacity ratio	0,86					F				
Actuated Cycle Length (s)	100,0					Sum of lost time (s)				
Intersection Capacity Utilization	61,1%					ICU Level of Service				
Analysis Period (min)	15					B				
c Critical Lane Group										

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Queues  
6: Liverpool Rd & Glenanna Rd

HCM Signalized Intersection Capacity Analysis  
4: Liverpool Rd & North Dwy/Main Plaza Dwy

19225 | 1294 Kingston Rd  
2028 FT AM: Option 4 Split Appr



Movement	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT	
Lane Configurations	←	←	←	←	←	←	←	←	←	
Traffic Volume (vph)	47	138	251	71	87	115	376	73	658	
Future Volume (vph)	47	138	251	71	87	115	376	73	658	
Ideal Flow (vphpl)	51	150	273	77	156	125	445	79	790	
Lane Width	Perm	Perm	Perm	Perm	Perm	NA	Perm	NA	Perm	
Total Lost Time (s)	3.7	3.7	3.7	3.7	3.7	4.6	4.6	4.6	4.6	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	54	0	63	115	0	64	36	515	177	
RTOR Reduction (vph)	0	0	0	0	0	0	0	28	0	
Lane Group Flow (vph)	54	63	0	115	64	0	36	664	0	
Conf. Peds. (#/hr)	1	1	1	1	1	1	1	14	14	
Heavy Vehicles (%)	0%	0%	14%	1%	0%	0%	0%	4%	2%	
Turn Type	Split	NA	NA	Split	NA	Split	NA	Split	NA	
Protected Phases	4	4	4	8	8	2	2	6	6	
Permitted Phases	8,8	8,8	12,0	12,0	12,0	33,5	33,5	18,1	18,1	
Actuated Green, G (s)	8,8	8,8	12,0	12,0	12,0	33,5	33,5	18,1	18,1	
Effective Green, g (s)	0,09	0,09	0,12	0,12	0,12	0,34	0,34	0,18	0,18	
Actuated g/C Ratio	6,9	6,9	6,9	6,9	6,9	6,9	6,9	6,9	6,9	
Clearance Time (s)	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	
Vehicle Extension (s)	151	121	204	188	204	577	1097	306	630	
Lane Grp Cap (vph)	0,03	c0,05	c0,07	0,04	0,02	c0,20	c0,20	0,06	c0,31	
v/s Ratio Prot	0,36	0,52	0,56	0,34	0,34	0,06	0,61	0,33	1,69	
v/s Ratio Perm	42,9	43,6	41,5	40,4	22,6	27,7	41,0	35,7	41,0	
Uniform Delay, d1	1,00	1,00	1,00	1,00	1,00	1,36	1,37	0,94	0,96	
Progression Factor	1,5	4,0	3,5	1,1	0,2	2,4	0,6	316,2	355,4	
Incremental Delay, d2	44,4	47,6	45,1	41,5	30,9	40,4	34,0	35,4	35,4	
Delay (s)	D	D	D	D	D	C	D	C	F	
Level of Service	D	D	D	D	D	D	D	C	F	
Approach Delay (s)	46,1	46,1	43,8	39,9	39,9	39,9	327,3	327,3	327,3	
Approach LOS	D	D	D	D	D	D	F	F	F	
<b>Intersection Summary</b>										
HCM 2000 Control Delay	193,6					HCM 2000 Level of Service				
HCM 2000 Volume to Capacity ratio	0,86					F				
Actuated Cycle Length (s)	100,0					Sum of lost time (s)				
Intersection Capacity Utilization	61,1%					ICU Level of Service				
Analysis Period (min)	15					B				
c Critical Lane Group										

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Synchro 9 Report Page 8



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Synchro 9 Report Page 8

HCM Signalized Intersection Capacity Analysis  
 6: Liverpool Rd & Glenanna Rd

19225 | 1294 Kingston Rd  
 2028 FT AM: Option 4 Spill Appr

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	←	←	←	←	←	←	←	←	←	←	←	←
Traffic Volume (vph)	47	138	251	71	87	56	115	376	33	73	658	69
Future Volume (vph)	47	138	251	71	87	56	115	376	33	73	658	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	5.9	6.7	6.7	6.7	6.7	6.7	6.7
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frbp. ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00	0.99	1.00	1.00
Frbp. ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00	0.99	1.00	1.00
Flt	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Flt Protected	1658	1773	1513	1675	1717	1658	3353	1639	3410	1639	3410	1639
Satd. Flow (prot)	0.55	1.00	1.00	0.57	1.00	0.35	1.00	0.49	1.00	0.49	1.00	0.49
Flt Permitted	965	1773	1513	1008	1717	605	3353	853	3410	853	3410	853
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	273	77	95	61	125	409	36	79	715	75
RTOR Reduction (vph)	0	0	185	0	27	0	0	4	0	0	5	0
Lane Group Flow (vph)	51	150	88	77	129	0	125	441	0	79	785	0
Confl. Peds. (#/hr)							11	8	8	8	11	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	Perm	NA	Perm
Protected Phases	4		4	8	8	2		2		6		6
Permitted Phases	4		4	8	8	2		2		6		6
Actuated Green, G (s)	14.1	14.1	14.1	14.1	14.1	14.1	73.3	73.3	73.3	73.3	73.3	73.3
Effective Green, g (s)	14.1	14.1	14.1	14.1	14.1	14.1	73.3	73.3	73.3	73.3	73.3	73.3
Actuated g/C Ratio	0.14	0.14	0.14	0.14	0.14	0.14	0.73	0.73	0.73	0.73	0.73	0.73
Clearance Time (s)	5.9	5.9	5.9	5.9	5.9	5.9	6.7	6.7	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	3.0	3.0	3.0
Lane Grp Cap (vph)	136	249	213	142	242	443	2457	625	2499	625	2499	625
w/s Ratio Prot	c0.08					0.07		0.13			c0.23	
w/s Ratio Perm	0.05		0.06	0.08		0.21		0.09			0.09	
v/c Ratio	0.38	0.60	0.41	0.54	0.53	0.28	0.18	0.13	0.31	0.13	0.31	0.31
Uniform Delay, d1	39.0	40.3	39.2	39.9	39.9	4.5	4.1	3.9	4.6	3.9	4.6	4.6
Progression Factor	1.00	1.00	1.00	0.95	0.94	0.49	0.43	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.7	4.1	1.3	4.2	2.2	1.4	0.1	0.4	0.3	0.4	0.3	0.3
Delay (s)	40.7	44.4	40.5	42.1	39.6	3.6	1.9	4.3	5.0	4.3	5.0	5.0
Level of Service	D	D	D	D	D	A	A	A	A	A	A	A
Approach Delay (s)			41.7		40.4		2.3		4.9		4.9	
Approach LOS			D		D		A		A		A	
<b>Intersection Summary</b>												
HCM 2000 Control Delay	16.2 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	62.5% ICU Level of Service B											
Analysis Period (min)	15											
c Critical Lane Group												



**Weekday PM Peak Hour**

HCM Signalized Intersection Capacity Analysis  
 1: Glenanna Rd & Kingston Rd

19225 | 1294 Kingston Rd  
 2028 FT PVI: Option 4 Split Appr

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	→	→	→	←	←	←	←	←	←	←	←	←
Traffic Volume (vph)	24	1218	141	156	614	132	120	177	194	178	199	36
Future Volume (vph)	24	1218	141	156	614	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	6.4	3.0	6.4	6.4	7.0	3.0	7.0	3.0	7.0	7.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frbp, ped/bikes	1.00	1.00	0.83	1.00	1.00	0.90	1.00	1.00	0.91	1.00	1.00	0.84
Frbp, ped/bikes	0.97	1.00	1.00	1.00	1.00	1.00	0.96	1.00	1.00	0.97	1.00	1.00
Flt	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)	1668	3500	1220	1658	3500	1373	1649	1879	1385	1673	1824	1295
Flt Permitted	0.40	1.00	1.00	0.08	1.00	1.00	0.47	1.00	1.00	0.53	1.00	1.00
Satd. Flow (perm)	699	3500	1220	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	1324	153	170	667	143	130	192	211	193	216	39
RTOR Reduction (vph)	0	0	0	0	0	39	0	0	171	0	0	32
Lane Group Flow (vph)	26	1324	153	170	667	104	130	192	40	193	216	7
Conf. Peds. (#/hr)	30	55	55	55	30	91	0%	0%	50	50	50	91
Heavy Vehicles (%)	0%	2%	5%	4%	2%	1%	0%	0%	0%	1%	0%	3%
Turn Type	Perm	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm
Permitted Phases	4	4	4	8	8	8	5	2	2	2	6	6
Actuated Green, G (s)	44.5	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	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	0.44	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	6.4	3.0	6.4	6.4	3.0	7.0	3.0	7.0	3.0	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	3.0
Lane Grp Cap (vph)	311	1557	542	282	2110	827	239	325	239	262	315	224
v/s Ratio Prot	c0.38	c0.08	0.19	0.08	0.09	0.03	0.10	0.03	0.10	c0.04	0.12	0.12
v/s Ratio Perm	0.04	0.13	0.29	0.08	0.09	0.08	0.09	0.03	0.03	0.03	0.13	0.01
Uniform Delay, d1	16.0	24.8	17.6	19.7	9.7	8.5	32.4	38.1	35.2	34.7	38.8	34.4
Progression Factor	0.48	0.52	0.46	1.00	1.00	1.00	1.00	1.00	1.00	1.11	1.08	1.00
Incremental Delay, d2	0.1	2.2	0.1	3.6	0.1	0.1	2.5	7.7	1.5	10.3	11.5	0.2
Delay (s)	7.7	15.1	8.3	23.3	9.8	8.6	34.9	45.8	36.7	48.8	53.6	34.6
Level of Service	A	B	A	C	A	A	C	D	D	D	D	C
Approach Delay (s)	14.3			12.0			39.5				49.9	
Approach LOS	B			B			D				D	
Intersection Summary												
HCM 2000 Control Delay	22.1 HCM 2000 Level of Service C											
HCM 2000 Volume to Capacity ratio	0.78											
Actuated Cycle Length (s)	100.0 Sum of lost time (s) E											
Intersection Capacity Utilization	85.0% ICU Level of Service											
Analysis Period (min)	15											
C Critical Lane Group												

Queues  
 1: Glenanna Rd & Kingston Rd

19225 | 1294 Kingston Rd  
 2028 FT PVI: Option 4 Split Appr

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	→	→	→	←	←	←	←	←	←	←	←	←
Traffic Volume (vph)	24	1218	141	156	614	132	120	177	194	178	199	36
Future Volume (vph)	24	1218	141	156	614	132	120	177	194	178	199	36
Lane Group Flow (vph)	26	1324	153	170	667	143	130	192	211	193	216	39
Turn Type	Perm	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm
Permitted Phases	4	4	4	8	8	8	5	2	2	2	6	6
Detector Phase	4	4	4	3	3	3	5	2	2	2	6	6
Switch Phase	4	4	4	3	3	3	5	2	2	2	6	6
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)	24.4	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	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%	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	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	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	0.0
Total Lost Time (s)	6.4	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	Lag	Lead	Lead	Lead	Lag	Lag	Lag	Lead	Lag	Lag
Lead/Lag Optimize?	None	None	None	None	None	None	None	None	None	None	None	None
Recall Mode	0.08	0.85	0.28	0.59	0.32	0.17	0.49	0.59	0.51	0.65	0.69	0.13
v/s Ratio	9.5	18.4	9.9	25.0	10.9	4.4	32.3	44.9	9.8	42.3	52.7	1.9
Control 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
Queue Delay	9.5	18.4	9.9	25.0	10.9	4.4	32.3	44.9	9.8	42.3	52.7	1.9
Queue Length 50th (m)	0.9	139.0	5.1	15.7	32.4	3.5	19.9	36.5	0.7	34.7	43.9	0.0
Queue Length 95th (m)	m2.8m#181.1	m20.8	39.7	50.8	13.5	32.0	55.0	19.2	41.8	66.7	1.5	416.6
Internal Link Dist (m)	523.9											
Turn Bay Length (m)	42.6	60.4	33.0	23.2	25.4	25.0	27.3	25.4	25.0	27.3	25.0	27.3
Base Capacity (vph)	310	1557	542	287	2110	866	265	676	631	296	656	532
Stallion Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillover 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	0.08	0.85	0.28	0.59	0.32	0.17	0.49	0.28	0.33	0.65	0.33	0.07
Intersection Summary												
Cycle Length: 100												
Actual Cycle Length: 100												
Offset: 31 (31%), Referenced to phase 2:NBT and 6:SBTL, Start of Green												
Natural Cycle: 80												
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 met by upstream signal.												
Spills and Phases: 1: Glenanna Rd & Kingston Rd												



HCM Signalized Intersection Capacity Analysis  
 2: Liverpool Rd & Kingston Rd

19225 | 1294 Kingston Rd  
 2028 FT P.M.: Option 4 Split Appr

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR	
Lane Configurations	←	←	←	←	←	←	←	←	←	←	←	
Traffic Volume (vph)	244	1069	330	226	525	85	302	934	278	119	378	
Future Volume (vph)	244	1069	330	226	525	85	302	934	278	119	378	
Ideal Flow (vphpl)	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	3.5	3.2	3.5	3.2	3.5	
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	
Frbp. ped/bikes	1.00	1.00	0.94	1.00	1.00	0.95	1.00	1.00	0.91	1.00	0.99	
Frbp. ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00	1.00	1.00	
Fit	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97	
Fit 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	1678	3535	1363	1672	4894	
Fit Permitted	0.34	1.00	1.00	0.12	1.00	1.00	0.36	1.00	1.00	0.19	1.00	
Satd. Flow (perm)	601	3500	1416	222	3500	1431	634	3535	1363	332	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	
Adj. Flow (vph)	265	1162	359	246	571	92	328	1015	302	129	411	
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	152	0	38	
Lane Group Flow (vph)	265	1162	359	246	571	92	328	1015	150	129	468	
Conf. Peds. (#/hr)	26	32	32	32	26	34	26	34	48	48	34	
Heavy Vehicles (%)	1%	2%	2%	1%	2%	2%	2%	1%	3%	3%	0%	
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Permitted Phases	7	4	4	3	8	8	5	2	2	1	6	
Actuated Green, G (s)	46.4	34.2	34.2	42.8	32.4	32.4	38.1	30.1	30.1	26.2	21.2	
Effective Green, g (s)	46.4	34.2	34.2	42.8	32.4	32.4	38.1	30.1	30.1	26.2	21.2	
Actuated g/C Ratio	0.46	0.34	0.34	0.43	0.32	0.32	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)	412	1197	484	249	1134	463	386	1064	410	153	1037	
v/s Ratio Prot	c0.08	c0.33	c0.10	0.16	c0.12	c0.29	c0.29	c0.29	0.04	0.10	0.10	
v/s Ratio Perm	0.22	0.25	0.32	0.06	0.06	0.21	0.11	0.11	0.11	0.18	0.18	
Uniform Delay, d1	0.64	0.97	0.74	0.99	0.50	0.20	0.85	0.95	0.36	0.84	0.45	
Progression Factor	1.00	1.00	1.00	1.38	1.44	1.46	1.00	1.00	1.00	0.94	0.91	
Incremental Delay, d2	3.4	19.3	6.1	52.2	0.3	0.2	15.9	18.5	2.5	23.9	1.0	
Delay (s)	20.9	51.7	35.1	87.2	39.7	35.8	40.4	52.8	29.9	54.9	32.2	
Level of Service	C	D	D	F	D	D	D	D	C	D	C	
Approach Delay (s)	43.8			52.2			46.1			36.8		
Approach LOS	D			D			D			D		
Intersection Summary												
HCM 2000 Control Delay	45.2 HCM 2000 Level of Service											
HCM 2000 Volume to Capacity ratio	0.99											
Actuated Cycle Length (s)	100.0 Sum of lost time (s)											
Intersection Capacity Utilization	93.1% ICU Level of Service											
Analysis Period (min)	15											
C Critical Lane Group												

Queues  
 2: Liverpool Rd & Kingston Rd

19225 | 1294 Kingston Rd  
 2028 FT P.M.: Option 4 Split Appr

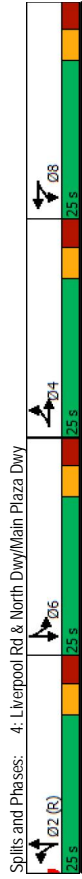
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR
Lane Configurations	←	←	←	←	←	←	←	←	←	←	←
Traffic Volume (vph)	244	1069	330	226	525	85	302	934	278	119	378
Future Volume (vph)	244	1069	330	226	525	85	302	934	278	119	378
Lane Group Flow (vph)	265	1162	359	246	571	92	328	1015	302	129	506
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA
Projected Phases	7	4	4	3	8	8	5	2	2	1	6
Permitted Phases	4	4	4	3	8	8	5	2	2	1	6
Switch Phase	7	4	4	3	8	8	5	2	2	1	6
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	41.6	41.6	13.4	39.0	39.0	17.0	37.0	37.0	8.0	28.0
Total Split (%)	16.0%	41.6%	41.6%	13.4%	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?	None	Min	None	Min	None	Min	None	C-Min	C-Min	None	C-Min
Recall Mode	0.61	0.97	0.74	0.95	0.50	0.20	0.80	0.95	0.54	0.78	0.47
v/s Ratio	20.1	53.1	40.0	75.0	41.7	37.9	38.0	53.6	12.5	44.8	29.5
Control Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
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	20.1	53.1	40.0	75.0	41.7	37.9	38.0	53.6	12.5	44.8	29.5
Queue Length 50th (m)	29.3	121.8	63.9	40.8	63.0	63.0	47.1	106.4	12.7	20.7	35.0
Queue Length 95th (m)	46.2	#168.4	#102.0	#83.2	78.2	31.3	#84.3	#149.2	39.1	m#27.2	m36.3
Internal Link Dist (m)	667.5 393.2 242.2										
Turn Bay Length (m)	33.5	49.1	103.2	61.6	46.2	61.6	46.2	51.8	30.9	30.9	30.9
Base Capacity (vph)	451	1197	484	259	1134	463	411	1064	562	166	1073
Stallion 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	0.59	0.97	0.74	0.95	0.50	0.20	0.80	0.95	0.54	0.78	0.47
Intersection Summary											
Cycle Length: 100											
Offset: 0 (0%)	Referenced to phase 2:NBL and 6:SBTL, Start of Green, Master Intersection										
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 measured by upstream signal.											
Spills and Phases:	2: Liverpool Rd & Kingston Rd										
Ø1	Ø2 (R)	Ø3	Ø4	Ø5	Ø6 (R)	Ø7	Ø8				
8 s	37 s	13.4 s	51.6 s	15 s	25 s	15 s	59 s				
17 s	Ø5	Ø6 (R)	Ø7	Ø8							

Queues  
 4: Liverpool Rd & North Dwy/Main Plaza Dwy

HCM Unsignalized Intersection Capacity Analysis  
 3: Liverpool Rd & South Dwy

19225 | 1294 Kingston Rd  
 2028 FT PM: Option 4 Split Appr

	EBL	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group	EBL	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	←	←	←	←	←	←	←
Traffic Volume (vph)	40	0	123	0	100	1014	76
Future Volume (vph)	40	0	123	0	100	1014	76
Lane Group Flow (vph)	43	51	134	107	109	1370	83
Turn Type	Split	NA	Split	NA	Split	NA	Split
Projected Phases	4	4	8	8	2	2	6
Permitted Phases	4	4	8	8	2	2	6
Detector Phase	4	4	8	8	2	2	6
Switch Phase	4	4	8	8	2	2	6
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	24.9	24.9	18.9	18.9	20.9	20.9	24.9
Total Split (s)	25.0	25.0	25.0	25.0	25.0	25.0	25.0
Total Split (%)	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%
Yellow Time (s)	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
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
LeadLag							
LeadLag Optimize?							
Recall Mode	None	None	None	None	C-Min	C-Min	Min
v/c Ratio	0.28	0.38	0.60	0.55	0.18	1.13	0.27
Control Delay	46.5	50.5	51.6	50.5	16.8	91.7	36.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	46.5	50.5	51.6	50.5	16.8	91.7	36.7
Queue Length 50th (m)	8.4	10.0	26.2	20.8	7.0	~187.0	15.3
Queue Length 95th (m)	18.7	21.3	43.3	36.3	m16.3m#245.0	29.7	#90.2
Internal Link Dist (m)	38.1	35.8			80.8		167.9
Turn Bay Length (m)					30.0		30.0
Base Capacity (vph)	312	275	312	272	607	1210	312
Stallion 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	0.14	0.19	0.43	0.39	0.18	1.13	0.27
Intersection Summary							
Cycle Length: 100							
Actuated Cycle Length: 100							
Offset: 21 (21%), Referenced to phase 2:NBLT, Start of Green							
Natural Cycle: 130							
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.							
m Volume for 95th percentile queue is metered by upstream signal.							



	EBL	NBL	NBT	SBT	SBR
Movement	EBL	NBL	NBT	SBT	SBR
Lane Configurations	←	←	←	←	←
Traffic Volume (veh/h)	0	26	0	1263	558
Future Volume (Veh/h)	0	26	0	1263	558
Sign Control	Stop	Free	Free	Free	Free
Grade	0%	0%	0%	0%	0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	28	0	1373	607
Pedestrians	4				
Lane Width (m)	3.2				
Walking Speed (m/s)	1.2				
Percent Blockage	0				
Right turn flare (veh)			None	None	None
Median storage (veh)					
Upstream signal (m)			59	105	
pX, platoon unblocked	0.79	0.86	0.86		
vC, conflicting volume	1298	308	611		
vC1, stage 1 conf vol					
vC2, stage 2 conf vol					
vCu, unblocked vol	45	0	230		
IC, single (s)	6.8	6.9	4.1		
IC, 2 stage (s)					
IF (s)	3.5	3.3	2.2		
p0 queue free %	100	97	100		
cM capacity (veh/h)	757	938	1161		
Direction, Lane #	EB.1	NB.1	NB.2	SB.1	SB.2
Volume Total	28	686	686	304	304
Volume Left	0	0	0	0	0
Volume Right	28	0	0	0	0
cSH	938	1700	1700	1700	1700
Volume to Capacity	0.03	0.40	0.40	0.18	0.18
Queue Length 95th (m)	0.7	0.0	0.0	0.0	0.0
Control Delay (s)	9.0	0.0	0.0	0.0	0.0
Lane LOS	A				
Approach Delay (s)	9.0	0.0	0.0	0.0	0.0
Approach LOS	A				
Intersection Summary					
Average Delay			0.1		
Intersection Capacity Utilization			38.2%		A
Analysis Period (min)			15		



Queues  
6: Liverpool Rd & Glenanna Rd

HCM Signalized Intersection Capacity Analysis  
4: Liverpool Rd & North Dwy/Main Plaza Dwy

19225 | 1294 Kingston Rd  
2028 FT PM: Option 4 Split Appr



Movement	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	4	4	4	4	8	2	2	6	6
Traffic Volume (vph)	45	72	112	54	145	348	633	67	352
Future Volume (vph)	45	72	112	54	145	348	633	67	352
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2
Total Lost Time (s)	6.9	6.9	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	1.00	1.00	1.00	1.00	1.00
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	1.00	1.00
Fit	0.95	1.00	1.00	0.95	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1725	1521	1725	1506	1725	3389	1725	3436	1725
Flt Permitted	0.95	1.00	1.00	0.95	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	1725	1521	1725	1506	1725	3389	1725	3436	1725
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	43	0	51	134	0	107	109	1102	268
RTOR Reduction (vph)	0	0	0	0	0	0	0	17	0
Lane Group Flow (vph)	43	51	0	134	107	0	109	1353	0
Conf. Peds. (#/hr)	1	1	1	1	1	1	1	15	6
Heavy Vehicles (%)	0%	0%	0%	0%	0%	1%	0%	0%	2%
Turn Type	Split	NA	NA	Split	NA	Split	NA	Split	NA
Permitted Phases	4	4	4	8	8	2	2	6	6
Protected Phases									
Actuated Green, G (s)	7.7	7.7	7.7	13.0	13.0	33.8	33.8	17.9	17.9
Effective Green, g (s)	7.7	7.7	7.7	13.0	13.0	33.8	33.8	17.9	17.9
Actuated g/C Ratio	0.08	0.08	0.08	0.13	0.13	0.34	0.34	0.18	0.18
Clearance Time (s)	6.9	6.9	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	3.0	3.0
Lane Grp Cap (vph)	132	117	224	195	583	1145	308	615	615
v/s Ratio Prot	0.02	c0.03	c0.08	0.07	0.06	c0.40	0.05	c0.16	
v/s Ratio Perm	0.33	0.44	0.60	0.55	0.19	1.18	0.27	0.90	
Uniform Delay, d1	43.7	44.1	41.0	40.8	23.4	33.1	35.4	40.2	
Progression Factor	1.00	1.00	1.00	1.00	0.61	0.66	0.96	0.98	
Incremental Delay, d2	1.4	2.6	4.3	3.1	0.4	87.5	0.5	16.3	
Delay (s)	45.1	46.7	45.3	43.9	14.8	109.2	34.6	55.7	
Level of Service	D	D	D	D	B	F	C	E	
Approach Delay (s)					44.7	102.3		53.0	
Approach LOS					D	F		D	
Intersection Summary	HCM 2000 Control Delay 81.5 HCM 2000 Level of Service F								
HCM 2000 Volume to Capacity ratio	0.93								
Actuated Cycle Length (s)	100.0 Sum of lost time (s) 27.6								
Intersection Capacity Utilization	71.1% ICU Level of Service C								
Analysis Period (min)	15								
Critical Lane Group	C								

Split and Phases: 6: Liverpool Rd & Glenanna Rd



Cycle Length: 100  
Offset: 31 (31%), Referenced to phase 2:NBT and 6:SBTL, Start of Green  
Natural Cycle: 60  
Control Type: Actuated-Coordinated  
m Volume for 95th percentile queue is metered by upstream signal.

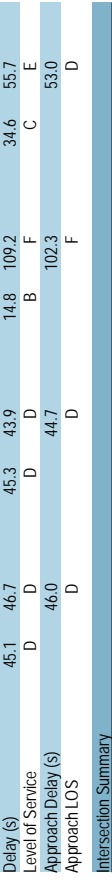
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Synchro 9 Report  
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19225 | 1294 Kingston Rd  
2028 FT PM: Option 4 Split Appr



Movement	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	4	0	47	123	0	98	100	1014	247
Traffic Volume (vph)	40	0	47	123	0	98	100	1014	247
Future Volume (vph)	40	0	47	123	0	98	100	1014	247
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2
Total Lost Time (s)	6.9	6.9	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	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.99	1.00	0.99	1.00	0.99	1.00	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
Fit	0.95	1.00	1.00	0.85	1.00	0.97	1.00	0.98	1.00
Satd. Flow (prot)	1725	1521	1725	1506	1725	3389	1725	3436	1725
Flt Permitted	0.95	1.00	1.00	0.95	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	1725	1521	1725	1506	1725	3389	1725	3436	1725
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	43	0	51	134	0	107	109	1102	268
RTOR Reduction (vph)	0	0	0	0	0	0	0	17	0
Lane Group Flow (vph)	43	51	0	134	107	0	109	1353	0
Conf. Peds. (#/hr)	1	1	1	1	1	1	1	15	6
Heavy Vehicles (%)	0%	0%	0%	0%	0%	1%	0%	0%	2%
Turn Type	Split	NA	NA	Split	NA	Split	NA	Split	NA
Permitted Phases	4	4	4	8	8	2	2	6	6
Protected Phases									
Actuated Green, G (s)	7.7	7.7	7.7	13.0	13.0	33.8	33.8	17.9	17.9
Effective Green, g (s)	7.7	7.7	7.7	13.0	13.0	33.8	33.8	17.9	17.9
Actuated g/C Ratio	0.08	0.08	0.08	0.13	0.13	0.34	0.34	0.18	0.18
Clearance Time (s)	6.9	6.9	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	3.0	3.0
Lane Grp Cap (vph)	132	117	224	195	583	1145	308	615	615
v/s Ratio Prot	0.02	c0.03	c0.08	0.07	0.06	c0.40	0.05	c0.16	
v/s Ratio Perm	0.33	0.44	0.60	0.55	0.19	1.18	0.27	0.90	
Uniform Delay, d1	43.7	44.1	41.0	40.8	23.4	33.1	35.4	40.2	
Progression Factor	1.00	1.00	1.00	1.00	0.61	0.66	0.96	0.98	
Incremental Delay, d2	1.4	2.6	4.3	3.1	0.4	87.5	0.5	16.3	
Delay (s)	45.1	46.7	45.3	43.9	14.8	109.2	34.6	55.7	
Level of Service	D	D	D	D	B	F	C	E	
Approach Delay (s)					44.7	102.3		53.0	
Approach LOS					D	F		D	
Intersection Summary	HCM 2000 Control Delay 81.5 HCM 2000 Level of Service F								
HCM 2000 Volume to Capacity ratio	0.93								
Actuated Cycle Length (s)	100.0 Sum of lost time (s) 27.6								
Intersection Capacity Utilization	71.1% ICU Level of Service C								
Analysis Period (min)	15								
Critical Lane Group	C								

Split and Phases: 6: Liverpool Rd & Glenanna Rd



Cycle Length: 100  
Offset: 31 (31%), Referenced to phase 2:NBT and 6:SBTL, Start of Green  
Natural Cycle: 60  
Control Type: Actuated-Coordinated  
m Volume for 95th percentile queue is metered by upstream signal.

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Synchro 9 Report  
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HCM Signalized Intersection Capacity Analysis  
 6: Liverpool Rd & Glenanna Rd

19225 | 1294 Kingston Rd  
 2028 FT PM: Option 4 Split Appr

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	
Traffic Volume (vph)	45	72	112	54	145	44	348	633	73	67	352	30	
Future Volume (vph)	45	72	112	54	145	44	348	633	73	67	352	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	5.9	6.7	6.7	6.7	6.7	6.7	6.7	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Frbp. ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00	0.99	1.00	
Fipb. ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.98	1.00	1.00	0.99	1.00	
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)	1725	1824	1543	1725	1791	1708	3448	1708	3448	1707	3527	3527	
Flt Permitted	0.43	1.00	1.00	0.71	1.00	0.51	1.00	0.51	1.00	0.35	1.00	1.00	
Satd. Flow (perm)	788	1824	1543	1282	1791	914	3448	914	3448	634	3527	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	122	59	158	48	378	688	79	73	383	33	
RTOR Reduction (vph)	0	0	102	0	13	0	0	6	0	0	4	0	
Lane Group Flow (vph)	49	78	20	59	193	0	378	761	0	73	412	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	Perm	NA	NA	
Protected Phases	4		4	8		8		2		6		6	
Permitted Phases	4		4	8		8		2		6		6	
Actuated Green, G (s)	16.0	16.0	16.0	16.0	16.0	16.0	71.4	71.4	71.4	71.4	71.4	71.4	
Effective Green, g (s)	16.0	16.0	16.0	16.0	16.0	16.0	71.4	71.4	71.4	71.4	71.4	71.4	
Actuated g/C Ratio	0.16	0.16	0.16	0.16	0.16	0.16	0.71	0.71	0.71	0.71	0.71	0.71	
Clearance Time (s)	5.9	5.9	5.9	5.9	5.9	5.9	6.7	6.7	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	3.0	3.0	3.0	
Lane Grp Cap (vph)	126	291	246	205	286	652	2461	652	2461	452	2518	2518	
w/s Ratio Prot	0.04			c0.11			0.22			0.12		0.12	
w/s Ratio Perm	0.06		0.01	0.05		c0.41				0.12		0.12	
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	7.0	5.2			4.6		4.6	
Progression Factor	1.00	1.00	1.00	0.70	0.77	0.63	0.11			1.00		1.00	
Incremental Delay, d2	2.0	0.5	0.1	0.8	6.0	0.3	0.0			0.8		0.1	
Delay (s)	39.6	37.4	35.9	26.7	36.5	4.7	0.6			5.4		4.8	
Level of Service	D	D	D	C	D	A	A			A		A	
Approach Delay (s)			37.1		34.3		2.0			4.9		4.9	
Approach LOS			D		C		A			A		A	
<b>Intersection Summary</b>													
HCM 2000 Control Delay	10.7											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	67.9%											ICU Level of Service	C
Analysis Period (min)	15												
c Critical Lane Group													



## Phasing Plan 2

Exclusive North and South Left Phases, Permissive North-South Phase and Protected East and West Phases



**Weekday AM Peak Hour**

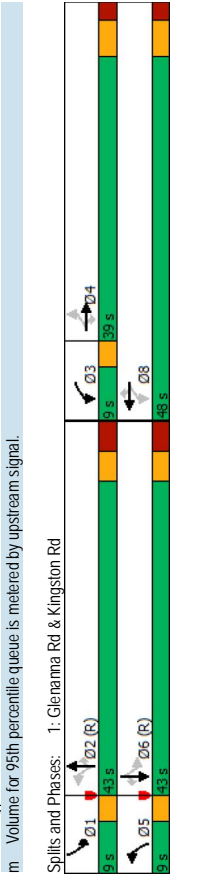
HCM Signalized Intersection Capacity Analysis  
 1: Glenanna Rd & Kingston Rd  
 19225 | 1294 Kingston Rd  
 2028 FT AM: Option 4 N-S Prot Left

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	10	413	92	96	590	122	52	73	64	190	102	26
Traffic Volume (vph)	10	413	92	96	590	122	52	73	64	190	102	26
Future Volume (vph)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Ideal Flow (vphpl)	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2
Lane Width	6.4	6.4	6.4	3.0	6.4	3.0	7.0	3.0	7.0	3.0	7.0	7.0
Total Lost Time (s)	1.00	1.00	0.91	1.00	1.00	0.96	1.00	1.00	0.93	1.00	1.00	0.93
Lane Util. Factor	0.99	1.00	1.00	0.99	1.00	1.00	0.97	1.00	0.97	1.00	0.97	1.00
Frbp, ped/bikes	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	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Flt Protected	1568	3305	1303	1646	3400	1464	1667	1860	1397	1641	1773	1436
Satd. Flow (prot)	0.41	1.00	1.00	0.31	1.00	1.00	0.69	1.00	1.00	0.66	1.00	1.00
Flt Permitted	674	3305	1303	533	3400	1464	1203	1860	1397	1134	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	449	100	104	641	133	57	79	70	207	111	28
RTOR Reduction (vph)	0	0	0	0	0	65	0	0	42	0	0	15
Lane Group Flow (vph)	11	449	100	104	641	68	57	79	28	207	111	13
Conf. Peds. (#/hr)	8	25	25	8	35	8	35	34	34	34	34	35
Heavy Vehicles (%)	9%	8%	8%	4%	5%	1%	0%	1%	3%	2%	6%	0%
Turn Type	Perm	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm
Permitted Phases	4	4	8	8	8	2	2	2	2	6	6	6
Actuated Green, G (s)	20.1	20.1	31.7	31.7	31.7	46.3	40.3	40.3	40.3	54.9	45.9	45.9
Effective Green, g (s)	20.1	20.1	31.7	31.7	31.7	46.3	40.3	40.3	40.3	54.9	45.9	45.9
Actuated g/C Ratio	0.20	0.20	0.32	0.32	0.32	0.46	0.40	0.40	0.40	0.55	0.46	0.46
Clearance Time (s)	6.4	6.4	3.0	6.4	3.0	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	3.0
Lane Grp Cap (vph)	135	664	261	264	1077	464	584	749	562	681	813	659
v/s Ratio Prot	c0.14		0.03	c0.19		0.01	0.04		0.02	c0.04	0.06	
v/s Ratio Perm	0.02	0.08	0.09	0.05	0.04	0.05	0.04	0.02	0.02	c0.13	0.06	0.01
Uniform Delay, d1	32.5	36.9	34.6	25.3	28.7	24.5	14.9	18.6	18.2	11.7	15.6	14.8
Progression Factor	1.46	1.30	1.35	1.00	1.00	1.00	1.00	1.00	1.00	0.68	0.70	1.00
Incremental Delay, d2	0.2	2.6	0.9	1.0	0.9	0.1	0.1	0.3	0.2	0.3	0.3	0.1
Level of Service	D	D	D	C	C	C	B	B	B	A	B	B
Approach Delay (s)	D	D	D	C	C	C	B	B	B	A	B	B
Approach LOS	D	D	D	C	C	C	B	B	B	A	B	B

Intersection Summary	Value
HCM 2000 Control Delay	30.1
HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.44
Actuated Cycle Length (s)	100.0
Intersection Capacity Utilization	54.2%
Analysis Period (min)	15
Critical Lane Group	

Queues  
 1: Glenanna Rd & Kingston Rd  
 19225 | 1294 Kingston Rd  
 2028 FT AM: Option 4 N-S Prot Left

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	10	413	92	96	590	122	52	73	64	190	102	26
Traffic Volume (vph)	10	413	92	96	590	122	52	73	64	190	102	26
Future Volume (vph)	10	413	92	96	590	122	52	73	64	190	102	26
Lane Group Flow (vph)	11	449	100	104	641	133	57	79	70	207	111	28
Turn Type	Perm	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm
Projected Phases	4	4	4	4	4	8	8	2	2	6	6	6
Permitted Phases	4	4	4	4	4	8	8	2	2	6	6	6
Detector Phase	4	4	4	4	4	8	8	2	2	6	6	6
Switch Phase	4	4	4	4	4	8	8	2	2	6	6	6
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)	24.4	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	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%	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	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	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	0.0
Total Lost Time (s)	6.4	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	Lag	Lead	Lead	Lead	Lag	Lag	Lag	Lead	Lag	Lag
Lead/Lag Optimize?	None	None	None	None	None	None	None	None	None	None	None	None
Recall Mode	0.08	0.68	0.38	0.35	0.61	0.26	0.09	0.10	0.11	0.28	0.13	0.04
v/c Ratio	46.6	53.1	50.3	24.2	31.0	8.8	11.7	23.4	2.9	8.5	13.7	0.2
Control 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
Queue Length	46.6	53.1	50.3	24.2	31.0	8.8	11.7	23.4	2.9	8.5	13.7	0.2
Queue Length 50th (m)	2.2	51.1	21.2	14.4	57.1	5.4	4.7	9.8	0.0	11.9	8.0	0.2
Queue Length 95th (m)	m6.4	67.9	38.4	23.1	65.5	16.5	12.6	24.8	5.5	22.7	19.8	0.0
Internal Link Dist (m)		393.2			523.9		174.6				416.6	
Turn Bay Length (m)	42.6	60.4	33.0	33.0	23.2	25.4	25.4	25.0	27.3	25.0	27.3	16.5
Base Capacity (vph)	219	1077	424	293	1414	664	653	802	660	728	843	737
Stallion 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	0.05	0.42	0.24	0.35	0.45	0.20	0.09	0.10	0.11	0.28	0.13	0.04
Intersection Summary												
Cycle Length: 100												
Actuated Cycle Length: 100												
Offset: 5 (9%), Referenced to phase 2:NBLT and 6:SBTL, Start of Green												
Natural Cycle: 70												
Control Type: Actuated-Coordinated												
m Volume for 95th percentile queue is metered by upstream signal.												



HCM Signalized Intersection Capacity Analysis  
 2: Liverpool Rd & Kingston Rd

19225 | 1294 Kingston Rd  
 2028 FT AM: Option 4 N-S Prot Left



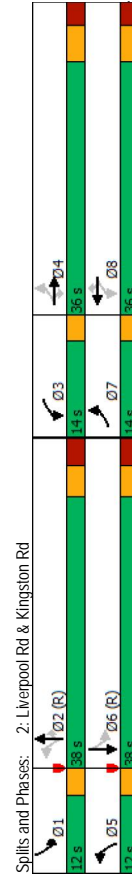
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR
Lane Configurations	←	←	←	←	←	←	←	←	←	←	←
Traffic Volume (vph)	101	394	254	178	493	49	215	461	122	85	871
Future Volume (vph)	101	394	254	178	493	49	215	461	122	85	871
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.5	3.2	3.2	3.5	3.2	3.5	3.2	3.2	3.2	3.5
Total Lost Time (s)	3.0	7.0	3.0	3.0	7.0	3.0	6.9	6.9	3.0	6.9	3.2
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
Frbp. ped/bikes	1.00	1.00	0.96	1.00	1.00	0.96	1.00	1.00	0.95	1.00	0.99
Frbp. ped/bikes	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98
Flt	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	1329	1675	4911
Flt Permitted	0.35	1.00	1.00	0.39	1.00	1.00	0.16	1.00	1.00	0.47	1.00
Satd. Flow (perm)	607	3368	1462	679	3400	1487	281	3500	1329	826	4911
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
Adj. Flow (vph)	110	428	276	193	536	53	234	501	133	92	947
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	81	0	15
Lane Group Flow (vph)	110	428	276	193	536	53	234	501	52	92	1047
Conf. Peds. (#/hr)	15	19	9	15	22	15	22	25	25	25	44
Heavy Vehicles (%)	4%	6%	1%	5%	5%	0%	2%	2%	10%	2%	2%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA
Permitted Phases	7	4	4	3	8	8	5	2	2	1	6
Actuated Green, G (s)	32.8	23.6	23.6	35.8	25.1	25.1	48.8	39.0	39.0	40.8	34.0
Effective Green, g (s)	32.8	23.6	23.6	35.8	25.1	25.1	48.8	39.0	39.0	40.8	34.0
Actuated g/C Ratio	0.33	0.24	0.24	0.36	0.25	0.25	0.49	0.39	0.39	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)	295	794	345	345	853	373	303	1365	518	394	1669
v/s Ratio Prot	0.03	0.13	0.06	0.16	0.16	0.09	0.14	0.09	0.14	0.02	0.21
v/s Ratio Perm	0.09	0.19	0.14	0.14	0.04	0.29	0.04	0.04	0.04	0.08	0.08
Uniform Delay, d1	0.37	0.54	0.80	0.56	0.63	0.14	0.77	0.37	0.10	0.23	0.63
Progression Factor	24.4	33.4	36.0	23.5	33.3	29.1	17.3	21.7	19.4	18.5	27.7
Incremental Delay, d2	0.8	0.7	12.5	1.9	1.4	0.2	11.6	0.8	0.4	0.1	0.6
Delay (s)	25.2	34.1	48.4	13.9	13.2	10.5	28.9	22.5	19.7	5.8	19.4
Level of Service	C	C	D	B	B	B	C	C	C	B	A
Approach Delay (s)	C	37.8	D	B	B	B	23.8	C	B	A	18.3
Approach LOS	D	B	B	B	B	B	C	C	B	A	B
Intersection Summary											
HCM 2000 Control Delay	22.9 HCM 2000 Level of Service C										
HCM 2000 Volume to Capacity ratio	0.78										
Actuated Cycle Length (s)	100.0 Sum of lost time (s) 19.9										
Intersection Capacity Utilization	72.3% ICU Level of Service C										
Analysis Period (min)	15										
Critical Lane Group	C										

Queues  
 2: Liverpool Rd & Kingston Rd

19225 | 1294 Kingston Rd  
 2028 FT AM: Option 4 N-S Prot Left



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR
Lane Configurations	←	←	←	←	←	←	←	←	←	←	←
Traffic Volume (vph)	101	394	254	178	493	49	215	461	122	85	871
Future Volume (vph)	101	394	254	178	493	49	215	461	122	85	871
Lane Group Flow (vph)	110	428	276	193	536	53	234	501	133	92	1062
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA
Projected Phases	7	4	4	3	8	8	5	2	2	1	6
Permitted Phases	4	4	4	3	8	8	5	2	2	1	6
Switch Phase	7	4	4	3	8	8	5	2	2	1	6
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?	None	Min	None	None	Min	Min	None	C-Max	C-Max	None	C-Max
Recall Mode	0.34	0.54	0.80	0.52	0.63	0.14	0.75	0.36	0.22	0.21	0.63
v/c Ratio	20.2	35.3	53.0	14.4	15.0	10.5	34.6	24.4	5.6	4.6	19.6
Control Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
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	20.2	35.3	53.0	14.4	15.0	10.5	34.6	24.4	5.6	4.6	19.6
Queue Length 50th (m)	13.4	39.6	52.4	5.7	21.4	1.9	25.9	39.6	0.0	1.7	79.6
Queue Length 95th (m)	22.8	52.1	78.5	17.1	26.5	5.7	73.8	88.7	13.3	2.1	178.6
Internal Link Dist (m)	667.5										
Turn Bay Length (m)	393.2										
Base Capacity (vph)	33.5	49.1	103.2	61.6	46.2	61.6	46.2	51.8	30.9	30.9	168.7
Stallion Cap Reductn	348	976	423	375	986	431	310	1387	607	464	1687
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	0.32	0.44	0.65	0.51	0.54	0.12	0.75	0.36	0.22	0.20	0.63
Intersection Summary											
Cycle Length: 100											
Actuated Cycle Length: 100											
Offset: 0 (0%). Referenced to phase 2:NBL and 6:SBTL, Start of Green, Master Intersection											
Natural Cycle: 75											
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.											



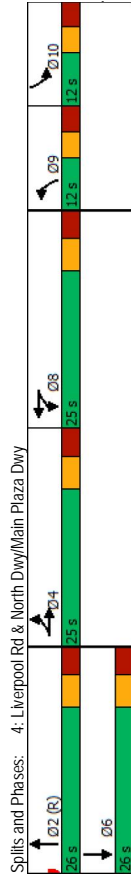
Queues  
 4: Liverpool Rd & North Dwy/Main Plaza Dwy

HCM Unsignalized Intersection Capacity Analysis  
 3: Liverpool Rd & South Dwy

19225 | 1294 Kingston Rd  
 2028 FT AM: Option 4 N-S Prot Left

19225 | 1294 Kingston Rd  
 2028 FT AM: Option 4 N-S Prot Left

Lane Group	EBL	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	50	0	106	0	33	474	94
Future Volume (vph)	50	0	106	0	33	474	94
Lane Group Flow (vph)	54	63	115	64	36	692	102
Turn Type	Split	NA	Split	NA	Prot	NA	Prot
Projected Phases	4	4	8	8	9	2	10
Permitted Phases	4	4	8	8	9	2	10
Detector Phase	4	4	8	8	9	2	10
Switch Phase							
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	24.9	24.9	24.9	11.0	24.9	11.0	24.9
Total Split (s)	25.0	25.0	25.0	12.0	26.0	12.0	26.0
Total Split (%)	25.0%	25.0%	25.0%	12.0%	26.0%	12.0%	26.0%
Yellow Time (s)	3.7	3.7	3.7	3.0	3.7	3.0	3.7
All-Red Time (s)	3.2	3.2	3.2	3.0	3.2	3.0	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	6.0	6.9	6.0	6.9
Lead/Lag				Lead		Lag	
Lead-Lag Optimize?							
Recall Mode	None	None	None	Min	C-Min	Min	Min
v/c Ratio	0.32	0.46	0.56	0.34	0.27	0.72	0.51
Control Delay	45.5	52.4	51.4	43.9	39.6	48.4	56.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	45.5	52.4	51.4	43.9	39.6	48.4	56.5
Queue Length 50th (m)	10.4	12.3	22.5	12.2	7.4	75.3	19.3
Queue Length 95th (m)	21.7	24.8	38.7	24.2	17.5	118.3	51.9
Internal Link Dist (m)			37.6		80.8		167.9
Turn Bay Length (m)				30.0		30.0	
Base Capacity (vph)	312	249	309	284	132	961	200
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	0.17	0.25	0.37	0.23	0.27	0.72	0.51
<b>Intersection Summary</b>							
Cycle Length: 100							
Actuated Cycle Length: 100							
Offset: 75 (75%), Referenced to phase 2:NBT, Start of Green							
Natural Cycle: 110							
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.							



Spits and Phases: 4: Liverpool Rd & North Dwy/Main Plaza Dwy

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↔	↔	↔	↔	↔
Traffic Volume (veh/h)	0	32	0	611	1030	0
Future Volume (Veh/h)	0	32	0	611	1030	0
Sign Control	Stop	Free	Free	Free	Free	Free
Grade	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	35	0	664	1120	0
Pedestrians	4					
Lane Width (m)	3.2					
Walking Speed (m/s)	1.2					
Percent Blockage	0					
Right turn flare (veh)				None	TW/LTL	
Median storage (veh)					2	
Upstream signal (m)				59	105	
pX, platoon unblocked	0.79	0.74	0.74			
vC, conflicting volume	1456	564	1124			
vC1, stage 1 conf vol	1124					
vC2, stage 2 conf vol	332					
vCu, unblocked vol	466	0	452			
IC, 1 stage (s)	6.8	7.1	4.1			
IC, 2 stage (s)	5.8					
p0 queue free %	3.5	3.4	2.2			
cM capacity (veh/h)	440	779	822			
<b>Direction, Lane #</b>						
Volume Total	EB.1	NB.1	NB.2	SB.1	SB.2	
Volume Left	35	332	332	560	560	
Volume Right	0	0	0	0	0	
cSH	35	0	0	0	0	
Volume to Capacity	779	1700	1700	1700	1700	
Queue Length 95th (m)	0.04	0.20	0.20	0.33	0.33	
Control Delay (s)	1.1	0.0	0.0	0.0	0.0	
Lane LOS	A	A	A	A	A	
Approach Delay (s)	9.8	0.0	0.0	0.0	0.0	
Approach LOS	A	A	A	A	A	
<b>Intersection Summary</b>						
Average Delay						0.2
Intersection Capacity Utilization						38.5%
Analysis Period (min)						15
						A



Queues  
6: Liverpool Rd & Glenanna Rd

HCM Signalized Intersection Capacity Analysis  
4: Liverpool Rd & North Dwy/Main Plaza Dwy

19225 | 1294 Kingston Rd  
2028 FT AM: Option 4 N-S Prot Left



Movement	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Traffic Volume (vph)	47	138	251	71	87	115	376	73	658	
Future Volume (vph)	47	138	251	71	87	115	376	73	658	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.5	3.2	3.2	3.5	3.2	3.5	3.2	3.5	3.2
Total Lost time (s)	6.9	6.9	6.9	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	1.00	1.00	1.00	1.00	1.00	1.00
Frbp, ped/bikes	1.00	0.99	1.00	1.00	0.99	1.00	0.98	1.00	1.00	1.00
Frbp, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Flt	1.00	0.85	1.00	0.85	1.00	0.96	1.00	1.00	1.00	1.00
Flt Protected	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1725	1381	1708	1574	1725	3275	1691	3484		
Flt Permitted	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	1725	1381	1708	1574	1725	3275	1691	3484		
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	54	0	63	115	0	64	36	515	177	102
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	54	63	0	115	64	0	36	661	0	102
Conf. Peds. (#/hr)	1	1	1	1	1	1	1	1	1	1
Heavy Vehicles (%)	0%	0%	14%	1%	0%	0%	0%	4%	0%	2%
Turn Type	Split	NA	NA	Split	NA	Prot	NA	Prot	NA	Prot
Protected Phases	4	4	4	8	8	9	2	10	6	6
Permitted Phases										
Actuated Green, G (s)	8.8	8.8	12.0	12.0	12.0	7.6	27.1	11.8	27.1	
Effective Green, g (s)	8.8	8.8	12.0	12.0	12.0	7.6	27.1	11.8	27.1	
Actuated g/C Ratio	0.09	0.09	0.12	0.12	0.12	0.08	0.27	0.12	0.27	
Clearance Time (s)	6.9	6.9	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	3.0	3.0	
Lane Grp Cap (vph)	151	121	204	188	131	887	199	944		
v/s Ratio Prot	0.03	c0.05	c0.07	0.04	c0.02	0.20	c0.06	c0.31		
v/s Ratio Perm	0.36	0.52	0.56	0.34	0.27	0.75	0.51	1.13		
Uniform Delay, d1	42.9	43.6	41.5	40.4	43.6	33.3	41.4	36.5		
Progression Factor	1.00	1.00	1.00	1.00	1.00	0.80	1.35	1.11		
Incremental Delay, d2	1.5	4.0	3.5	1.1	1.1	5.5	2.1	70.2		
Delay (s)	44.4	47.6	45.1	41.5	44.7	38.8	43.5	106.7		
Level of Service	D	D	D	D	D	D	D	D		
Approach Delay (s)	46.1	46.1	43.8	43.8	49.9	49.9	99.4	99.4		
Approach LOS	D	D	D	D	D	D	F	F		
<b>Intersection Summary</b>										
HCM 2000 Control Delay	75.5									
HCM 2000 Volume to Capacity ratio	0.74									
Actuated Cycle Length (s)	100.0									
Intersection Capacity Utilization	60.4%									
Analysis Period (min)	15									
Critical Lane Group	c Critical Lane Group									

Queues  
6: Liverpool Rd & Glenanna Rd

HCM Signalized Intersection Capacity Analysis  
4: Liverpool Rd & North Dwy/Main Plaza Dwy

19225 | 1294 Kingston Rd  
2028 FT AM: Option 4 N-S Prot Left



Movement	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Traffic Volume (vph)	47	138	251	71	87	115	376	73	658	
Future Volume (vph)	47	138	251	71	87	115	376	73	658	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.5	3.2	3.2	3.5	3.2	3.5	3.2	3.5	3.2
Total Lost time (s)	6.9	6.9	6.9	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	1.00	1.00	1.00	1.00	1.00	1.00
Frbp, ped/bikes	1.00	0.99	1.00	1.00	0.99	1.00	0.98	1.00	1.00	1.00
Frbp, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Flt	1.00	0.85	1.00	0.85	1.00	0.96	1.00	1.00	1.00	1.00
Flt Protected	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1725	1381	1708	1574	1725	3275	1691	3484		
Flt Permitted	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	1725	1381	1708	1574	1725	3275	1691	3484		
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	54	0	63	115	0	64	36	515	177	102
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	54	63	0	115	64	0	36	661	0	102
Conf. Peds. (#/hr)	1	1	1	1	1	1	1	1	1	1
Heavy Vehicles (%)	0%	0%	14%	1%	0%	0%	0%	4%	0%	2%
Turn Type	Split	NA	NA	Split	NA	Prot	NA	Prot	NA	Prot
Protected Phases	4	4	4	8	8	9	2	10	6	6
Permitted Phases										
Actuated Green, G (s)	8.8	8.8	12.0	12.0	12.0	7.6	27.1	11.8	27.1	
Effective Green, g (s)	8.8	8.8	12.0	12.0	12.0	7.6	27.1	11.8	27.1	
Actuated g/C Ratio	0.09	0.09	0.12	0.12	0.12	0.08	0.27	0.12	0.27	
Clearance Time (s)	6.9	6.9	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	3.0	3.0	
Lane Grp Cap (vph)	151	121	204	188	131	887	199	944		
v/s Ratio Prot	0.03	c0.05	c0.07	0.04	c0.02	0.20	c0.06	c0.31		
v/s Ratio Perm	0.36	0.52	0.56	0.34	0.27	0.75	0.51	1.13		
Uniform Delay, d1	42.9	43.6	41.5	40.4	43.6	33.3	41.4	36.5		
Progression Factor	1.00	1.00	1.00	1.00	1.00	0.80	1.35	1.11		
Incremental Delay, d2	1.5	4.0	3.5	1.1	1.1	5.5	2.1	70.2		
Delay (s)	44.4	47.6	45.1	41.5	44.7	38.8	43.5	106.7		
Level of Service	D	D	D	D	D	D	D	D		
Approach Delay (s)	46.1	46.1	43.8	43.8	49.9	49.9	99.4	99.4		
Approach LOS	D	D	D	D	D	D	F	F		
<b>Intersection Summary</b>										
HCM 2000 Control Delay	75.5									
HCM 2000 Volume to Capacity ratio	0.74									
Actuated Cycle Length (s)	100.0									
Intersection Capacity Utilization	60.4%									
Analysis Period (min)	15									
Critical Lane Group	c Critical Lane Group									

Split and Phases: 6: Liverpool Rd & Glenanna Rd



Phase	Duration (s)	Offset (s)
D02 (E)	56 s	0 s
D04	34 s	0 s
D06 (E)	56 s	0 s



HCM Signalized Intersection Capacity Analysis  
 6: Liverpool Rd & Glenanna Rd

19225 | 1294 Kingston Rd  
 2028 FT AM: Option 4 N-S Prot Left

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	←	←	←	←	←	←	←	←	←	←	←	←
Traffic Volume (vph)	47	138	251	71	87	56	115	376	33	73	658	69
Future Volume (vph)	47	138	251	71	87	56	115	376	33	73	658	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	5.9	6.7	6.7	6.7	6.7	6.7	6.7
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frbp. ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00	0.99	1.00	1.00
Frbp. ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00	0.99	1.00	1.00
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)	1658	1773	1513	1675	1717	1658	3353	1639	3410	1639	3410	1639
Flt Permitted	0.55	1.00	1.00	0.57	1.00	0.35	1.00	0.49	1.00	0.49	1.00	0.49
Satd. Flow (perm)	965	1773	1513	1008	1717	605	3353	853	3410	853	3410	853
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	273	77	95	61	125	409	36	79	715	75
RTOR Reduction (vph)	0	0	185	0	27	0	0	4	0	0	5	0
Lane Group Flow (vph)	51	150	88	77	129	0	125	441	0	79	785	0
Confl. Peds. (#/hr)							11		8		8	
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	Perm	NA	Perm
Protected Phases	4		4	8		8		2		6		6
Permitted Phases	4		4	8		8		2		6		6
Actuated Green, G (s)	14.1	14.1	14.1	14.1	14.1	14.1	73.3	73.3	73.3	73.3	73.3	73.3
Effective Green, g (s)	14.1	14.1	14.1	14.1	14.1	14.1	73.3	73.3	73.3	73.3	73.3	73.3
Actuated g/C Ratio	0.14	0.14	0.14	0.14	0.14	0.14	0.73	0.73	0.73	0.73	0.73	0.73
Clearance Time (s)	5.9	5.9	5.9	5.9	5.9	5.9	6.7	6.7	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	3.0	3.0	3.0
Lane Grp Cap (vph)	136	249	213	142	242	443	2457	625	2499	625	2499	625
w/s Ratio Prot	c0.08					0.07		0.13				c0.23
w/s Ratio Perm	0.05		0.06	0.08		0.21		0.09				0.09
v/c Ratio	0.38	0.60	0.41	0.54	0.53	0.28	0.18	0.13	0.31	0.13	0.31	0.31
Uniform Delay, d1	39.0	40.3	39.2	39.9	39.9	4.5	4.1	3.9	4.6	3.9	4.6	4.6
Progression Factor	1.00	1.00	1.00	0.95	0.94	0.54	0.39	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.7	4.1	1.3	4.2	2.2	1.2	0.1	0.4	0.3	0.4	0.3	0.3
Delay (s)	40.7	44.4	40.5	42.1	39.6	3.7	1.7	4.3	5.0	4.3	5.0	5.0
Level of Service	D	D	D	D	D	A	A	A	A	A	A	A
Approach Delay (s)		41.7		40.4		2.2		4.9		4.9		4.9
Approach LOS		D		D		A		A		A		A
<b>Intersection Summary</b>												
HCM 2000 Control Delay	16.2 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	62.5% ICU Level of Service B											
Analysis Period (min)	15											
c Critical Lane Group												



**Weekday PM Peak Hour**

HCM Signalized Intersection Capacity Analysis  
 1: Glenanna Rd & Kingston Rd

19225 | 1294 Kingston Rd  
 2028 FT PM: Option 4 N-S Prot Left



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR
Lane Configurations	24	1218	141	156	614	132	120	177	194	178	199
Traffic Volume (vph)	24	1218	141	156	614	132	120	177	194	178	199
Future Volume (vph)	24	1218	141	156	614	132	120	177	194	178	199
Ideal Flow (vphpl)	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
Total Lost Time (s)	6.4	6.4	6.4	3.0	6.4	6.4	7.0	7.0	3.0	7.0	7.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frbp. ped/bikes	1.00	1.00	0.83	1.00	1.00	0.90	1.00	1.00	0.91	1.00	0.84
Frbp. ped/bikes	0.97	1.00	1.00	1.00	1.00	1.00	0.96	1.00	1.00	0.97	1.00
Frbp. ped/bikes	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	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
Satd. Flow (prot)	1668	3500	1220	1658	3500	1373	1649	1879	1385	1673	1824
Flt Permitted	0.40	1.00	1.00	0.08	1.00	1.00	0.47	1.00	1.00	0.53	1.00
Satd. Flow (perm)	699	3500	1220	147	3500	1373	814	1879	1385	935	1824
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
Adj. Flow (vph)	26	1324	153	170	667	143	130	192	211	193	216
RTOR Reduction (vph)	0	0	0	0	0	39	0	0	171	0	32
Lane Group Flow (vph)	26	1324	153	170	667	104	130	192	40	193	216
Conf. Peds. (#/hr)	30	55	55	55	30	91	0%	1%	0%	50	50
Heavy Vehicles (%)	0%	2%	5%	4%	2%	1%	0%	0%	0%	0%	3%
Turn Type	Perm	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm	pm-pt	NA
Permitted Phases	4	4	4	8	8	8	5	2	2	1	6
Actuated Green, G (s)	44.5	44.5	44.5	60.3	60.3	60.3	23.3	17.3	17.3	23.3	17.3
Effective Green, g (s)	44.5	44.5	44.5	60.3	60.3	60.3	23.3	17.3	17.3	23.3	17.3
Actuated g/C Ratio	0.44	0.44	0.44	0.60	0.60	0.60	0.23	0.17	0.17	0.23	0.17
Clearance Time (s)	6.4	6.4	6.4	3.0	6.4	6.4	3.0	7.0	7.0	3.0	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	1557	542	282	2110	827	239	325	239	262	315
v/s Ratio Prot	c0.38	c0.08	0.19	0.08	0.19	0.08	0.03	0.10	0.03	c0.04	0.12
v/s Ratio Perm	0.04	0.13	0.29	0.08	0.32	0.13	0.09	0.08	0.03	c0.13	0.01
Uniform Delay, d1	16.0	24.8	17.6	19.7	9.7	8.5	32.4	38.1	35.2	34.7	38.8
Progression Factor	0.48	0.52	0.46	1.00	1.00	1.00	1.00	1.00	1.00	0.98	0.99
Incremental Delay, d2	0.1	2.2	0.1	3.6	0.1	0.1	2.5	7.7	1.5	10.3	11.5
Delay (s)	7.7	15.2	8.3	23.3	9.8	8.6	34.9	45.8	36.7	44.5	49.9
Level of Service	A	B	A	C	A	A	C	D	D	D	C
Approach Delay (s)	14.4			12.0			39.5			46.2	
Approach LOS	B			B			D			D	
Intersection Summary											
HCM 2000 Control Delay	21.7	HCM 2000 Level of Service									
HCM 2000 Volume to Capacity ratio	0.78	C									
Actuated Cycle Length (s)	100.0	Sum of lost time (s)									
Intersection Capacity Utilization	86.0%	ICU Level of Service									
Analysis Period (min)	15	E									
C Critical Lane Group	D										

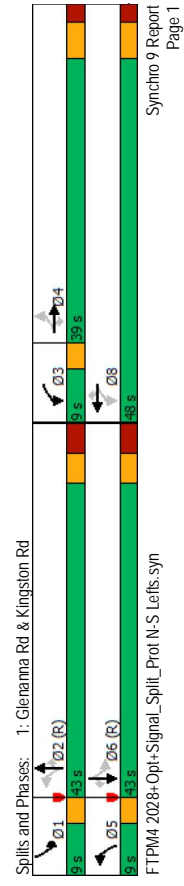
FTPM4 2028+Opt+Signal\_SplitL\_Prot N-S Lefts syn  
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Queues  
 1: Glenanna Rd & Kingston Rd

19225 | 1294 Kingston Rd  
 2028 FT PM: Option 4 N-S Prot Left



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR
Lane Configurations	24	1218	141	156	614	132	120	177	194	178	199
Traffic Volume (vph)	24	1218	141	156	614	132	120	177	194	178	199
Future Volume (vph)	24	1218	141	156	614	132	120	177	194	178	199
Lane Group Flow (vph)	26	1324	153	170	667	143	130	192	211	193	216
Turn Type	Perm	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm	pm-pt	NA
Permitted Phases	4	4	4	8	8	8	5	2	2	1	6
Permitted Phases	4	4	4	8	8	8	5	2	2	1	6
Switch Phase	4	4	4	8	8	8	5	2	2	1	6
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	24.4	8.0	24.4	24.4	8.0	25.0	25.0	8.0	25.0
Total Split (s)	39.0	39.0	39.0	9.0	48.0	48.0	9.0	43.0	43.0	9.0	43.0
Total Split (%)	39.0%	39.0%	39.0%	9.0%	48.0%	48.0%	9.0%	43.0%	43.0%	9.0%	43.0%
Yellow Time (s)	4.2	4.2	4.2	3.0	4.2	4.2	3.0	3.3	3.3	3.0	3.3
All-Red Time (s)	2.2	2.2	2.2	0.0	2.2	2.2	0.0	3.7	3.7	0.0	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	6.4	3.0	6.4	6.4	3.0	7.0	7.0	3.0	7.0
Lead/Lag	Lag	Lag	Lag	Lag	Lead	Lead	Lag	Lag	Lag	Lead	Lag
Lead/Lag Optimize?	None	None	None	None	None	None	None	None	None	None	None
Recall Mode	0.08	0.85	0.28	0.59	0.32	0.17	0.49	0.59	0.51	0.65	0.69
v/s Ratio	9.5	18.5	9.9	25.0	10.9	4.4	32.3	44.9	9.8	38.7	49.1
Control Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Queue Delay	9.5	18.5	9.9	25.0	10.9	4.4	32.3	44.9	9.8	38.7	49.1
Total Delay	0.9	139.0	5.1	15.7	32.4	3.5	19.9	36.5	0.7	33.0	44.2
Queue Length 50th (m)	m2.8m#18.1	m20.8	39.7	50.8	13.5	32.0	55.0	19.2	42.1	66.7	0.5
Queue Length 95th (m)	393.2			523.9			174.6			416.6	
Turn Bay Length (m)	42.6	60.4	33.0	23.2	25.4	25.4	25.0	27.3	25.0	27.3	16.5
Base Capacity (vph)	310	1557	542	287	2110	866	265	676	631	296	532
Stallion Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillover 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	0.85	0.28	0.59	0.32	0.17	0.49	0.28	0.33	0.65	0.33
Intersection Summary											
Cycle Length: 100											
Actuated Cycle Length: 100											
Offset: 0 (0%). Referenced to phase 2:NBL and 6:SBTL, Start of Green											
Natural Cycle: 80											
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 met by upstream signal.											



FTPM4 2028+Opt+Signal\_SplitL\_Prot N-S Lefts syn  
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HCM Signalized Intersection Capacity Analysis  
 2: Liverpool Rd & Kingston Rd

19225 | 1294 Kingston Rd  
 2028 FT PM: Option 4 N-S Prot Left

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR	
Lane Configurations	←	←	←	←	←	←	←	←	←	←	←	
Traffic Volume (vph)	244	1069	330	226	525	85	302	934	278	119	378	
Future Volume (vph)	244	1069	330	226	525	85	302	934	278	119	378	
Ideal Flow (vphpl)	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	3.5	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	
Frbp, ped/bikes	1.00	1.00	0.94	1.00	1.00	0.95	1.00	1.00	0.91	1.00	0.99	
Frbp, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00	1.00	1.00	
Fit	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	1678	3535	1363	1672	4894	
Flt Permitted	0.34	1.00	1.00	0.12	1.00	1.00	0.36	1.00	1.00	0.19	1.00	
Satd. Flow (perm)	601	3500	1416	222	3500	1431	634	3535	1363	332	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	
Adj. Flow (vph)	265	1162	359	246	571	92	328	1015	302	129	411	
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	152	0	38	
Lane Group Flow (vph)	265	1162	359	246	571	92	328	1015	150	129	468	
Conf. Peds. (#/hr)	26	32	32	32	26	34	26	34	48	48	34	
Heavy Vehicles (%)	1%	2%	2%	1%	2%	2%	2%	1%	3%	3%	0%	
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Permitted Phases	7	4	4	8	8	8	5	2	2	1	6	
Actuated Green, G (s)	46.4	34.2	34.2	42.8	32.4	32.4	38.1	30.1	30.1	26.2	21.2	
Effective Green, g (s)	46.4	34.2	34.2	42.8	32.4	32.4	38.1	30.1	30.1	26.2	21.2	
Actuated g/C Ratio	0.46	0.34	0.34	0.43	0.32	0.32	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)	412	1197	484	249	1134	463	386	1064	410	153	1037	
v/s Ratio Prot	c0.08	c0.33	c0.10	0.16	c0.12	c0.29	c0.12	c0.29	0.04	0.10	0.10	
v/s Ratio Perm	0.22	0.25	0.32	0.25	0.32	0.06	0.21	0.11	0.11	0.18	0.45	
Uniform Delay, d1	17.5	32.4	29.0	25.4	27.3	24.4	24.5	34.3	27.4	32.9	34.3	
Progression Factor	1.00	1.00	1.00	1.37	1.44	1.45	1.00	1.00	1.00	1.39	1.27	
Incremental Delay, d2	3.4	19.3	6.1	52.2	0.3	0.2	15.9	18.5	2.5	28.7	1.2	
Delay (s)	20.9	51.7	35.1	87.0	39.6	35.6	40.4	52.8	29.9	74.5	44.9	
Level of Service	C	D	D	F	D	D	D	D	C	E	D	
Approach Delay (s)	43.8			52.0			46.1			50.9		
Approach LOS	D			D			D			D		
Intersection Summary												
HCM 2000 Control Delay	47.0 HCM 2000 Level of Service											
HCM 2000 Volume to Capacity ratio	0.99											
Actuated Cycle Length (s)	100.0 Sum of lost time (s)											
Intersection Capacity Utilization	93.1% ICU Level of Service											
Analysis Period (min)	15											
C Critical Lane Group												

Queues  
 2: Liverpool Rd & Kingston Rd

19225 | 1294 Kingston Rd  
 2028 FT PM: Option 4 N-S Prot Left

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR
Lane Configurations	←	←	←	←	←	←	←	←	←	←	←
Traffic Volume (vph)	244	1069	330	226	525	85	302	934	278	119	378
Future Volume (vph)	244	1069	330	226	525	85	302	934	278	119	378
Lane Group Flow (vph)	265	1162	359	246	571	92	328	1015	302	129	506
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA
Projected Phases	7	4	4	8	8	8	5	2	2	1	6
Permitted Phases	4	4	4	8	8	8	5	2	2	1	6
Switch Phase	7	4	4	3	8	8	5	2	2	1	6
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	41.6	41.6	13.4	39.0	39.0	17.0	37.0	37.0	8.0	28.0
Total Spill (%)	16.0%	41.6%	41.6%	13.4%	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?	None	Min	None	Min	None	Min	None	C-Min	C-Min	None	C-Min
Recall Mode	0.61	0.97	0.74	0.95	0.50	0.20	0.80	0.95	0.54	0.78	0.47
v/s Ratio	20.1	53.1	40.0	74.9	41.5	37.7	38.0	53.6	12.5	58.3	41.1
Control Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
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	20.1	53.1	40.0	74.9	41.5	37.7	38.0	53.6	12.5	58.3	41.1
Queue Length 50th (m)	29.3	121.8	63.9	40.7	63.0	16.8	47.1	106.4	12.7	22.7	38.1
Queue Length 95th (m)	46.2	#168.4	#102.0	#83.2	78.1	31.3	#84.3	#149.2	39.1	#F37.9	49.7
Internal Link Dist (m)	667.5 393.2 242.2										
Turn Bay Length (m)	33.5	49.1	103.2	61.6	46.2	51.8	46.2	51.8	30.9	30.9	30.9
Base Capacity (vph)	451	1197	484	259	1134	463	411	1064	562	166	1073
Stallout 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	0.59	0.97	0.74	0.95	0.50	0.20	0.80	0.95	0.54	0.78	0.47
Intersection Summary											
Cycle Length: 100											
Actuated Cycle Length: 100											
Offset: 69 (69%), 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 measured by upstream signal.											

Queues  
 4: Liverpool Rd & North Dwy/Main Plaza Dwy

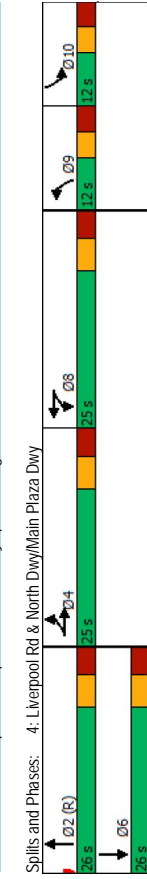
HCM Unsignalized Intersection Capacity Analysis  
 3: Liverpool Rd & South Dwy

19225 | 1294 Kingston Rd  
 2028 FT PM: Option 4 N-S Prot Left



Lane Group	EBL	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	40	0	123	0	100	1014	76
Future Volume (vph)	40	0	123	0	100	1014	76
Lane Group Flow (vph)	43	51	134	107	109	1370	83
Turn Type	Split	NA	Split	NA	Prot	NA	Prot
Projected Phases	4	4	8	8	9	2	10
Permitted Phases	4	4	8	8	9	2	10
Detector Phase	4	4	8	8	9	2	10
Switch Phase							
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	24.9	24.9	18.9	18.9	11.0	20.9	11.0
Total Split (s)	25.0	25.0	25.0	25.0	12.0	26.0	12.0
Total Split (%)	25.0%	25.0%	25.0%	25.0%	12.0%	26.0%	12.0%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.0	3.7	3.0
All-Red Time (s)	3.2	3.2	3.2	3.2	3.0	3.2	3.0
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	6.0	6.9	6.0
Lead/Lag					Lead		Lag
Lead/Lag Optimize?							
Recall Mode	None	None	None	None	C-Min	None	Min
v/c Ratio	0.28	0.38	0.60	0.55	0.47	1.52	0.57
Control Delay	46.5	50.5	51.6	50.5	52.9	262.8	60.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	46.5	50.5	51.6	50.5	52.9	262.8	60.5
Queue Length 50th (m)	8.4	10.0	26.2	20.8	19.0	-233.5	16.5
Queue Length 95th (m)	18.7	21.3	43.3	36.3	m21.6m#261.3	#45.3	#86.2
Internal Link Dist (m)			38.1	37.6	80.8		167.9
Turn Bay Length (m)					30.0		30.0
Base Capacity (vph)	312	275	312	272	231	902	146
Stallion 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	0.14	0.19	0.43	0.39	0.47	1.52	0.57

Direction, Lane #	EB.1	NB.1	NB.2	SB.1	SB.2
Volume Total	28	686	686	304	304
Volume Left	0	0	0	0	0
Volume Right	28	0	0	0	0
CSH	952	1700	1700	1700	1700
Volume to Capacity	0.03	0.40	0.40	0.18	0.18
Queue Length 95th (m)	0.7	0.0	0.0	0.0	0.0
Control Delay (s)	8.9	0.0	0.0	0.0	0.0
Lane LOS	A	A	A	A	A
Approach Delay (s)	8.9	0.0	0.0	0.0	0.0
Approach LOS	A	A	A	A	A



Intersection Summary	ICU Level of Service	
Average Delay	0.1	A
Intersection Capacity Utilization	38.2%	A
Analysis Period (min)	15	

Queues  
6: Liverpool Rd & Glenanna Rd

HCM Signalized Intersection Capacity Analysis  
4: Liverpool Rd & North Dwy/Main Plaza Dwy

19225 | 1294 Kingston Rd  
2028 FT PM: Option 4 N-S Prot Left



Movement	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations	4	4	4	8	8	2	2	6	6	6
Traffic Volume (vph)	45	72	112	54	145	348	633	67	352	464
Future Volume (vph)	45	72	112	54	145	348	633	67	352	464
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2
Total Lost time (s)	6.9	6.9	6.9	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	1.00	1.00	1.00	1.00	1.00	1.00
Frbp, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frbp, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Flt Protected	0.95	1.00	0.85	1.00	0.85	1.00	0.97	1.00	0.98	1.00
Satd. Flow (prot)	1725	1521	1725	1506	1725	1506	1725	3389	1725	3436
Flt Permitted	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	1725	1521	1725	1506	1725	1506	1725	3389	1725	3436
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	43	0	51	134	0	107	109	1102	268	83
RTOR Reduction (vph)	0	0	0	0	0	0	0	20	0	0
Lane Group Flow (vph)	43	51	0	134	107	0	109	1350	0	83
Conf. Peds. (#/hr)	1	1	1	1	1	1	1	6	15	15
Heavy Vehicles (%)	0%	0%	0%	0%	0%	1%	0%	1%	0%	2%
Turn Type	Split	NA	NA	Split	NA	Prot	NA	Prot	NA	Prot
Permitted Phases	4	4	4	8	8	9	2	10	6	6
Actuated Green, G (s)	7.7	7.7	7.7	13.0	13.0	13.4	24.7	8.5	24.7	8.5
Effective Green, g (s)	7.7	7.7	7.7	13.0	13.0	13.4	24.7	8.5	24.7	8.5
Actuated g/C Ratio	0.08	0.08	0.08	0.13	0.13	0.13	0.25	0.08	0.25	0.08
Clearance Time (s)	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.0	6.9	6.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	132	117	224	195	231	837		146	848	
v/s Ratio Prot	0.02	c0.03	c0.08	0.07	c0.06	c0.40		c0.05	0.16	
v/s Ratio Perm	0.33	0.44	0.60	0.55	0.47	1.61		0.57	0.65	
Uniform Delay, d1	43.7	44.1	41.0	40.8	40.0	37.6		44.0	33.8	
Progression Factor	1.00	1.00	1.00	1.00	1.19	0.75		0.99	0.94	
Incremental Delay, d2	1.4	2.6	4.3	3.1	0.9	279.5		5.0	1.8	
Delay (s)	45.1	46.7	45.3	43.9	48.7	307.7		48.5	33.7	
Level of Service	D	D	D	D	D	F		D	C	
Approach Delay (s)	46.0	46.0	44.7	44.7	288.6			35.6		
Approach LOS	D	D	D	D	F			D		
Intersection Summary										
HCM 2000 Control Delay	189.0 HCM 2000 Level of Service F									
HCM 2000 Volume to Capacity ratio	0.92									
Actuated Cycle Length (s)	100.0 Sum of lost time (s) 32.7									
Intersection Capacity Utilization	70.4% ICU Level of Service C									
Analysis Period (min)	15									
Critical Lane Group	C Critical Lane Group									

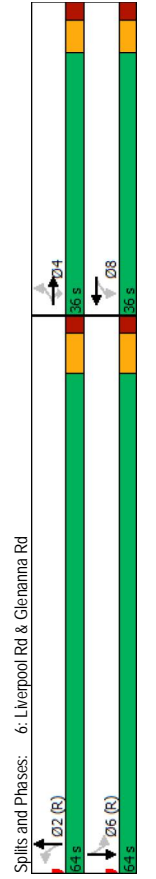
Queues  
6: Liverpool Rd & Glenanna Rd

HCM Signalized Intersection Capacity Analysis  
4: Liverpool Rd & North Dwy/Main Plaza Dwy

19225 | 1294 Kingston Rd  
2028 FT PM: Option 4 N-S Prot Left



Movement	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations	4	4	4	8	8	2	2	6	6	6
Traffic Volume (vph)	45	72	112	54	145	348	633	67	352	464
Future Volume (vph)	45	72	112	54	145	348	633	67	352	464
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2
Total Lost time (s)	6.9	6.9	6.9	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	1.00	1.00	1.00	1.00	1.00	1.00
Frbp, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frbp, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Flt Protected	0.95	1.00	0.85	1.00	0.85	1.00	0.97	1.00	0.98	1.00
Satd. Flow (prot)	1725	1521	1725	1506	1725	1506	1725	3389	1725	3436
Flt Permitted	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	1725	1521	1725	1506	1725	1506	1725	3389	1725	3436
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	43	0	51	134	0	107	109	1102	268	83
RTOR Reduction (vph)	0	0	0	0	0	0	0	20	0	0
Lane Group Flow (vph)	43	51	0	134	107	0	109	1350	0	83
Conf. Peds. (#/hr)	1	1	1	1	1	1	1	6	15	15
Heavy Vehicles (%)	0%	0%	0%	0%	0%	1%	0%	1%	0%	2%
Turn Type	Split	NA	NA	Split	NA	Prot	NA	Prot	NA	Prot
Permitted Phases	4	4	4	8	8	9	2	10	6	6
Actuated Green, G (s)	7.7	7.7	7.7	13.0	13.0	13.4	24.7	8.5	24.7	8.5
Effective Green, g (s)	7.7	7.7	7.7	13.0	13.0	13.4	24.7	8.5	24.7	8.5
Actuated g/C Ratio	0.08	0.08	0.08	0.13	0.13	0.13	0.25	0.08	0.25	0.08
Clearance Time (s)	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.0	6.9	6.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	132	117	224	195	231	837		146	848	
v/s Ratio Prot	0.02	c0.03	c0.08	0.07	c0.06	c0.40		c0.05	0.16	
v/s Ratio Perm	0.33	0.44	0.60	0.55	0.47	1.61		0.57	0.65	
Uniform Delay, d1	43.7	44.1	41.0	40.8	40.0	37.6		44.0	33.8	
Progression Factor	1.00	1.00	1.00	1.00	1.19	0.75		0.99	0.94	
Incremental Delay, d2	1.4	2.6	4.3	3.1	0.9	279.5		5.0	1.8	
Delay (s)	45.1	46.7	45.3	43.9	48.7	307.7		48.5	33.7	
Level of Service	D	D	D	D	D	F		D	C	
Approach Delay (s)	46.0	46.0	44.7	44.7	288.6			35.6		
Approach LOS	D	D	D	D	F			D		
Intersection Summary										
HCM 2000 Control Delay	189.0 HCM 2000 Level of Service F									
HCM 2000 Volume to Capacity ratio	0.92									
Actuated Cycle Length (s)	100.0 Sum of lost time (s) 32.7									
Intersection Capacity Utilization	70.4% ICU Level of Service C									
Analysis Period (min)	15									
Critical Lane Group	C Critical Lane Group									



FTPM4 2028+Opt+Signal\_Split\_Prot N-S Lefts syn

Synchro 9 Report  
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HCM Signalized Intersection Capacity Analysis  
 6: Liverpool Rd & Glenanna Rd

19225 | 1294 Kingston Rd  
 2028 FT PM: Option 4 N-S Prot Left

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	←	←	←	←	←	←	←	←	←	←	←	←
Traffic Volume (vph)	45	72	112	54	145	44	348	633	73	67	352	30
Future Volume (vph)	45	72	112	54	145	44	348	633	73	67	352	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	5.9	6.7	6.7	6.7	6.7	6.7	6.7
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frbp, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00	0.99	1.00
Fipb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.98	1.00	1.00	0.99	1.00
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1725	1824	1543	1725	1791	1708	1708	3448	1707	1707	3527	3527
Flt Permitted	0.43	1.00	1.00	0.71	1.00	0.51	0.51	1.00	0.35	1.00	0.35	1.00
Satd. Flow (perm)	788	1824	1543	1282	1791	914	3448	634	3527	634	3527	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	122	59	158	48	378	688	79	73	383	33
RTOR Reduction (vph)	0	0	102	0	13	0	0	6	0	0	4	0
Lane Group Flow (vph)	49	78	20	59	193	0	378	761	0	73	412	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	Perm	NA	NA
Protected Phases	4		4	8		8		2		6		6
Permitted Phases	4		4	8		8		2		6		6
Actuated Green, G (s)	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0
Effective Green, g (s)	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0
Actuated g/C Ratio	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16
Clearance Time (s)	5.9	5.9	5.9	5.9	5.9	5.9	6.7	6.7	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	3.0	3.0	3.0
Lane Grp Cap (vph)	126	291	246	205	286	652	2461	452	2518	452	2518	2518
w/s Ratio Prot	0.04			c0.11		c0.11		0.22		0.12		0.12
w/s Ratio Perm	0.06		0.01	0.05		0.41		0.12		0.12		0.12
v/c Ratio	0.39	0.27	0.08	0.29	0.67	0.58	0.31	0.16		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		4.6
Progression Factor	1.00	1.00	1.00	0.70	0.77	2.54	1.27	1.00		1.00		1.00
Incremental Delay, d2	2.0	0.5	0.1	0.8	6.0	0.3	0.0	0.8		0.8		0.1
Delay (s)	39.6	37.4	35.9	26.7	36.5	18.0	6.7	5.4		4.8		4.8
Level of Service	D	D	D	C	D	B	A	A		A		A
Approach Delay (s)			37.1		34.3		10.4			4.9		4.9
Approach LOS			D		C		B			A		A
<b>Intersection Summary</b>												
HCM 2000 Control Delay	15.2 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	67.9% ICU Level of Service C											
Analysis Period (min)	15											
c Critical Lane Group												



**Future Total Traffic - Option 4A**

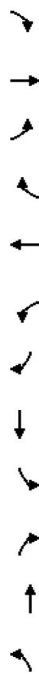




**Weekday AM Peak Hour**

HCM Signalized Intersection Capacity Analysis  
 1: Glenanna Rd & Kingston Rd

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 2028 FT AM: Option 4A North Dwy+Plaza Shifted



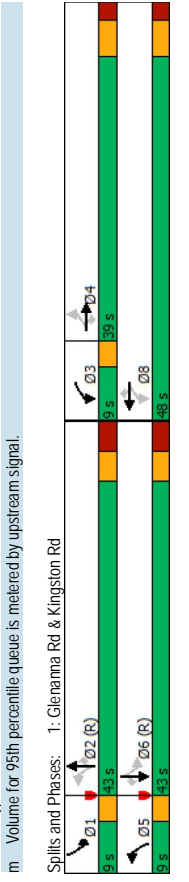
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	10	413	92	96	590	122	52	73	64	190	102	26
Traffic Volume (vph)	10	413	92	96	590	122	52	73	64	190	102	26
Future Volume (vph)	10	413	92	96	590	122	52	73	64	190	102	26
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	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	6.4	3.0	6.4	3.0	7.0	3.0	7.0	3.0	7.0	7.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frbp. ped/bikes	1.00	1.00	0.83	1.00	1.00	0.90	1.00	1.00	0.91	1.00	1.00	0.84
Frbp. ped/bikes	0.97	1.00	1.00	0.98	1.00	1.00	0.91	1.00	1.00	0.96	1.00	1.00
Fit	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)	1666	3500	1220	1632	3500	1373	1575	1879	1385	1649	1824	1295
Flt Permitted	0.41	1.00	1.00	0.30	1.00	1.00	0.69	1.00	1.00	0.66	1.00	1.00
Satd. Flow (perm)	716	3500	1220	512	3500	1373	1136	1879	1385	1142	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)	11	449	100	104	641	133	57	79	70	207	111	28
RTOR Reduction (vph)	0	0	0	0	0	66	0	0	41	0	0	15
Lane Group Flow (vph)	11	449	100	104	641	67	57	79	29	207	111	13
Conf. Peds. (#/hr)	30	55	55	55	30	91	0%	0%	50	50	0%	91
Heavy Vehicles (%)	0%	2%	5%	4%	2%	1%	0%	0%	0%	0%	3%	0%
Turn Type	Perm	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm
Permitted Phases	4	4	4	8	8	8	5	2	2	2	6	6
Actuated Green, G (s)	19.3	19.3	19.3	31.0	31.0	31.0	47.1	41.2	41.2	55.6	46.7	46.7
Effective Green, g (s)	19.3	19.3	19.3	31.0	31.0	31.0	47.1	41.2	41.2	55.6	46.7	46.7
Actuated g/C Ratio	0.19	0.19	0.19	0.31	0.31	0.31	0.47	0.41	0.41	0.56	0.47	0.47
Clearance Time (s)	6.4	6.4	6.4	3.0	6.4	3.0	7.0	3.0	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	3.0
Lane Grp Cap (vph)	138	675	235	256	1085	425	560	774	570	692	851	604
v/s Ratio Prot	0.13	0.04	0.04	c0.18	0.01	0.04	0.01	0.04	0.02	c0.03	0.06	0.06
v/s Ratio Perm	0.02	0.08	0.09	0.05	0.05	0.04	0.05	0.04	0.02	c0.13	0.01	0.01
Uniform Delay, d1	33.1	37.4	35.5	25.9	29.1	25.0	14.5	18.0	17.7	11.3	15.1	14.3
Progression Factor	0.62	0.77	0.67	1.00	1.00	1.00	1.00	1.00	1.00	0.70	0.81	1.00
Incremental Delay, d2	0.2	2.4	1.2	1.1	0.9	0.2	0.1	0.3	0.2	0.2	0.3	0.1
Delay (s)	20.7	31.0	25.0	26.9	30.0	25.2	14.6	18.3	17.8	8.2	12.5	14.4
Level of Service	C	C	C	C	C	C	B	B	B	A	B	B
Approach Delay (s)	C	C	C	C	C	C	B	B	B	A	B	B
Approach LOS	C	C	C	C	C	C	B	B	B	A	B	B

Intersection Summary	Value	Level
HCM 2000 Control Delay	24.7	HCM 2000 Level of Service
HCM 2000 Volume to Capacity ratio	0.43	C
Actuated Cycle Length (s)	100.0	Sum of lost time (s)
Intersection Capacity Utilization	54.5%	ICU Level of Service
Analysis Period (min)	15	A
Critical Lane Group		

19225 | 1294 Kingston Rd  
 2028 FT AM: Option 4A North Dwy+Plaza Shifted



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	10	413	92	96	590	122	52	73	64	190	102	26
Traffic Volume (vph)	10	413	92	96	590	122	52	73	64	190	102	26
Future Volume (vph)	10	413	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	6.4	3.0	6.4	3.0	7.0	3.0	7.0	3.0	7.0	7.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frbp. ped/bikes	1.00	1.00	0.83	1.00	1.00	0.90	1.00	1.00	0.91	1.00	1.00	0.84
Frbp. ped/bikes	0.97	1.00	1.00	0.98	1.00	1.00	0.91	1.00	1.00	0.96	1.00	1.00
Fit	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)	1666	3500	1220	1632	3500	1373	1575	1879	1385	1649	1824	1295
Flt Permitted	0.41	1.00	1.00	0.30	1.00	1.00	0.69	1.00	1.00	0.66	1.00	1.00
Satd. Flow (perm)	716	3500	1220	512	3500	1373	1136	1879	1385	1142	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)	11	449	100	104	641	133	57	79	70	207	111	28
RTOR Reduction (vph)	0	0	0	0	0	66	0	0	41	0	0	15
Lane Group Flow (vph)	11	449	100	104	641	67	57	79	29	207	111	13
Conf. Peds. (#/hr)	30	55	55	55	30	91	0%	0%	50	50	0%	91
Heavy Vehicles (%)	0%	2%	5%	4%	2%	1%	0%	0%	0%	0%	3%	0%
Turn Type	Perm	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm
Permitted Phases	4	4	4	8	8	8	5	2	2	2	6	6
Actuated Green, G (s)	19.3	19.3	19.3	31.0	31.0	31.0	47.1	41.2	41.2	55.6	46.7	46.7
Effective Green, g (s)	19.3	19.3	19.3	31.0	31.0	31.0	47.1	41.2	41.2	55.6	46.7	46.7
Actuated g/C Ratio	0.19	0.19	0.19	0.31	0.31	0.31	0.47	0.41	0.41	0.56	0.47	0.47
Clearance Time (s)	6.4	6.4	6.4	3.0	6.4	3.0	7.0	3.0	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	3.0
Lane Grp Cap (vph)	138	675	235	256	1085	425	560	774	570	692	851	604
v/s Ratio Prot	0.13	0.04	0.04	c0.18	0.01	0.04	0.01	0.04	0.02	c0.03	0.06	0.06
v/s Ratio Perm	0.02	0.08	0.09	0.05	0.05	0.04	0.05	0.04	0.02	c0.13	0.01	0.01
Uniform Delay, d1	33.1	37.4	35.5	25.9	29.1	25.0	14.5	18.0	17.7	11.3	15.1	14.3
Progression Factor	0.62	0.77	0.67	1.00	1.00	1.00	1.00	1.00	1.00	0.70	0.81	1.00
Incremental Delay, d2	0.2	2.4	1.2	1.1	0.9	0.2	0.1	0.3	0.2	0.2	0.3	0.1
Delay (s)	20.7	31.0	25.0	26.9	30.0	25.2	14.6	18.3	17.8	8.2	12.5	14.4
Level of Service	C	C	C	C	C	C	B	B	B	A	B	B
Approach Delay (s)	C	C	C	C	C	C	B	B	B	A	B	B
Approach LOS	C	C	C	C	C	C	B	B	B	A	B	B



HCM Signalized Intersection Capacity Analysis  
 2: Liverpool Rd & Kingston Rd

19225 | 1294 Kingston Rd  
 2028 FT AM: Option 4A North Dwy+Plaza Shifted



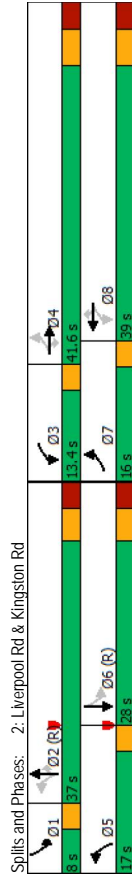
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
Traffic Volume (vph)	101	394	254	178	493	49	215	461	122	85	871	106
Future Volume (vph)	101	394	254	178	493	49	215	461	122	85	871	106
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.5	3.2	3.2	3.5	3.2	3.5	3.2	3.5	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	3.0	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	0.99
Frbp. ped/bikes	1.00	1.00	0.94	1.00	1.00	0.95	1.00	1.00	0.91	1.00	0.99	1.00
Frbp. ped/bikes	0.99	1.00	1.00	0.99	1.00	1.00	1.00	1.00	0.85	1.00	0.98	1.00
Frbp. ped/bikes	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98	1.00
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)	1698	3500	1416	1690	3500	1431	1690	3535	1363	1645	4993	638
Flt Permitted	0.36	1.00	1.00	0.42	1.00	1.00	0.14	1.00	1.00	0.47	1.00	0.92
Satd. Flow (perm)	638	3500	1416	748	3500	1431	257	3535	1363	811	4993	638
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)	110	428	276	193	536	53	234	501	133	92	947	115
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	82	0	13
Lane Group Flow (vph)	110	428	276	193	536	53	234	501	51	92	1049	0
Conf. Peds. (#/hr)	26	32	32	32	32	26	34	48	48	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	NA
Permitted Phases	4	4	8	8	8	8	2	2	2	6	6	6
Actuated Green, G (s)	34.4	25.2	25.2	36.4	26.2	26.2	47.3	38.3	38.3	37.3	31.3	31.3
Effective Green, g (s)	34.4	25.2	25.2	36.4	26.2	26.2	47.3	38.3	38.3	37.3	31.3	31.3
Actuated g/C Ratio	0.34	0.25	0.25	0.36	0.26	0.26	0.47	0.38	0.38	0.37	0.31	0.31
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)	316	882	356	368	917	374	307	1353	522	352	1562	162
v/s Ratio Prot	0.03	0.12	0.05	0.15	0.05	0.15	0.10	0.14	0.02	0.02	0.21	0.21
v/s Ratio Perm	0.09	0.19	0.14	0.14	0.04	0.26	0.04	0.08	0.04	0.08	0.08	0.08
v/s Ratio	0.35	0.49	0.78	0.52	0.58	0.14	0.76	0.37	0.10	0.26	0.67	0.67
Uniform Delay, d1	23.2	31.9	34.8	22.9	32.2	28.3	18.4	22.2	19.8	20.8	29.9	29.9
Progression Factor	1.00	1.00	1.00	2.41	1.86	1.99	1.00	1.00	1.00	1.00	0.71	0.79
Incremental Delay, d2	0.7	0.4	10.1	1.3	0.9	0.2	10.7	0.8	0.4	0.4	2.2	2.2
Delay (s)	23.8	32.3	44.9	56.5	60.8	56.6	29.1	23.0	20.1	15.2	25.9	25.9
Level of Service	C	C	D	E	E	E	C	C	C	C	B	C
Approach Delay (s)	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4	35.4
Approach LOS	D	D	D	D	D	D	D	D	D	D	D	D
Intersection Summary												
HCM 2000 Control Delay	34.6 HCM 2000 Level of Service C											
HCM 2000 Volume to Capacity ratio	0.76											
Actuated Cycle Length (s)	100.0 Sum of lost time (s) 20.3											
Intersection Capacity Utilization	73.5% ICU Level of Service D											
Analysis Period (min)	15											
Critical Lane Group	C Critical Lane Group											

Queues  
 2: Liverpool Rd & Kingston Rd

19225 | 1294 Kingston Rd  
 2028 FT AM: Option 4A North Dwy+Plaza Shifted



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	
Lane Configurations	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	
Traffic Volume (vph)	101	394	254	178	493	49	215	461	122	85	871	
Future Volume (vph)	101	394	254	178	493	49	215	461	122	85	871	
Lane Group Flow (vph)	110	428	276	193	536	53	234	501	133	92	1062	
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Projected Phases	7	4	4	4	4	4	8	2	2	6	6	
Permitted Phases	4	4	8	8	8	8	2	2	2	6	6	
Switch Phase	7	4	4	4	4	4	8	2	2	6	6	
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	41.6	41.6	13.4	39.0	39.0	17.0	37.0	37.0	8.0	28.0	
Total Split (%)	16.0%	41.6%	41.6%	13.4%	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	Lead	Lag	Lead	Lag	Lag	Lead	Lag	
Lead/Lag Optimize?	None	Min	None	Min	None	Min	None	C-Min	C-Min	None	C-Min	
Recall Mode	0.32	0.48	0.77	0.49	0.58	0.14	0.74	0.36	0.22	0.23	0.67	
v/s Ratio	18.4	32.7	48.7	45.5	61.2	53.0	33.1	25.0	5.7	13.0	28.1	
Control Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
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	18.4	32.7	48.7	45.5	61.2	53.0	33.1	25.0	5.7	13.0	28.1	
Queue Length 50th (m)	13.2	39.0	52.1	40.3	61.0	11.3	26.3	40.0	0.0	6.7	72.7	
Queue Length 95th (m)	20.3	47.4	73.1	54.1	77.8	23.7	66.8	59.5	13.5	15.5	105.2	
Internal Link Dist (m)	667.5											
Turn Bay Length (m)	393.2											
Base Capacity (vph)	33.5	49.1	103.2	61.6	46.2	46.2	51.8	30.9	61.1	39.9	157.6	
Stallion 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	0.36	0.57	0.48	0.48	0.12	0.69	0.36	0.22	0.23	0.67	
Intersection Summary												
Cycle Length: 100												
Actuated Cycle Length: 100												
Offset: 69 (69%), Referenced to phase 2:NBT and 6:SBTL, 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.												



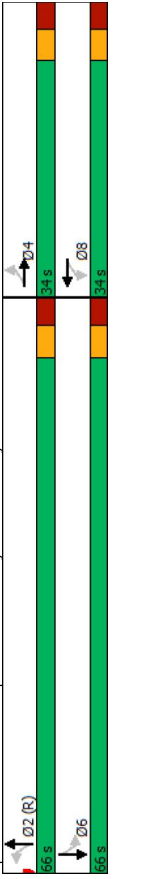
Queues  
 4: Liverpool Rd & North Dwy/Main Plaza Dwy

HCM Unsignalized Intersection Capacity Analysis  
 3: Liverpool Rd & South Dwy

19225 | 1294 Kingston Rd  
 2028 FT AM: Option 4A North Dwy+Plaza Shifted

EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
→	→	←	←	→	→	→	→
↖	↖	↗	↗	↖	↖	↗	↗
↘	↘	↙	↙	↘	↘	↙	↙

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	↖	↖	↗	↗	↖	↖	↗	↗
Traffic Volume (vph)	50	0	106	0	33	415	94	866
Future Volume (vph)	50	0	106	0	33	415	94	866
Lane Group Flow (vph)	54	63	115	64	36	628	102	963
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Projected Phases	4	4	8	8	2	2	6	6
Permitted Phases	4	4	8	8	2	2	6	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	24.9	24.9
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	0.0
Total Lost Time (s)	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9
LeadLag								
LeadLag Optimize?								
Recall Mode	None	None	None	None	C-Min	C-Min	Min	Min
v/c Ratio	0.30	0.29	0.62	0.30	0.10	0.26	0.19	0.38
Control Delay	40.6	40.0	54.4	40.3	3.0	1.9	5.4	5.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	40.6	40.0	54.4	40.3	3.0	1.9	5.4	5.2
Queue Length 50th (m)	10.0	11.7	22.4	11.9	0.9	6.2	5.5	28.3
Queue Length 95th (m)	20.4	22.7	38.5	23.1	1.6	3.8	12.8	44.0
Internal Link Dist (m)		38.9		67.0		81.6		167.2
Turn Bay Length (m)				30.0				30.0
Base Capacity (vph)	351	412	351	408	366	2431	532	2513
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.15	0.15	0.33	0.16	0.10	0.26	0.19	0.38



Intersection Summary

EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
↖	↖	↗	↗	↖	↖	↗	↗
↘	↘	↙	↙	↘	↘	↙	↙

EB.1	NB.1	NB.2	SB.1	SB.2
↖	↖	↖	↖	↖
↘	↘	↘	↘	↘

Movement	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	↖	↖	↗	↗	↖	↖	↗	↗
Traffic Volume (veh/h)	0	32	0	611	1030	0	0	0
Future Volume (Veh/h)	0	32	0	611	1030	0	0	0
Sign Control	Slop	Free	Free	Free	Free	Free	Free	Free
Grade	0%	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Peak Hour Factor	0	35	0	664	1120	0	0	0
Hourly flow rate (vph)	4	3.2	1.2	0	0	0	0	0
Pedestrians	4	3.2	1.2	0	0	0	0	0
Lane Width (m)	3.2	1.2	0	0	0	0	0	0
Walking Speed (m/s)	1.2	0	0	0	0	0	0	0
Percent Blockage	0	0	0	0	0	0	0	0
Right turn flare (veh)	None	None	None	None	None	None	None	None
Median storage (veh)	None	None	None	None	None	None	None	None
Upstream signal (m)	59	105						
pX, platoon unblocked	0.94	0.89	0.89	0.89	0.89	0.89	0.89	0.89
vC, conflicting volume	1456	564	1124					
vC1, stage 1 conf vol								
vC2, stage 2 conf vol								
vCu, unblocked vol	890	277	903					
tC, single (s)	6.8	6.9	4.1					
tC, 2 stage (s)	3.5	3.3	2.2					
tF (s)	100	95	100					
p0 queue free %	270	648	679					
cM capacity (veh/h)	EB.1	NB.1	NB.2	SB.1	SB.2			
Volume Total	35	332	332	560	560			
Volume Left	0	0	0	0	0			
Volume Right	35	0	0	0	0			
cSH	648	1700	1700	1700	1700			
Volume to Capacity	0.05	0.20	0.20	0.33	0.33			
Queue Length 95th (m)	1.4	0.0	0.0	0.0	0.0			
Control Delay (s)	10.9	0.0	0.0	0.0	0.0			
Lane LOS	B	B	B	B	B			
Approach Delay (s)	10.9	0.0	0.0	0.0	0.0			
Approach LOS	B	B	B	B	B			
Intersection Summary								
Average Delay	0.2							
Intersection Capacity Utilization	38.5%							
ICU Level of Service	A							
Analysis Period (min)	15							

Queues  
 6: Liverpool Rd & Glenanna Rd

HCM Signalized Intersection Capacity Analysis  
 4: Liverpool Rd & North Dwy/Main Plaza Dwy

19225 | 1294 Kingston Rd  
 2028 FT AM: Option 4A North Dwy+Plaza Shifted

Movement	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations	←	←	←	←	←	←	←	←	←	←
Traffic Volume (vph)	47	138	251	71	87	115	376	73	658	73
Future Volume (vph)	47	138	251	71	87	115	376	73	658	73
Ideal Flow (vphpl)	51	150	273	77	156	125	445	79	790	79
Lane Width	Perm	Perm	Perm	Perm	Perm	NA	Perm	NA	Perm	NA
Total Lost Time (s)	3.7	3.7	3.7	3.7	3.7	4.6	4.6	4.6	4.6	4.6
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	54	0	63	115	0	64	36	451	177	102
RTOR Reduction (vph)	0	0	0	0	0	0	0	28	0	0
Lane Group Flow (vph)	54	63	0	115	64	0	36	600	0	102
Conf. Peds. (#/hr)	1	1	1	1	1	1	1	6	15	15
Heavy Vehicles (%)	0%	0%	0%	0%	0%	1%	0%	0%	0%	2%
Turn Type	Perm	NA	NA	Perm	NA	Perm	NA	NA	Perm	NA
Protected Phases	4	4	4	8	8	2	2	6	6	6
Permitted Phases	4	4	4	8	8	2	2	6	6	6
Actuated Green, G (s)	14.2	14.2	14.2	14.2	14.2	72.0	72.0	72.0	72.0	72.0
Effective Green, g (s)	14.2	14.2	14.2	14.2	14.2	72.0	72.0	72.0	72.0	72.0
Actuated g/C Ratio	0.14	0.14	0.14	0.14	0.14	0.72	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	6.9	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
Lane Grp Cap (vph)	184	216	184	213	365	2401	184	2510	6028	184
v/s Ratio Prot	0.04	0.04	0.04	0.04	0.04	0.18	0.18	0.18	0.18	0.18
v/s Ratio Perm	0.04	0.04	0.04	0.04	0.04	0.07	0.07	0.07	0.07	0.07
Uniform Delay, d1	38.4	38.4	38.4	38.4	38.4	4.2	4.8	4.8	4.8	4.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	0.44	0.37	0.81	0.79	0.79
Incremental Delay, d2	0.9	0.8	0.8	0.8	0.8	0.5	0.2	0.2	0.1	0.1
Delay (s)	39.3	39.2	39.2	39.2	39.2	2.4	2.0	3.9	4.4	4.4
Level of Service	D	D	D	D	D	A	A	A	A	A
Approach Delay (s)	39.2	39.2	39.2	44.1	2.0	2.0	4.3	4.3	4.3	4.3
Approach LOS	D	D	D	D	D	A	A	A	A	A

Intersection Summary

HCM 2000 Control Delay	9.1	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.42		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	13.8
Intersection Capacity Utilization	58.6%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

FTAM4A 2028+Signal-syn  
 Synchro 9 Report  
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Queues  
 6: Liverpool Rd & Glenanna Rd

HCM Signalized Intersection Capacity Analysis  
 4: Liverpool Rd & North Dwy/Main Plaza Dwy

19225 | 1294 Kingston Rd  
 2028 FT AM: Option 4A North Dwy+Plaza Shifted

Movement	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations	←	←	←	←	←	←	←	←	←	←
Traffic Volume (vph)	47	138	251	71	87	115	376	73	658	73
Future Volume (vph)	47	138	251	71	87	115	376	73	658	73
Ideal Flow (vphpl)	51	150	273	77	156	125	445	79	790	79
Lane Width	Perm	Perm	Perm	Perm	Perm	NA	Perm	NA	Perm	NA
Total Lost Time (s)	3.7	3.7	3.7	3.7	3.7	4.6	4.6	4.6	4.6	4.6
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	54	0	63	115	0	64	36	451	177	102
RTOR Reduction (vph)	0	0	0	0	0	0	0	28	0	0
Lane Group Flow (vph)	54	63	0	115	64	0	36	600	0	102
Conf. Peds. (#/hr)	1	1	1	1	1	1	1	6	15	15
Heavy Vehicles (%)	0%	0%	0%	0%	0%	1%	0%	0%	0%	2%
Turn Type	Perm	NA	NA	Perm	NA	Perm	NA	NA	Perm	NA
Protected Phases	4	4	4	8	8	2	2	6	6	6
Permitted Phases	4	4	4	8	8	2	2	6	6	6
Actuated Green, G (s)	14.2	14.2	14.2	14.2	14.2	72.0	72.0	72.0	72.0	72.0
Effective Green, g (s)	14.2	14.2	14.2	14.2	14.2	72.0	72.0	72.0	72.0	72.0
Actuated g/C Ratio	0.14	0.14	0.14	0.14	0.14	0.72	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	6.9	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
Lane Grp Cap (vph)	184	216	184	213	365	2401	184	2510	6028	184
v/s Ratio Prot	0.04	0.04	0.04	0.04	0.04	0.18	0.18	0.18	0.18	0.18
v/s Ratio Perm	0.04	0.04	0.04	0.04	0.04	0.07	0.07	0.07	0.07	0.07
Uniform Delay, d1	38.4	38.4	38.4	38.4	38.4	4.2	4.8	4.8	4.8	4.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	0.44	0.37	0.81	0.79	0.79
Incremental Delay, d2	0.9	0.8	0.8	0.8	0.8	0.5	0.2	0.2	0.1	0.1
Delay (s)	39.3	39.2	39.2	39.2	39.2	2.4	2.0	3.9	4.4	4.4
Level of Service	D	D	D	D	D	A	A	A	A	A
Approach Delay (s)	39.2	39.2	39.2	44.1	2.0	2.0	4.3	4.3	4.3	4.3
Approach LOS	D	D	D	D	D	A	A	A	A	A

Intersection Summary

HCM 2000 Control Delay	9.1	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.42		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	13.8
Intersection Capacity Utilization	58.6%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

FTAM4A 2028+Signal-syn  
 Synchro 9 Report  
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HCM Signalized Intersection Capacity Analysis  
 6: Liverpool Rd & Glenanna Rd

19225 | 1294 Kingston Rd  
 2028 FT AM: Option 4A North Dwy+Plaza Shifted

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	47	138	251	71	87	56	115	376	33	73	658	69
Future Volume (vph)	47	138	251	71	87	56	115	376	33	73	658	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	5.9	6.7	6.7	6.7	6.7	6.7	6.7
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frbp. ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frbp. ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Flt	1.00	1.00	0.85	1.00	0.94	1.00	0.99	1.00	0.99	1.00	0.99	1.00
Flt Protected	0.95	1.00	1.00	0.95	1.00	0.95	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1725	1824	1543	1725	1744	1708	3466	1696	3519	1696	3519	1696
Flt Permitted	0.55	1.00	1.00	0.57	1.00	0.35	1.00	0.49	1.00	0.49	1.00	0.49
Satd. Flow (perm)	1000	1824	1543	1035	1744	623	3466	883	3519	883	3519	883
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	273	77	95	61	125	409	36	79	715	75
RTOR Reduction (vph)	0	0	183	0	28	0	0	4	0	0	5	0
Lane Group Flow (vph)	51	150	90	77	128	0	125	441	0	79	785	0
Confl. Peds. (#/hr)	0%	3%	0%	0%	1%	2%	1%	1%	5%	0%	0%	0%
Heavy Vehicles (%)	0%	3%	0%	0%	1%	2%	1%	1%	5%	0%	0%	0%
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	NA	Perm	NA	NA
Protected Phases	4		4	8		8		2		6		6
Permitted Phases	4		4	8		8		2		6		6
Actuated Green, G (s)	13.9	13.9	13.9	13.9	13.9	13.9	73.5	73.5	73.5	73.5	73.5	73.5
Effective Green, g (s)	13.9	13.9	13.9	13.9	13.9	13.9	73.5	73.5	73.5	73.5	73.5	73.5
Actuated g/C Ratio	0.14	0.14	0.14	0.14	0.14	0.14	0.74	0.74	0.74	0.74	0.74	0.74
Clearance Time (s)	5.9	5.9	5.9	5.9	5.9	5.9	6.7	6.7	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	3.0	3.0	3.0
Lane Grp Cap (vph)	139	253	214	143	242	457	2547	649	2586	649	2586	649
w/s Ratio Prot	c0.08			0.07		0.07		0.13		0.09		c0.22
w/s Ratio Perm	0.05		0.06	0.07		0.07	0.20	0.20		0.09		0.09
w/c Ratio	0.37	0.59	0.42	0.54	0.53	0.27	0.17	0.17	0.12	0.30	0.12	0.30
Uniform Delay, d1	39.1	40.4	39.4	40.1	40.0	4.4	4.0	4.0	3.9	4.5	3.9	4.5
Progression Factor	1.00	1.00	1.00	1.02	1.01	0.59	0.57	0.57	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.6	3.7	1.3	3.8	2.1	1.5	0.1	0.1	0.4	0.3	0.4	0.3
Delay (s)	40.7	44.1	40.7	44.8	42.5	4.1	2.4	2.4	4.2	4.8	4.2	4.8
Level of Service	D	D	D	D	D	A	A	A	A	A	A	A
Approach Delay (s)							43.3	2.8	2.8	4.8	4.8	4.8
Approach LOS							D	A	A	A	A	A
<b>Intersection Summary</b>												
HCM 2000 Control Delay	16.6 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	62.4% ICU Level of Service B											
Analysis Period (min)	15											
c Critical Lane Group												

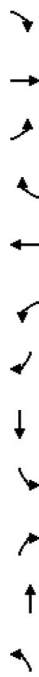


**Weekday PM Peak Hour**



HCM Signalized Intersection Capacity Analysis  
 1: Glenanna Rd & Kingston Rd

19225 | 1294 Kingston Rd  
 2028 FT PM: Option 4A North Dwy+Plaza Shifted

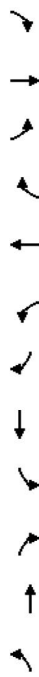


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	24	1218	141	156	614	132	120	177	194	178	199	36
Traffic Volume (vph)	24	1218	141	156	614	132	120	177	194	178	199	36
Future Volume (vph)	24	1218	141	156	614	132	120	177	194	178	199	36
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	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	6.4	3.0	6.4	6.4	7.0	7.0	3.0	7.0	3.0	7.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frbp. ped/bikes	1.00	1.00	0.83	1.00	1.00	0.90	1.00	1.00	0.91	1.00	1.00	0.84
Frbp. ped/bikes	0.97	1.00	1.00	1.00	1.00	0.96	1.00	1.00	0.97	1.00	1.00	0.85
Flt	0.95	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)	1668	3500	1220	1658	3500	1373	1649	1879	1385	1673	1824	1295
Flt Permitted	0.40	1.00	1.00	0.08	1.00	1.00	0.47	1.00	0.53	1.00	1.00	1.00
Satd. Flow (perm)	699	3500	1220	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	1324	153	170	667	143	130	192	211	193	216	39
RTOR Reduction (vph)	0	0	0	0	0	39	0	0	171	0	0	32
Lane Group Flow (vph)	26	1324	153	170	667	104	130	192	40	193	216	7
Conf. Peds. (#/hr)	30	55	55	55	30	91	0%	1%	0%	50	50	0%
Heavy Vehicles (%)	0%	2%	5%	4%	2%	1%	0%	0%	0%	0%	3%	0%
Turn Type	Perm	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm
Permitted Phases	4	4	4	8	8	8	5	2	2	1	6	6
Actuated Green, G (s)	44.5	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	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	0.44	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	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	3.0
Lane Grp Cap (vph)	311	1557	542	282	2110	827	239	325	239	262	315	224
v/s Ratio Prot	c0.38	c0.08	0.19	0.08	0.09	0.03	0.10	0.10	0.03	c0.04	0.12	0.12
v/s Ratio Perm	0.04	0.13	0.29	0.08	0.09	0.08	0.09	0.09	0.03	c0.13	0.13	0.01
Uniform Delay, d1	0.08	0.85	0.28	0.60	0.32	0.13	0.54	0.59	0.17	0.74	0.69	0.03
Progression Factor	16.0	24.8	17.6	19.7	9.7	8.5	32.4	38.1	35.2	34.7	38.8	34.4
Incremental Delay, d2	0.48	0.54	0.47	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.05	1.00
Delay (s)	0.1	2.2	2.1	3.6	0.1	2.5	7.7	1.5	10.3	11.5	0.2	0.2
Level of Service	A	B	A	C	A	A	C	D	D	D	D	C
Approach Delay (s)	A	B	A	C	A	A	C	D	D	D	D	C
Approach LOS	B	B	B	B	B	B	B	B	B	B	B	D

Intersection Summary	Value
HCM 2000 Control Delay	22.1
HCM 2000 Volume to Capacity ratio	0.78
Actuated Cycle Length (s)	100.0
Intersection Capacity Utilization	85.0%
Analysis Period (min)	15
Critical Lane Group	

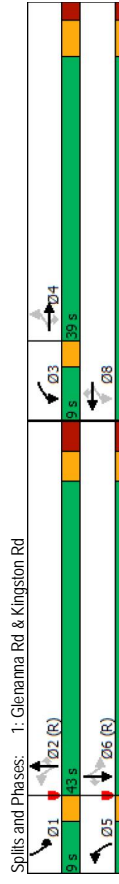
Queues  
 1: Glenanna Rd & Kingston Rd

19225 | 1294 Kingston Rd  
 2028 FT PM: Option 4A North Dwy+Plaza Shifted



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	24	1218	141	156	614	132	120	177	194	178	199	36
Traffic Volume (vph)	24	1218	141	156	614	132	120	177	194	178	199	36
Future Volume (vph)	24	1218	141	156	614	132	120	177	194	178	199	36
Lane Group Flow (vph)	26	1324	153	170	667	143	130	192	211	193	216	39
Turn Type	Perm	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm
Permitted Phases	4	4	4	8	8	8	5	2	2	1	6	6
Detector Phase	4	4	4	8	8	8	5	2	2	1	6	6
Switch Phase	4	4	4	8	8	8	5	2	2	1	6	6
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)	24.4	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	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%	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	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	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	0.0
Total Lost Time (s)	6.4	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	Lag	Lag	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead/Lag Optimize?	None	None	None	None	None	None	None	None	None	None	None	None
Recall Mode	0.08	0.85	0.28	0.59	0.32	0.17	0.49	0.59	0.51	0.65	0.69	0.13
v/c Ratio	9.6	18.9	10.1	25.0	10.9	4.4	32.3	44.9	9.8	40.5	51.8	1.6
Control 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
Queue Delay	9.6	18.9	10.1	25.0	10.9	4.4	32.3	44.9	9.8	40.5	51.8	1.6
Total Delay	0.9	142.6	5.3	15.7	32.4	3.5	19.9	36.5	0.7	34.0	44.2	0.0
Queue Length 50th (m)	m2.8m#181.2	m20.8	39.7	50.8	13.5	32.0	55.0	19.2	41.0	66.7	0.6	0.6
Queue Length 95th (m)	393.2			523.9			174.6					
Turn Bay Length (m)	42.6	60.4	33.0	23.2	25.4	25.4	25.0	27.3	25.0	27.3	16.5	16.5
Base Capacity (vph)	310	1557	542	287	2110	866	265	676	631	296	656	532
Stallion Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillover 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	0.08	0.85	0.28	0.59	0.32	0.17	0.49	0.28	0.33	0.65	0.33	0.07

Intersection Summary	Value
Cycle Length: 100	
Actuated Cycle Length: 100	
Offset: 0 (0%). Referenced to phase 2:NBL and 6:SBTL, Start of Green	
Natural Cycle: 80	
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.	



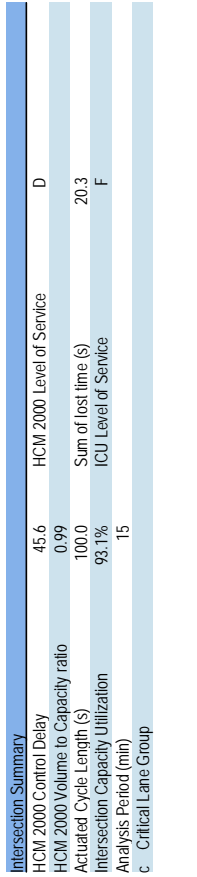


HCM Signalized Intersection Capacity Analysis  
 2: Liverpool Rd & Kingston Rd

19225 | 1294 Kingston Rd  
 2028 FT PM: Option 4A North Dwy+Plaza Shifted



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	←	←	←	←	←	←	←	←	←	←	←	←
Traffic Volume (vph)	244	1069	330	226	525	85	302	934	278	119	378	87
Future Volume (vph)	244	1069	330	226	525	85	302	934	278	119	378	87
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	0.91	0.91
Frbp. ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frbp. ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Flt	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Flt Protected	1700	3500	1416	1708	3500	1431	1678	3535	1363	1672	4894	4894
Satd. Flow (prot)	0.34	1.00	1.00	0.12	1.00	1.00	0.36	1.00	1.00	0.19	1.00	1.00
Flt Permitted	601	3500	1416	222	3500	1431	634	3535	1363	332	4894	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)	265	1162	359	246	571	92	328	1015	302	129	411	95
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	152	0	38	0
Lane Group Flow (vph)	265	1162	359	246	571	92	328	1015	150	129	468	0
Conf. Peds. (#/hr)	26	32	32	32	26	34	26	34	48	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	NA
Permitted Phases	7	4	4	8	8	8	5	2	2	1	6	6
Actuated Green, G (s)	46.4	34.2	34.2	42.8	32.4	32.4	38.1	30.1	30.1	26.2	21.2	21.2
Effective Green, g (s)	46.4	34.2	34.2	42.8	32.4	32.4	38.1	30.1	30.1	26.2	21.2	21.2
Actuated g/C Ratio	0.46	0.34	0.34	0.43	0.32	0.32	0.38	0.30	0.30	0.26	0.21	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	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)	412	1197	484	249	1134	463	386	1064	410	153	1037	1037
v/s Ratio Prot	c0.08	c0.33	c0.10	0.16	0.16	c0.12	c0.29	0.04	0.10	0.18	0.10	0.10
v/s Ratio Perm	0.22	0.25	0.32	0.06	0.21	0.06	0.21	0.11	0.11	0.18	0.18	0.18
Uniform Delay, d1	17.5	32.4	29.0	25.4	27.3	24.4	24.5	34.3	27.4	32.9	34.3	34.3
Progression Factor	1.00	1.00	1.00	1.37	1.44	1.45	1.00	1.00	1.00	0.99	0.95	0.95
Incremental Delay, d2	3.4	19.3	6.1	52.2	0.3	0.2	15.9	18.5	2.5	31.9	1.4	1.4
Delay (s)	20.9	51.7	35.1	87.0	39.6	35.7	40.4	52.8	29.9	64.6	33.9	33.9
Level of Service	C	D	D	F	D	D	D	D	D	C	E	C
Approach Delay (s)	43.8			52.1			46.1			40.2		
Approach LOS	D			D			D			D		D
Intersection Summary												
HCM 2000 Control Delay	45.6 HCM 2000 Level of Service											
HCM 2000 Volume to Capacity ratio	0.99											
Actuated Cycle Length (s)	100.0 Sum of lost time (s)											
Intersection Capacity Utilization	93.1% ICU Level of Service											
Analysis Period (min)	15											
Critical Lane Group	c Critical Lane Group											



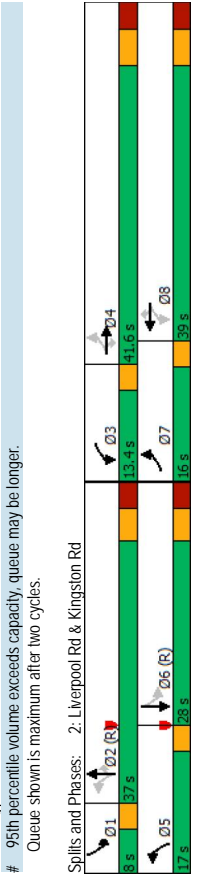
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Queues  
 2: Liverpool Rd & Kingston Rd

19225 | 1294 Kingston Rd  
 2028 FT PM: Option 4A North Dwy+Plaza Shifted



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	
Lane Configurations	←	←	←	←	←	←	←	←	←	←	←	
Traffic Volume (vph)	244	1069	330	226	525	85	302	934	278	119	378	
Future Volume (vph)	244	1069	330	226	525	85	302	934	278	119	378	
Lane Group Flow (vph)	265	1162	359	246	571	92	328	1015	302	129	468	
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Projected Phases	7	4	4	8	8	8	5	2	2	1	6	
Permitted Phases	4	4	4	8	8	8	5	2	2	1	6	
Switch Phase	7	4	4	8	8	8	5	2	2	1	6	
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	41.6	41.6	13.4	39.0	39.0	17.0	37.0	37.0	8.0	28.0	
Total Spill (%)	16.0%	41.6%	41.6%	13.4%	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	Lead	Lag	Lead	Lag	Lag	Lead	Lag	
Lead/Lag Optimize?	None	Min	None	Min	Min	None	None	C-Min	C-Min	None	C-Min	
Recall Mode	0.61	0.97	0.74	0.95	0.50	0.20	0.80	0.95	0.54	0.78	0.47	
v/s Ratio	20.1	53.1	40.0	74.9	41.6	37.8	38.0	53.6	12.5	53.4	31.1	
Control Delay	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Queue Delay	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	29.3	53.1	40.0	74.9	41.6	37.8	38.0	53.6	12.5	53.4	31.1	
Queue Length 50th (m)	29.3	121.8	63.9	40.7	62.9	16.7	47.1	106.4	12.7	13.0	26.0	
Queue Length 95th (m)	46.2	#168.4	#102.0	#83.1	78.2	31.3	#84.3	#149.2	39.1	#41.0	46.3	
Internal Link Dist (m)	667.5											
Turn Bay Length (m)	33.5	49.1	103.2	61.6	46.2	46.2	51.8	30.9	51.8	30.9	30.9	
Base Capacity (vph)	451	1197	484	259	1134	463	411	1064	562	166	1073	
Stallout Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Spillback Cap Reductn	13	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	0.61	0.97	0.74	0.95	0.50	0.20	0.80	0.95	0.54	0.78	0.47	
Intersection Summary												
Cycle Length: 100												
Actuated Cycle Length: 100												
Offset: 69 (69%), Referenced to phase 2:NBL 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.												



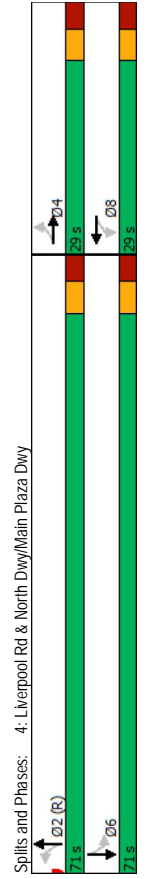
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Queues  
4: Liverpool Rd & North Dwy/Main Plaza Dwy

HCM Unsignalized Intersection Capacity Analysis  
3: Liverpool Rd & South Dwy

19225 | 1294 Kingston Rd  
2028 FT PM: Option 4A North Dwy+Plaza Shifted

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	40	0	123	0	100	916	76	388
Future Volume (vph)	40	0	123	0	100	916	76	388
Lane Group Flow (vph)	43	51	134	107	109	1264	83	481
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Projected Phases	4	4	8	8	2	2	6	6
Permitted Phases	4	4	8	8	2	2	6	6
Detector Phase								
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	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	0.0
Total Lost Time (s)	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9
LeadLag								
LeadLag Optimize?								
Recall Mode	None	None	None	None	C-Min	C-Min	Min	Min
v/c Ratio	0.22	0.22	0.66	0.46	0.18	0.52	0.35	0.20
Control Delay	37.6	37.1	54.8	43.7	2.4	3.7	10.8	4.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0
Total Delay	37.6	37.1	54.8	43.7	2.4	4.2	10.8	4.4
Queue Length 50th (m)	7.8	9.2	26.1	20.1	2.3	12.2	5.2	13.2
Queue Length 95th (m)	16.8	18.8	43.0	34.4	m3.3	m120.6	12.5	15.9
Internal Link Dist (m)	38.9		67.0		81.6		167.2	
Turn Bay Length (m)					30.0		30.0	
Base Capacity (vph)	275	336	289	333	607	2414	240	2436
Starvation Cap Reductn	0	0	0	0	0	645	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.16	0.15	0.46	0.32	0.18	0.71	0.35	0.20
Intersection Summary								
Cycle Length: 100								
Actuated Cycle Length: 100								
Offset: 0 (0%), Referenced to phase 2:NBT, Start of Green								
Natural Cycle: 60								
Control Type: Actuated-Coordinated								
m Volume for 95th percentile queue is met/led by upstream signal.								



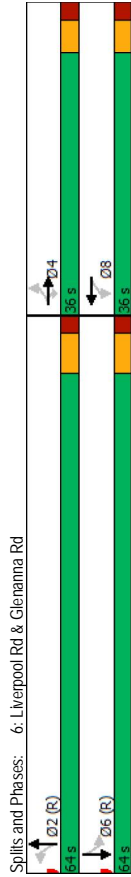
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↔	↔	↔	↔	↔
Traffic Volume (veh/h)	0	26	0	1263	558	0
Future Volume (Veh/h)	0	26	0	1263	558	0
Sign Control	Stop	Free	Free	Free	Free	Free
Grade	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	28	0	1373	607	0
Pedestrians	4					
Lane Width (m)	3.2					
Walking Speed (m/s)	1.2					
Percent Blockage	0					
Right turn flare (veh)				None	None	
Median storage (veh)						
Upstream signal (m)				59	105	
pX, platoon unblocked	0.73	0.97	0.97			
vC, conflicting volume	1298	308	611			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	495	228	540			
IC, single (s)	6.8	6.9	4.1			
IC, 2 stage (s)						
IF (s)	3.5	3.3	2.2			
p0 queue free %	100	96	100			
cM capacity (veh/h)	371	756	1005			
Direction, Lane #	EB.1	NB.1	NB.2	SB.1	SB.2	
Volume Total	28	686	686	304	304	
Volume Left	0	0	0	0	0	
Volume Right	28	0	0	0	0	
cSH	756	1700	1700	1700	1700	
Volume to Capacity	0.04	0.40	0.40	0.18	0.18	
Queue Length 95th (m)	0.9	0.0	0.0	0.0	0.0	
Control Delay (s)	9.9	0.0	0.0	0.0	0.0	
Lane LOS	A	A	A	A	A	
Approach Delay (s)	9.9	0.0	0.0	0.0	0.0	
Approach LOS	A	A	A	A	A	
Intersection Summary						
Average Delay	0.1					
Intersection Capacity Utilization	38.2%					
ICU Level of Service	A					
Analysis Period (min)	15					

Queues

6: Liverpool Rd & Glenanna Rd 19225 | 1294 Kingston Rd  
2028 FT PM: Option 4A North Dwy+Plaza Shifted



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Configurations	←	←	←	←	←	←	←	←	←	←
Traffic Volume (vph)	45	72	112	54	145	348	633	67	352	352
Future Volume (vph)	45	72	112	54	145	348	633	67	352	352
Ideal Flow (vphpl)	49	78	122	59	206	378	767	73	416	416
Lane Type	Perm	NA	Perm	Perm	NA	Perm	NA	Perm	NA	Perm
Protected Phases	4	4	4	8	8	8	2	2	6	6
Detector Phase	4	4	4	8	8	8	2	2	6	6
Switch Phase										
Minimum Initial (s)	8.0	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	24.7
Total Split (s)	36.0	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%	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	4.6
All-Red Time (s)	2.2	2.2	2.2	2.2	2.2	2.1	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	0.0
Total Lost Time (s)	5.9	5.9	5.9	5.9	5.9	6.7	6.7	6.7	6.7	6.7
LeadLag										
LeadLag Optimize?										
Recall Mode	None	None	None	None	None	None	C-Min	C-Min	C-Min	C-Min
v/c Ratio	0.39	0.27	0.35	0.29	0.69	0.58	0.31	0.16	0.17	0.17
Control Delay	45.0	37.4	9.2	28.2	39.4	9.0	3.3	6.7	5.1	5.1
Queue Delay	0.0	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	28.2	39.4	9.0	3.3	6.7	5.1	5.1
Queue Length 50th (m)	9.1	14.1	0.0	5.8	32.0	16.4	16.1	4.1	11.9	11.9
Queue Length 95th (m)	19.6	28.9	14.5	22.9	60.4	103.1	14.9	11.6	21.5	21.5
Internal Link Dist (m)						416.6	167.2		478.0	
Turn Bay Length (m)				24.3		24.4		46.2		
Base Capacity (vph)	237	549	549	385	550	651	2467	453	2521	2521
Stallion Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillover Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	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	0.17
Intersection Summary										
Cycle Length: 100										
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBTL, Start of Green										
Natural Cycle: 60										
Control Type: Actuated-Coordinated										



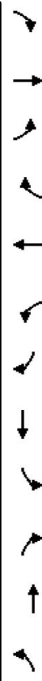
HCM Signalized Intersection Capacity Analysis 19225 | 1294 Kingston Rd  
2028 FT PM: Option 4A North Dwy+Plaza Shifted



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT	SBR
Lane Configurations	←	←	←	←	←	←	←	←	←	←	←
Traffic Volume (vph)	40	0	47	123	0	98	100	916	247	76	388
Future Volume (vph)	40	0	47	123	0	98	100	916	247	76	388
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.5	3.2	3.2	3.5
Total Lost Time (s)	6.9	6.9	6.9	6.9	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	1.00	1.00	1.00	0.95	1.00	1.00	0.95
Frbp, ped/bikes	1.00	0.99	1.00	0.99	1.00	0.99	1.00	0.99	1.00	1.00	0.99
Frbp, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	0.99	1.00	1.00
Flt	1.00	0.85	1.00	0.85	1.00	0.97	1.00	0.97	1.00	0.98	1.00
Flt Protected	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95
Satd. Flow (prot)	1722	1522	1722	1507	1710	3385	1710	3385	1716	3428	3428
Flt Permitted	0.69	1.00	0.72	1.00	0.48	1.00	0.48	1.00	0.19	1.00	0.19
Satd. Flow (perm)	1247	1522	1312	1507	859	3385	859	3385	340	3428	3428
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
Adj. Flow (vph)	43	0	51	134	0	107	109	996	268	83	422
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	43	51	0	134	107	0	109	1244	0	83	472
Conf. Peds. (#/hr)	1	1	1	1	1	1	6	15	15	15	6
Heavy Vehicles (%)	0%	0%	0%	0%	0%	1%	0%	1%	0%	0%	2%
Turn Type	Perm	NA	4	8	8	8	2	2	6	6	6
Protected Phases	4	4	4	8	8	8	2	2	6	6	6
Permitted Phases	4	4	4	8	8	8	2	2	6	6	6
Actuated Green, G (s)	15.4	15.4	15.4	15.4	15.4	15.4	70.8	70.8	70.8	70.8	70.8
Effective Green, g (s)	15.4	15.4	15.4	15.4	15.4	15.4	70.8	70.8	70.8	70.8	70.8
Actuated g/C Ratio	0.15	0.15	0.15	0.15	0.15	0.15	0.71	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	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	3.0	3.0	3.0	3.0
Lane Grip Cap (vph)	192	234	202	232	608	2396	240	2427	240	2427	2427
v/s Ratio Prot	0.03	0.03	0.03	0.07	0.07	0.07	c0.37	c0.37	0.14	0.14	0.14
v/s Ratio Perm	0.03	0.03	0.03	0.10	0.13	0.13	0.52	0.52	0.24	0.24	0.24
v/c Ratio	0.22	0.22	0.22	0.66	0.46	0.18	0.52	0.52	0.35	0.35	0.35
Uniform Delay, d1	37.1	37.0	37.0	39.9	38.5	4.9	6.7	6.7	5.6	4.9	4.9
Progression Factor	1.00	1.00	1.00	1.00	1.00	0.35	0.46	0.46	0.86	0.81	0.81
Incremental Delay, d2	0.6	0.5	0.5	7.9	1.5	0.3	0.4	0.4	0.9	0.0	0.0
Delay (s)	37.7	37.5	37.5	47.8	40.0	2.0	3.5	3.5	5.7	4.1	4.1
Level of Service	D	D	D	D	D	A	A	A	A	A	A
Approach Delay (s)							3.4	3.4	4.3	4.3	4.3
Approach LOS							D	D	A	A	A
Intersection Summary											
HCM 2000 Control Delay	9.4										
HCM 2000 Volume to Capacity ratio	0.54										
Actuated Cycle Length (s)	100.0										
Intersection Capacity Utilization	68.5%										
Analysis Period (min)	15										
Critical Lane Group	C										

HCM Signalized Intersection Capacity Analysis  
 6: Liverpool Rd & Glenanna Rd

19225 | 1294 Kingston Rd  
 2028 FT PVI: Option 4A North Dwy+Plaza Shifted



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	45	72	112	54	145	44	348	633	73	67	352	30
Future Volume (vph)	45	72	112	54	145	44	348	633	73	67	352	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	5.9	6.7	6.7	6.7	6.7	6.7	6.7
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frbp, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00	0.99	1.00
Frbp, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.98	1.00	1.00	0.99	1.00
Flt	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Flt Protected	1725	1824	1543	1725	1791	1708	3448	1708	3448	1707	3527	3527
Satd. Flow (prot)	0.43	1.00	1.00	0.71	1.00	0.51	1.00	0.51	1.00	0.35	1.00	1.00
Flt Permitted	788	1824	1543	1282	1791	914	3448	914	3448	634	3527	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	122	59	158	48	378	688	79	73	383	33
RTOR Reduction (vph)	0	0	102	0	13	0	0	6	0	0	4	0
Lane Group Flow (vph)	49	78	20	59	193	0	378	761	0	73	412	0
Confl. Peds. (#/hr)	0%	3%	0%	0%	1%	2%	1%	1%	5%	0%	0%	0%
Heavy Vehicles (%)	0%	3%	0%	0%	1%	2%	1%	1%	5%	0%	0%	0%
Turn Type	Perm	NA	Perm	Perm	NA	NA	Perm	NA	NA	Perm	NA	NA
Protected Phases	4		4	8		8	2		2		6	
Permitted Phases	4		4	8		8	2		2		6	
Actuated Green, G (s)	16.0	16.0	16.0	16.0	16.0	16.0	71.4	71.4	71.4	71.4	71.4	71.4
Effective Green, g (s)	16.0	16.0	16.0	16.0	16.0	16.0	71.4	71.4	71.4	71.4	71.4	71.4
Actuated g/C Ratio	0.16	0.16	0.16	0.16	0.16	0.16	0.71	0.71	0.71	0.71	0.71	0.71
Clearance Time (s)	5.9	5.9	5.9	5.9	5.9	5.9	6.7	6.7	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	3.0	3.0	3.0
Lane Grp Cap (vph)	126	291	246	205	286	652	2461	652	2461	452	2518	2518
w/s Ratio Prot	0.04		0.01	0.05		c0.11		0.22		0.12		0.12
w/s Ratio Perm	0.06		0.01	0.05		c0.41		0.12		0.12		0.12
w/c Ratio	0.39	0.27	0.08	0.29	0.67	0.58	0.31	0.58	0.31	0.16	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	4.6	4.6	4.6
Progression Factor	1.00	1.00	1.00	0.70	0.77	0.64	0.53	0.64	0.53	1.00	1.00	1.00
Incremental Delay, d2	2.0	0.5	0.1	0.8	6.0	3.3	0.3	3.3	0.3	0.8	0.1	0.1
Delay (s)	39.6	37.4	35.9	26.7	36.5	7.8	3.1	7.8	3.1	5.4	4.8	4.8
Level of Service	D	D	D	C	D	C	D	A	A	A	A	A
Approach Delay (s)			37.1		34.4		4.6		4.6		4.9	
Approach LOS			D		C		A		A		A	

Intersection Summary			
HCM 2000 Control Delay	12.1	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	67.9%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			



# APPENDIX C

SimTraffic Outputs

The background of the page features several thick, overlapping, curved lines in a light grey color. These lines sweep across the page from the top and right towards the bottom and left, creating a sense of movement and depth. The lines vary in thickness and overlap in a way that suggests a three-dimensional space.

**Existing Traffic**

Arterial Level of Service: EB Kingston Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (km)	Arterial Speed	Run 1 Speed	Run 1 Delay	Run 1 Speed	Run 1 Delay
Liverpool Rd	2	32.3	72.1	0.7	35	35	35	35	32.3
Glenanna Rd	1	24.2	47.1	0.4	32	32	32	32	24.2
<b>Total</b>		<b>56.5</b>	<b>119.1</b>	<b>1.1</b>	<b>34</b>	<b>34</b>	<b>34</b>	<b>34</b>	<b>56.5</b>

Arterial Level of Service: WB Kingston Rd

Cross Street	Node	Run 2 Speed	Run 2 Delay	Run 3 Speed	Run 3 Delay	Run 4 Speed	Run 4 Delay	Run 5 Speed	Run 5 Delay
Liverpool Rd	35	32.3	35	32.3	35	35	32.3	35	35
Glenanna Rd	32	24.2	32	24.2	32	32	24.2	32	32
<b>Total</b>	<b>34</b>	<b>56.5</b>	<b>34</b>	<b>56.5</b>	<b>34</b>	<b>34</b>	<b>56.5</b>	<b>34</b>	<b>34</b>

Arterial Level of Service: WB Kingston Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (km)	Arterial Speed	Run 1 Speed	Run 1 Delay
Glenanna Rd	1	26.7	59.2	0.5	33	33	26.7
Liverpool Rd	2	45.0	68.1	0.4	22	22	45.0
<b>Total</b>		<b>71.7</b>	<b>127.4</b>	<b>1.0</b>	<b>27</b>	<b>27</b>	<b>71.7</b>

Arterial Level of Service: WB Kingston Rd

Cross Street	Node	Run 2 Speed	Run 2 Delay	Run 3 Speed	Run 3 Delay	Run 4 Speed	Run 4 Delay	Run 5 Speed	Run 5 Delay
Glenanna Rd	33	26.7	33	26.7	33	33	26.7	33	33
Liverpool Rd	22	45.0	22	45.0	22	45.0	22	45.0	22
<b>Total</b>	<b>27</b>	<b>71.7</b>	<b>27</b>	<b>71.7</b>	<b>27</b>	<b>27</b>	<b>71.7</b>	<b>27</b>	<b>27</b>

Summary of All Intervals

Run Number	1	2	3	4	5	Avg
Start Time	7:45	7:45	7:45	7:45	7:45	7:45
End Time	9:00	9:00	9:00	9:00	9:00	9:00
Total Time (min)	75	75	75	75	75	75
Time Recorded (min)	60	60	60	60	60	60
# of Intervals	2	2	2	2	2	2
# of Recorded Intervals	1	1	1	1	1	1
Vehs Entered	4059	4059	4059	4059	4059	4059
Vehs Exited	4064	4064	4064	4064	4064	4064
Starting Vehs	126	126	126	126	126	126
Ending Vehs	121	121	121	121	121	121
Travel Distance (km)	4379	4379	4379	4379	4379	4379
Travel Time (hr)	137.2	137.2	137.2	137.2	137.2	137.2
Total Delay (hr)	49.8	49.8	49.8	49.8	49.8	49.8
Total Stops	4807	4807	4807	4807	4807	4807
Fuel Used (l)	390.5	390.5	390.5	390.5	390.5	390.5

Interval #0 Information Seeding

Start Time	7:45
End Time	8:00
Total Time (min)	15
Volumes adjusted by Growth Factors.	
No data recorded this interval.	

Interval #1 Information Recording

Start Time	8:00
End Time	9:00
Total Time (min)	60
Volumes adjusted by Growth Factors.	

Run Number	1	2	3	4	5	Avg
Vehs Entered	4059	4059	4059	4059	4059	4059
Vehs Exited	4064	4064	4064	4064	4064	4064
Starting Vehs	126	126	126	126	126	126
Ending Vehs	121	121	121	121	121	121
Travel Distance (km)	4379	4379	4379	4379	4379	4379
Travel Time (hr)	137.2	137.2	137.2	137.2	137.2	137.2
Total Delay (hr)	49.8	49.8	49.8	49.8	49.8	49.8
Total Stops	4807	4807	4807	4807	4807	4807
Fuel Used (l)	390.5	390.5	390.5	390.5	390.5	390.5

Intersection: 1: Glenanna Rd & Kingston Rd

Movement	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB	NB	NB	SB
Directions Served	L	T	R	T	L	T	R	T	L	T	R	T	L	R
Maximum Queue (m)	49.8	61.0	60.5	28.7	40.4	72.8	67.1	30.7	32.5	33.1	20.9	34.6	34.6	L
Average Queue (m)	3.2	21.4	26.2	7.9	20.1	45.0	38.3	12.7	6.9	11.0	4.6	19.0	19.0	L
95th Queue (m)	18.1	50.8	53.2	17.8	40.4	67.7	65.2	29.2	19.3	27.1	12.4	33.1	33.1	L
Link Distance (m)	383.4	383.4	383.4	383.4	534.5	534.5	534.5	534.5	182.2	182.2	182.2	182.2	182.2	L
Upstream Blk Time (%)														
Queuing Penalty (veh)														
Storage Bay Dist (m)	42.6			60.4	33.0			23.2	25.4	25.4	25.0	27.3	27.3	L
Storage Blk Time (%)	4	1			18	14	0	0	0	2	0	3	3	L
Queuing Penalty (veh)	0	1			17	17	1	0	3	0	4	4	4	L

Intersection: 1: Glenanna Rd & Kingston Rd

Movement	SB	SB
Directions Served	T	R
Maximum Queue (m)	62.0	20.4
Average Queue (m)	16.1	3.7
95th Queue (m)	39.5	13.1
Link Distance (m)	410.7	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)	16.5	
Storage Blk Time (%)	3	0
Queuing Penalty (veh)	6	0

Arterial Level of Service: NB Liverpool Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (km)	Arterial Speed	Run 1 Speed	Run 1 Delay
Kingston Rd	2	20.0	38.6	0.3	25	25	20.0
South Dwy	3	2.0	6.7	0.1	32	32	2.0
Main Plaza Dwy	4	1.2	6.9	0.1	42	42	1.2
Glenanna Rd	6	4.8	20.1	0.2	39	39	4.8
Total		27.9	72.3	0.6	31	31	27.9

Arterial Level of Service: NB Liverpool Rd

Cross Street	Run 2 Speed	Run 2 Delay	Run 3 Speed	Run 3 Delay	Run 4 Speed	Run 4 Delay	Run 5 Speed	Run 5 Delay
Kingston Rd	25	20.0	25	20.0	25	20.0	25	20.0
South Dwy	32	2.0	32	2.0	32	2.0	32	2.0
Main Plaza Dwy	42	1.2	42	1.2	42	1.2	42	1.2
Glenanna Rd	39	4.8	39	4.8	39	4.8	39	4.8
Total	31	27.9	31	27.9	31	27.9	31	27.9

Arterial Level of Service: SB Liverpool Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (km)	Arterial Speed	Run 1 Speed	Run 1 Delay
Glenanna Rd	6	8.3	44.1	0.5	41	41	8.3
North Dwy	4	2.2	17.4	0.2	45	45	2.2
South Dwy	3	8.9	14.8	0.1	20	20	8.9
Kingston Rd	2	25.9	29.7	0.1	7	7	25.9
Total		45.3	106.0	0.9	29	29	45.3

Arterial Level of Service: SB Liverpool Rd

Cross Street	Run 2 Speed	Run 2 Delay	Run 3 Speed	Run 3 Delay	Run 4 Speed	Run 4 Delay	Run 5 Speed	Run 5 Delay
Glenanna Rd	41	8.3	41	8.3	41	8.3	41	8.3
North Dwy	45	2.2	45	2.2	45	2.2	45	2.2
South Dwy	20	8.9	20	8.9	20	8.9	20	8.9
Kingston Rd	7	25.9	7	25.9	7	25.9	7	25.9
Total	29	45.3	29	45.3	29	45.3	29	45.3



Intersection: 4: Liverpool Rd & North Dwy/Main Plaza Dwy

Movement	EB	WB	WB	NB	NB	NB	SB	SB	SB	SB	SB	SB
	L	TR	L	TR	L	TR	L	TR	L	TR	L	TR
Directions Served	8.9	46.7	16.2	8.1	7.6	14.5	14.3	7.1	12.2			
Maximum Queue (m)	4.2	17.1	8.3	2.5	0.3	1.5	6.2	0.2	0.8			
Average Queue (m)	11.3	34.0	14.6	8.5	2.5	6.8	13.2	2.3	5.2			
95th Queue (m)	29.6	43.1	43.1	43.1	61.3	61.3	190.5	190.5	190.5			
Link Distance (m)												
Upstream Blk Time (%)												
Queuing Penalty (veh)							56.0					
Storage Bay Dist (m)												
Storage Blk Time (%)												
Queuing Penalty (veh)												

Intersection: 6: Liverpool Rd & Glenanna Rd

Movement	EB	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB	SB
	L	T	R	L	TR	L	TR	L	TR	L	TR	TR
Directions Served	29.4	41.5	42.6	31.4	34.6	27.4	19.5	24.1	20.1	46.1	41.0	
Maximum Queue (m)	8.9	21.0	20.4	14.5	18.9	11.2	5.0	7.6	8.3	19.6	23.5	
Average Queue (m)	20.7	36.7	33.6	28.6	31.9	21.2	14.6	18.3	16.7	33.4	39.5	
95th Queue (m)	117.4	117.4	117.4	410.7	410.7	190.5	190.5	190.5	491.4	491.4	491.4	
Link Distance (m)												
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (m)				24.3		24.4			46.2			
Storage Blk Time (%)				1		4		1	0			0
Queuing Penalty (veh)				1		3		3	1			0

Network Summary

Network wide Queuing Penalty: 435

Intersection: 2: Liverpool Rd & Kingston Rd

Movement	EB	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB	SB
	L	T	R	L	TR	L	TR	L	TR	L	TR	TR
Directions Served	40.8	72.7	72.5	56.6	56.3	63.8	66.9	53.4	77.8	52.9	21.4	31.5
Maximum Queue (m)	13.9	29.8	30.6	3.8	30.0	41.5	45.7	30.8	24.3	25.4	6.5	14.6
Average Queue (m)	30.5	53.6	53.3	27.1	50.7	60.6	61.9	50.4	45.8	45.1	16.9	33.3
95th Queue (m)	671.8	671.8	671.8	383.4	383.4	383.4	383.4	246.1	246.1	246.1	246.1	246.1
Link Distance (m)												
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (m)				49.1		103.2		46.2			51.8	47.9
Storage Blk Time (%)				0		2		0		2	1	0
Queuing Penalty (veh)				0		5		4		1	4	2

Intersection: 2: Liverpool Rd & Kingston Rd

Movement	SB	SB	SB	SB	SB	SB	SB	SB	SB	SB	SB	SB
	T	T	R	T	R	T	R	T	R	T	R	R
Directions Served	37.4	42.6	31.6									
Maximum Queue (m)	33.7	35.7	11.7									
Average Queue (m)	37.6	39.2	32.7									
95th Queue (m)	31.6	31.6										
Link Distance (m)												
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (m)				132		155		0				
Storage Blk Time (%)				27		32		0				
Queuing Penalty (veh)				22		32		1				

Intersection: 3: Liverpool Rd & South Dwy

Movement	EB	SB	SB	SB	SB	SB	SB	SB	SB	SB	SB	SB
	LR	T	TR	LR	T	TR	LR	T	TR	LR	T	TR
Directions Served	14.8	63.4	67.2									
Maximum Queue (m)	3.6	29.6	32.7									
Average Queue (m)	11.0	59.5	62.2									
95th Queue (m)	15.6	61.3	61.3									
Link Distance (m)												
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (m)				0		5		7				
Storage Blk Time (%)												
Queuing Penalty (veh)												

Intersection: 6: Liverpool Rd & Glenanna Rd

Phase	2	4	6	8
Movement(s) Served	NBTL	EBTL	SBTL	WBTL
Maximum Green (s)	57.3	30.1	57.3	30.1
Minimum Green (s)	5.0	8.0	5.0	8.0
Recall	C-Min	None	C-Min	None
Avg. Green (s)	44.5	16.5	44.5	16.5
g/C Ratio	NA	NA	NA	NA
Cycles Skipped (%)	0	0	0	0
Cycles @ Minimum (%)	0	2	0	2
Cycles Maxed Out (%)	100	0	100	0
Cycles with Peds (%)	23	0	0	0

**Controller Summary**  
 Average Cycle Length (s): NA  
 Number of Complete Cycles : 0

Intersection: 1: Glenanna Rd & Kingston Rd

Phase	1	2	3	4	5	6	8
Movement(s) Served	SBL	NBTL	WBL	EBTL	NBL	SBTL	WBTL
Maximum Green (s)	6.0	36.0	6.0	32.6	6.0	36.0	41.6
Minimum Green (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Recall	None	C-Min	None	None	None	C-Min	None
Avg. Green (s)	11.4	42.4	8.2	24.5	6.9	50.4	32.6
g/C Ratio	-0.01	NA	-0.01	-0.01	-0.01	NA	NA
Cycles Skipped (%)	19	0	19	3	63	0	0
Cycles @ Minimum (%)	0	0	0	0	0	0	0
Cycles Maxed Out (%)	6	100	0	0	0	100	0
Cycles with Peds (%)	0	60	0	67	0	94	61

**Controller Summary**  
 Average Cycle Length (s): NA  
 Number of Complete Cycles : 0

Intersection: 2: Liverpool Rd & Kingston Rd

Phase	1	2	3	4	5	6	7	8
Movement(s) Served	SBL	NBTL	WBL	EBTL	NBL	SBTL	EBL	WBTL
Maximum Green (s)	6.0	32.1	9.0	32.6	7.0	31.1	7.0	34.6
Minimum Green (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Recall	None	Min	None	C-Min	None	Min	None	C-Min
Avg. Green (s)	7.7	39.5	11.4	24.5	13.9	32.0	7.6	30.0
g/C Ratio	-0.01	NA	-0.01	NA	-0.01	NA	-0.01	NA
Cycles Skipped (%)	25	0	3	0	8	0	20	0
Cycles @ Minimum (%)	0	0	0	0	0	0	0	0
Cycles Maxed Out (%)	0	31	34	100	8	31	20	100
Cycles with Peds (%)	0	72	0	61	0	58	0	51

**Controller Summary**  
 Average Cycle Length (s): NA  
 Number of Complete Cycles : 0

## **Weekday PM Peak Hour**

Arterial Level of Service: EB Kingston Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (km)	Arterial Speed	Run 1 Speed	Run 1 Delay	Run 1 Speed	Run 1 Delay
Liverpool Rd	2	77.4	117.7	0.7	21	21	21	21	77.4
Glenanna Rd	1	29.3	53.6	0.4	28	28	28	28	29.3
<b>Total</b>		106.7	171.3	1.1	23	23	23	23	106.7

Arterial Level of Service: WB Kingston Rd

Cross Street	Node	Run 2 Speed	Run 2 Delay	Run 3 Speed	Run 3 Delay	Run 4 Speed	Run 4 Delay	Run 5 Speed	Run 5 Delay
Liverpool Rd	21	77.4	21	77.4	21	77.4	21	77.4	21
Glenanna Rd	28	29.3	28	29.3	28	29.3	28	29.3	28
<b>Total</b>	23	106.7	23	106.7	23	106.7	23	106.7	23

Arterial Level of Service: WB Kingston Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (km)	Arterial Speed	Run 1 Speed	Run 1 Delay
Glenanna Rd	1	16.1	48.2	0.5	41	41	16.1
Liverpool Rd	2	39.5	61.8	0.4	24	24	39.5
<b>Total</b>		55.5	110.0	1.0	32	32	55.5

Arterial Level of Service: WB Kingston Rd

Cross Street	Node	Run 2 Speed	Run 2 Delay	Run 3 Speed	Run 3 Delay	Run 4 Speed	Run 4 Delay	Run 5 Speed	Run 5 Delay
Glenanna Rd	41	16.1	41	16.1	41	16.1	41	16.1	41
Liverpool Rd	24	39.5	24	39.5	24	39.5	24	39.5	24
<b>Total</b>	32	55.5	32	55.5	32	55.5	32	55.5	32

Summary of All Intervals

Run Number	1	2	3	4	5	Avg
Start Time	4:45	4:45	4:45	4:45	4:45	4:45
End Time	6:00	6:00	6:00	6:00	6:00	6:00
Total Time (min)	75	75	75	75	75	75
Time Recorded (min)	60	60	60	60	60	60
# of Intervals	2	2	2	2	2	2
# of Recorded Intervals	1	1	1	1	1	1
Vehs Entered	5578	5578	5578	5578	5578	5578
Vehs Exited	5484	5484	5484	5484	5484	5484
Starting Vehs	181	181	181	181	181	181
Ending Vehs	275	275	275	275	275	275
Travel Distance (km)	6059	6059	6059	6059	6059	6059
Travel Time (hr)	220.9	220.9	220.9	220.9	220.9	220.9
Total Delay (hr)	102.5	102.5	102.5	102.5	102.5	102.5
Total Stops	7972	7972	7972	7972	7972	7972
Fuel Used (l)	565.4	565.4	565.4	565.4	565.4	565.4

Interval #0 Information Seeding

Start Time	4:45
End Time	5:00
Total Time (min)	15
Volumes adjusted by Growth Factors.	
No data recorded this interval.	

Interval #1 Information Recording

Start Time	5:00
End Time	6:00
Total Time (min)	60
Volumes adjusted by Growth Factors.	

Run Number	1	2	3	4	5	Avg
Vehs Entered	5578	5578	5578	5578	5578	5578
Vehs Exited	5484	5484	5484	5484	5484	5484
Starting Vehs	181	181	181	181	181	181
Ending Vehs	275	275	275	275	275	275
Travel Distance (km)	6059	6059	6059	6059	6059	6059
Travel Time (hr)	220.9	220.9	220.9	220.9	220.9	220.9
Total Delay (hr)	102.5	102.5	102.5	102.5	102.5	102.5
Total Stops	7972	7972	7972	7972	7972	7972
Fuel Used (l)	565.4	565.4	565.4	565.4	565.4	565.4

Queuing and Blocking Report

19225 | 1294 Kingston Rd  
EX PM

Intersection: 1: Glenanna Rd & Kingston Rd

Movement	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB	NB	NB	SB
Directions Served	L	T	R	T	L	T	R	T	L	T	R	T	L	R
Maximum Queue (m)	49.9	157.6	167.4	67.9	40.4	65.6	66.2	30.7	32.8	70.1	32.5	34.8	34.8	34.8
Average Queue (m)	5.1	62.8	69.8	20.8	26.7	31.7	29.6	13.5	17.3	31.7	22.3	27.9	27.9	27.9
95th Queue (m)	20.4	126.5	139.1	63.9	41.0	58.0	55.0	29.7	31.5	58.8	36.3	41.7	41.7	41.7
Link Distance (m)	383.4													383.4
Upstream Blk Time (%)	534.5													534.5
Queuing Penalty (veh)	182.2													182.2
Storage Bay Dist (m)	42.6	60.4											33.0	
Storage Blk Time (%)	20	15	0	6	8	11	0	0	0	14	6	17	17	17
Queuing Penalty (veh)	5	22	0	17	12	14	0	1	41	17	17	17	17	17

Intersection: 1: Glenanna Rd & Kingston Rd

Movement	SB	SB
Directions Served	T	R
Maximum Queue (m)	98.6	24.0
Average Queue (m)	49.6	7.3
95th Queue (m)	88.0	21.6
Link Distance (m)	410.7	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)	16.5	
Storage Blk Time (%)	27	
Queuing Penalty (veh)	57	

Arterial Level of Service

19225 | 1294 Kingston Rd  
EX PM

Arterial Level of Service: NB Liverpool Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (km)	Arterial Speed	Run 1 Speed	Run 1 Delay
Kingston Rd	2	43.5	62.1	0.3	16	16	43.5
South Dwy	3	2.9	7.6	0.1	28	28	2.9
Main Plaza Dwy	4	2.1	7.8	0.1	37	37	2.1
Glenanna Rd	6	6.5	21.8	0.2	36	36	6.5
Total		55.0	99.3	0.6	23	23	55.0

Arterial Level of Service: NB Liverpool Rd

Cross Street	Run 2 Speed	Run 2 Delay	Run 3 Speed	Run 3 Delay	Run 4 Speed	Run 4 Delay	Run 5 Speed	Run 5 Delay
Kingston Rd	16	43.5	16	43.5	16	43.5	16	43.5
South Dwy	28	2.9	28	2.9	28	2.9	28	2.9
Main Plaza Dwy	37	2.1	37	2.1	37	2.1	37	2.1
Glenanna Rd	36	6.5	36	6.5	36	6.5	36	6.5
Total	23	55.0	23	55.0	23	55.0	23	55.0

Arterial Level of Service: SB Liverpool Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (km)	Arterial Speed	Run 1 Speed	Run 1 Delay
Glenanna Rd	6	7.1	43.3	0.5	42	42	7.1
North Dwy	4	1.6	17.0	0.2	46	46	1.6
South Dwy	3	1.0	6.9	0.1	42	42	1.0
Kingston Rd	2	25.6	29.5	0.1	7	7	25.6
Total		35.3	96.7	0.9	32	32	35.3

Arterial Level of Service: SB Liverpool Rd

Cross Street	Run 2 Speed	Run 2 Delay	Run 3 Speed	Run 3 Delay	Run 4 Speed	Run 4 Delay	Run 5 Speed	Run 5 Delay
Glenanna Rd	42	7.1	42	7.1	42	7.1	42	7.1
North Dwy	46	1.6	46	1.6	46	1.6	46	1.6
South Dwy	42	1.0	42	1.0	42	1.0	42	1.0
Kingston Rd	7	25.6	7	25.6	7	25.6	7	25.6
Total	32	35.3	32	35.3	32	35.3	32	35.3

Intersection: 4: Liverpool Rd & North Dwy/Main Plaza Dwy

Movement	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB	SB	TR
Directions Served	L	T	R	L	T	R	L	T	R	L	T	TR
Maximum Queue (m)	16.8	47.7	29.5	8.3	7.5	28.2	26.7	3.9				
Average Queue (m)	7.3	23.3	12.0	3.7	0.3	2.1	10.9	0.1				
95th Queue (m)	14.4	40.7	22.0	10.2	2.5	11.4	22.1	1.3				
Link Distance (m)	29.6	43.1	43.1		61.3	61.3	190.5					
Upstream Blk Time (%)	1											
Queuing Penalty (veh)	0						56.0					
Storage Bay Dist (m)				32.0								
Storage Blk Time (%)												
Queuing Penalty (veh)												

Intersection: 6: Liverpool Rd & Glenanna Rd

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB	SB	TR
Directions Served	L	T	R	L	T	R	L	T	R	L	T	TR
Maximum Queue (m)	29.3	33.7	22.8	31.6	97.7	31.8	58.2	44.6	21.8	46.0	21.3	
Average Queue (m)	7.7	14.7	10.8	10.3	32.1	22.6	18.0	17.3	10.2	13.7	9.9	
95th Queue (m)	20.7	28.5	17.8	27.9	71.6	36.1	48.3	35.6	17.4	29.3	21.5	
Link Distance (m)	117.4	117.4		410.7		190.5	190.5	491.4				
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (m)	22.0			24.3		24.4		46.2				
Storage Blk Time (%)	3	4		1	16	11	0	0				
Queuing Penalty (veh)	2	2		2	9	32	0	0				

Network Summary

Network wide Queuing Penalty: 845

Intersection: 2: Liverpool Rd & Kingston Rd

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB	SB	TR
Directions Served	L	T	R	L	T	R	L	T	R	L	T	TR
Maximum Queue (m)	41.0	323.6	329.8	56.6	62.2	69.1	71.3	69.0	53.6	237.2	203.6	59.3
Average Queue (m)	34.9	154.4	163.3	43.3	37.4	40.5	42.9	4.5	50.3	104.7	91.9	47.0
95th Queue (m)	51.0	279.0	290.4	82.7	57.1	62.6	63.2	32.5	60.5	183.4	167.4	79.6
Link Distance (m)		671.8	671.8		383.4	383.4			246.1	246.1		
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (m)	33.5			49.1	103.2		61.6	46.2				
Storage Blk Time (%)	10	51	43	0	1	0	30	20	16	3		
Queuing Penalty (veh)	50	111	141	2	1	0	131	60	45	12		

Intersection: 2: Liverpool Rd & Kingston Rd

Movement	SB	SB	SB	SB	SB	SB	SB	SB	SB	SB	SB	TR
Directions Served	L	T	R	L	T	R	L	T	R	L	T	TR
Maximum Queue (m)	29.9	35.6	41.9	31.6								
Average Queue (m)	16.3	22.6	26.1	9.5								
95th Queue (m)	29.1	35.4	39.3	26.5								
Link Distance (m)	31.6	31.6										
Upstream Blk Time (%)	1	2	2	0								
Queuing Penalty (veh)	0	4	7	0								
Storage Bay Dist (m)	47.9			39.9								
Storage Blk Time (%)	1	2	2	0								
Queuing Penalty (veh)	2	2	2	0								

Intersection: 3: Liverpool Rd & South Dwy

Movement	EB	NB	NB	SB	SB	SB	SB	TR
Directions Served	LR	LT	T	T	TR			
Maximum Queue (m)	17.1	25.0	24.1	9.3	22.0			
Average Queue (m)	5.7	1.9	4.0	0.6	1.4			
95th Queue (m)	14.0	10.8	17.5	4.4	8.7			
Link Distance (m)	15.6	31.6	31.6	61.3	61.3			
Upstream Blk Time (%)	0							
Queuing Penalty (veh)	0							
Storage Bay Dist (m)								
Storage Blk Time (%)								
Queuing Penalty (veh)								

Intersection: 6: Liverpool Rd & Glenanna Rd

Phase	2	4	6	8
Movement(s) Served	NBTL	EBTL	SBTL	WBTL
Maximum Green (s)	57.3	30.1	57.3	30.1
Minimum Green (s)	5.0	8.0	5.0	8.0
Recall	C-Min	None	C-Min	None
Avg. Green (s)	57.0	16.6	57.0	16.6
g/C Ratio	NA	NA	NA	NA
Cycles Skipped (%)	0	0	0	0
Cycles @ Minimum (%)	0	14	0	14
Cycles Maxed Out (%)	100	0	100	0
Cycles with Peds (%)	15	0	0	0
<b>Controller Summary</b>				
Average Cycle Length (s):	NA			
Number of Complete Cycles:	0			

Intersection: 1: Glenanna Rd & Kingston Rd

Phase	1	2	3	4	5	6	8
Movement(s) Served	SBL	NBTL	WBL	EBTL	NBL	SBTL	WBTL
Maximum Green (s)	6.0	36.0	6.0	32.6	6.0	36.0	41.6
Minimum Green (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Recall	None	C-Min	None	None	None	C-Min	None
Avg. Green (s)	6.9	26.0	11.1	38.3	6.4	29.4	51.2
g/C Ratio	-0.01	NA	-0.01	NA	-0.01	NA	NA
Cycles Skipped (%)	3	0	8	0	31	0	0
Cycles @ Minimum (%)	0	0	0	0	0	0	0
Cycles Maxed Out (%)	75	100	17	72	51	100	72
Cycles with Peds (%)	0	83	0	67	0	91	61
<b>Controller Summary</b>							
Average Cycle Length (s):	NA						
Number of Complete Cycles:	0						

Intersection: 2: Liverpool Rd & Kingston Rd

Phase	1	2	3	4	5	6	7	8
Movement(s) Served	SBL	NBTL	WBL	EBTL	NBL	SBTL	EBL	WBTL
Maximum Green (s)	6.0	32.1	9.0	32.6	7.0	31.1	7.0	34.6
Minimum Green (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Recall	None	Min	None	C-Min	None	Min	None	C-Min
Avg. Green (s)	6.1	32.2	10.0	33.2	7.7	29.7	7.7	35.2
g/C Ratio	-0.01	NA	NA	NA	NA	NA	-0.01	NA
Cycles Skipped (%)	11	0	0	0	0	0	3	0
Cycles @ Minimum (%)	0	0	0	0	0	0	0	0
Cycles Maxed Out (%)	72	72	91	100	94	72	69	100
Cycles with Peds (%)	0	72	0	51	0	56	0	56
<b>Controller Summary</b>								
Average Cycle Length (s):	NA							
Number of Complete Cycles:	0							



**Future Total Traffic - Option 0**



**Weekday AM Peak Hour**

Arterial Level of Service: EB Kingston Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (km)	Arterial Speed	Run 1 Speed	Run 1 Delay	Run 1 Speed	Run 1 Delay
Liverpool Rd	2	34.9	82.4	0.7	30	31	34.5		
Glenanna Rd	1	31.5	55.0	0.4	27	29	28.9		
<b>Total</b>		<b>66.4</b>	<b>137.4</b>	<b>1.1</b>	<b>29</b>	<b>30</b>	<b>63.4</b>		

Arterial Level of Service: WB Kingston Rd

Cross Street	Node	Run 2 Speed	Run 2 Delay	Run 3 Speed	Run 3 Delay	Run 4 Speed	Run 4 Delay	Run 5 Speed	Run 5 Delay
Liverpool Rd	30	34.4	30	36.4	30	35.3	31		
Glenanna Rd	26	33.4	26	34.3	28	30.3	28		
<b>Total</b>	<b>29</b>	<b>67.8</b>	<b>28</b>	<b>70.8</b>	<b>29</b>	<b>65.6</b>	<b>29</b>		

Arterial Level of Service: WB Kingston Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (km)	Arterial Speed	Run 1 Speed	Run 1 Delay
Glenanna Rd	1	27.9	60.2	0.5	33	33	26.9
Liverpool Rd	2	54.1	77.3	0.4	19	19	55.3
<b>Total</b>		<b>82.0</b>	<b>137.4</b>	<b>1.0</b>	<b>25</b>	<b>25</b>	<b>82.1</b>

Arterial Level of Service: WB Kingston Rd

Cross Street	Node	Run 2 Speed	Run 2 Delay	Run 3 Speed	Run 3 Delay	Run 4 Speed	Run 4 Delay	Run 5 Speed	Run 5 Delay
Glenanna Rd	33	28.1	32	30.1	34	27.0	33		
Liverpool Rd	19	55.6	20	51.3	20	52.2	19		
<b>Total</b>	<b>25</b>	<b>83.7</b>	<b>25</b>	<b>81.4</b>	<b>26</b>	<b>79.2</b>	<b>25</b>		

Summary of All Intervals

Run Number	1	2	3	4	5	Avg
Start Time	7:45	7:45	7:45	7:45	7:45	7:45
End Time	9:00	9:00	9:00	9:00	9:00	9:00
Total Time (min)	75	75	75	75	75	75
Time Recorded (min)	60	60	60	60	60	60
# of Intervals	2	2	2	2	2	2
# of Recorded Intervals	1	1	1	1	1	1
Vehs Entered	4235	4299	4227	4104	4287	4233
Vehs Exited	4273	4274	4240	4120	4331	4251
Starting Vehs	156	116	141	150	159	144
Ending Vehs	118	141	128	134	115	129
Travel Distance (km)	4573	4612	4528	4398	4657	4554
Travel Time (hr)	144.9	148.2	146.5	138.4	150.3	145.7
Total Delay (hr)	52.0	54.2	54.6	49.1	55.8	53.1
Total Stops	4844	5035	4984	4718	5028	4925
Fuel Used (l)	407.6	414.8	409.7	394.4	419.0	409.1

Interval #0 Information Seeding

Start Time	7:45
End Time	8:00
Total Time (min)	15
Volumes adjusted by Growth Factors.	
No data recorded this interval.	

Interval #1 Information Recording

Run Number	1	2	3	4	5	Avg
Start Time	8:00	8:00	8:00	8:00	8:00	8:00
End Time	9:00	9:00	9:00	9:00	9:00	9:00
Total Time (min)	60	60	60	60	60	60
Volumes adjusted by Growth Factors.						
Vehs Entered	4235	4299	4227	4104	4287	4233
Vehs Exited	4273	4274	4240	4120	4331	4251
Starting Vehs	156	116	141	150	159	144
Ending Vehs	118	141	128	134	115	129
Travel Distance (km)	4573	4612	4528	4398	4657	4554
Travel Time (hr)	144.9	148.2	146.5	138.4	150.3	145.7
Total Delay (hr)	52.0	54.2	54.6	49.1	55.8	53.1
Total Stops	4844	5035	4984	4718	5028	4925
Fuel Used (l)	407.6	414.8	409.7	394.4	419.0	409.1

Queuing and Blocking Report

19225 | 1294 Kingston Rd  
2028 FT AM

Intersection: 1: Glenanna Rd & Kingston Rd

Movement	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB	NB	NB	SB				
Directions Served	L	T	R	T	L	T	R	L	T	L	T	R	L	L				
Maximum Queue (m)	16.8	59.8	63.0	27.0	113.1	104.0	30.7	22.6	32.1	21.7	34.7	34.7	34.7	34.7				
Average Queue (m)	2.6	28.9	33.1	7.2	21.8	52.3	43.7	14.3	7.1	9.1	6.8	18.4	18.4	18.4				
95th Queue (m)	11.2	52.8	55.4	17.6	44.5	92.6	85.5	33.3	17.2	22.5	16.2	34.1	34.1	34.1				
Link Distance (m)	383.4													383.4				
Upstream Blk Time (%)	534.5													534.5				
Queueing Penalty (veh)	182.2													182.2				
Storage Bay Dist (m)	42.6												60.4	33.0	23.2	25.4	25.0	27.3
Storage Blk Time (%)	5	1	1	2	22	17	0	0	1	0	1	0	4	4				
Queueing Penalty (veh)	0	1	1	6	21	21	1	0	1	0	1	0	5	5				

Intersection: 1: Glenanna Rd & Kingston Rd

Movement	SB	SB
Directions Served	T	R
Maximum Queue (m)	58.2	18.6
Average Queue (m)	14.2	2.1
95th Queue (m)	39.0	9.6
Link Distance (m)	410.7	
Upstream Blk Time (%)		
Queueing Penalty (veh)		
Storage Bay Dist (m)	16.5	
Storage Blk Time (%)	3	0
Queueing Penalty (veh)	7	0

Arterial Level of Service

19225 | 1294 Kingston Rd  
2028 FT AM

Arterial Level of Service: NB Liverpool Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (km)	Arterial Speed	Run 1 Speed	Run 1 Delay
Kingston Rd	2	18.3	36.9	0.3	26	27	17.1
South Dwy	3	1.8	6.5	0.1	33	34	1.7
Main Plaza Dwy	4	1.1	6.8	0.1	43	43	1.0
Glenanna Rd	6	5.1	20.4	0.2	38	38	5.2
Total		26.2	70.6	0.6	32	33	25.0

Arterial Level of Service: NB Liverpool Rd

Cross Street	Run 2 Speed	Run 2 Delay	Run 3 Speed	Run 3 Delay	Run 4 Speed	Run 4 Delay	Run 5 Speed	Run 5 Delay
Kingston Rd	26	19.0	25	20.4	27	17.2	27	27
South Dwy	32	1.9	32	1.9	33	1.7	33	33
Main Plaza Dwy	42	1.2	43	0.9	43	0.9	42	42
Glenanna Rd	37	5.4	41	3.7	37	5.5	37	37
Total	31	27.5	32	27.0	32	25.4	32	32

Arterial Level of Service: SB Liverpool Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (km)	Arterial Speed	Run 1 Speed	Run 1 Delay
Glenanna Rd	6	8.5	44.0	0.5	41	42	8.0
North Dwy	4	2.2	17.5	0.2	44	45	2.1
South Dwy	3	2.8	8.7	0.1	33	36	2.3
Kingston Rd	2	22.7	26.6	0.1	8	8	22.2
Total		36.2	96.9	0.9	32	33	34.6

Arterial Level of Service: SB Liverpool Rd

Cross Street	Run 2 Speed	Run 2 Delay	Run 3 Speed	Run 3 Delay	Run 4 Speed	Run 4 Delay	Run 5 Speed	Run 5 Delay
Glenanna Rd	42	7.8	41	9.1	41	8.8	41	41
North Dwy	44	2.2	44	2.2	45	2.2	44	44
South Dwy	34	2.7	34	2.8	36	2.3	30	30
Kingston Rd	8	22.3	8	22.4	8	21.8	7	7
Total	32	35.1	32	36.6	32	35.0	31	31

Intersection: 4: Liverpool Rd & North Dwy/Main Plaza Dwy

Movement	EB	WB	WB	EB	NB	NB	WB	WB	EB	SB	SB	TR	TR	SB	SB	TR	TR		
Directions Served	L	TR	L	TR	L	TR	L	TR	L	TR	L	TR	L	TR	L	TR	L	TR	
Maximum Queue (m)	35.3	32.8	17.5	16.6	2.2	14.4	21.6	5.6	6.1										
Average Queue (m)	18.4	15.0	8.7	4.8	0.1	1.2	7.7	0.2	0.3										
95th Queue (m)	32.6	28.0	15.4	13.1	1.5	7.2	16.6	2.5	3.7										
Link Distance (m)	29.6	43.1	43.1		61.3	61.3		190.5	190.5										
Upstream Blk Time (%)	6	0																	
Queuing Penalty (veh)	0	0			30.0	30.0		0	0										
Storage Bay Dist (m)	0	0			0	0		0	0										
Storage Blk Time (%)					0	0		0	0										
Queuing Penalty (veh)					0	0		0	0										

Intersection: 6: Liverpool Rd & Glenanna Rd

Movement	EB	EB	EB	WB	WB	WB	EB	NB	NB	WB	WB	EB	SB	SB	TR	TR	
Directions Served	L	T	R	L	TR	L	TR	L	TR	L	TR	L	TR	L	TR	L	TR
Maximum Queue (m)	29.4	54.9	35.7	31.6	53.5	28.5	29.1	27.2	24.1	48.4	47.5						
Average Queue (m)	11.1	23.7	19.5	15.4	22.4	12.5	8.1	9.4	9.2	25.2	22.2						
95th Queue (m)	25.1	43.1	31.0	30.2	43.8	24.2	19.7	21.5	19.7	43.2	40.6						
Link Distance (m)	117.4	117.4		410.7	190.5	190.5		491.4	491.4								
Upstream Blk Time (%)																	
Queuing Penalty (veh)																	
Storage Bay Dist (m)	22.0			24.3	24.4			46.2									
Storage Blk Time (%)	2	16		2	6	1	0	0	0								
Queuing Penalty (veh)	3	7		3	4	2	0	0	0								

Network Summary

Network wide Queuing Penalty: 252

Intersection: 2: Liverpool Rd & Kingston Rd

Movement	EB	EB	EB	WB	WB	WB	EB	WB	WB	EB	SB	SB	TR	TR	SB	SB	TR	TR	
Directions Served	L	T	R	L	TR	L	TR	L	TR	L	TR	L	TR	L	TR	L	TR	L	TR
Maximum Queue (m)	40.2	59.2	68.6	56.2	71.7	93.5	100.9	41.4	52.8	66.0	43.3								
Average Queue (m)	16.1	31.6	36.7	4.0	36.5	49.2	52.7	4.1	26.9	23.4	18.4								
95th Queue (m)	33.9	51.5	56.4	27.5	62.1	76.3	81.2	30.9	48.6	49.6	38.6								
Link Distance (m)	667.7	667.7		383.4	383.4		244.1	244.1											
Upstream Blk Time (%)																			
Queuing Penalty (veh)																			
Storage Bay Dist (m)	33.5			49.1	103.2		61.6	46.2											
Storage Blk Time (%)	1	7	1	0	5	0	3	0	0										
Queuing Penalty (veh)	2	7	3	0	2	0	6	1	0										

Intersection: 2: Liverpool Rd & Kingston Rd

Movement	SB	SB	SB	SB	SB	SB	TR	TR	
Directions Served	L	T	R	L	TR	L	TR	L	TR
Maximum Queue (m)	30.8	38.6	40.7	41.5					
Average Queue (m)	12.1	30.2	31.6	30.8					
95th Queue (m)	27.6	39.3	41.6	41.3					
Link Distance (m)	31.1	31.1	31.1	31.1					
Upstream Blk Time (%)	0	15	13	10					
Queuing Penalty (veh)	0	52	46	36					
Storage Bay Dist (m)	47.9								
Storage Blk Time (%)	0	15							
Queuing Penalty (veh)	0	12							

Intersection: 3: Liverpool Rd & South Dwy

Movement	EB	NB	NB	SB	SB	TR	TR
Directions Served	LR	LT	T	T	TR		
Maximum Queue (m)	20.2	1.1	18.3	45.1	45.8		
Average Queue (m)	7.2	0.0	1.7	12.2	11.3		
95th Queue (m)	16.8	0.8	11.0	33.2	34.0		
Link Distance (m)	12.0	31.1	31.1	61.3	61.3		
Upstream Blk Time (%)	4	0	0	0	0		
Queuing Penalty (veh)	0	0	0	0	0		
Storage Bay Dist (m)							
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 6: Liverpool Rd & Glenanna Rd

Phase	2	4	6	8
Movement(s) Served	NBTL	EBTL	SBTL	WBTL
Maximum Green (s)	59.3	28.1	59.3	28.1
Minimum Green (s)	5.0	8.0	8.0	5.0
Recall	C-Min	None	C-Min	None
Avg. Green (s)	49.0	18.1	49.0	18.1
g/C Ratio	NA	NA	NA	NA
Cycles Skipped (%)	0	0	0	0
Cycles @ Minimum (%)	0	2	0	0
Cycles Maxed Out (%)	100	0	100	0
Cycles with Peds (%)	11	0	16	0

**Controller Summary**  
 Average Cycle Length (s): NA  
 Number of Complete Cycles: 0

Intersection: 1: Glenanna Rd & Kingston Rd

Phase	1	2	3	4	5	6	8
Movement(s) Served	SBL	NBTL	WBL	EBTL	NBL	SBTL	WBTL
Maximum Green (s)	6.0	36.0	6.0	32.6	6.0	36.0	41.6
Minimum Green (s)	5.0	8.0	5.0	5.0	5.0	8.0	5.0
Recall	None	C-Min	None	None	None	C-Min	None
Avg. Green (s)	10.4	41.5	9.0	25.6	7.0	48.0	33.9
g/C Ratio	-0.01	NA	-0.01	NA	-0.01	NA	NA
Cycles Skipped (%)	17	0	23	0	54	0	0
Cycles @ Minimum (%)	0	0	0	0	0	0	0
Cycles Maxed Out (%)	3	100	0	0	3	100	0
Cycles with Peds (%)	0	60	0	54	0	63	19

**Controller Summary**  
 Average Cycle Length (s): NA  
 Number of Complete Cycles: 0

Intersection: 2: Liverpool Rd & Kingston Rd

Phase	1	2	3	4	5	6	7	8
Movement(s) Served	SBL	NBTL	WBL	EBTL	NBL	SBTL	EBL	WBTL
Maximum Green (s)	9.0	31.1	11.0	29.0	9.0	31.1	11.0	29.0
Minimum Green (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Recall	None	Max	None	C-Min	None	Max	None	C-Min
Avg. Green (s)	8.0	44.3	10.7	21.7	12.4	36.9	9.1	25.9
g/C Ratio	-0.01	NA	NA	NA	-0.01	NA	-0.01	NA
Cycles Skipped (%)	37	0	0	0	6	0	18	0
Cycles @ Minimum (%)	0	0	0	0	0	0	0	0
Cycles Maxed Out (%)	0	100	76	100	34	100	21	100
Cycles with Peds (%)	0	53	0	42	0	42	0	34

**Controller Summary**  
 Average Cycle Length (s): NA  
 Number of Complete Cycles: 0

## **Weekday PM Peak Hour**

Arterial Level of Service: EB Kingston Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (km)	Arterial Speed	Run 1 Speed	Run 1 Delay	Run 1 Speed	Run 1 Delay
Liverpool Rd	2	293.0	380.7	0.7	8	8	8	8	276.1
Glenanna Rd	1	24.3	49.1	0.4	31	26	26	26	32.5
<b>Total</b>		<b>317.2</b>	<b>429.8</b>	<b>1.1</b>	<b>11</b>	<b>11</b>	<b>11</b>	<b>11</b>	<b>308.6</b>

Arterial Level of Service: WB Kingston Rd

Cross Street	Node	Run 2 Speed	Run 2 Delay	Run 3 Speed	Run 3 Delay	Run 4 Speed	Run 4 Delay	Run 5 Speed	Run 5 Delay
Liverpool Rd	8	260.0	7	305.6	7	313.7	7	313.7	7
Glenanna Rd	32	21.6	32	22.7	31	23.6	31	23.6	33
<b>Total</b>	<b>12</b>	<b>281.7</b>	<b>10</b>	<b>328.3</b>	<b>10</b>	<b>337.4</b>	<b>10</b>	<b>337.4</b>	<b>10</b>

Arterial Level of Service: WB Kingston Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (km)	Arterial Speed	Run 1 Speed	Run 1 Delay
Glenanna Rd	1	17.0	49.6	0.5	40	40	17.4
Liverpool Rd	2	43.2	66.0	0.4	23	23	41.1
<b>Total</b>		<b>60.2</b>	<b>115.6</b>	<b>1.0</b>	<b>30</b>	<b>31</b>	<b>58.4</b>

Arterial Level of Service: WB Kingston Rd

Cross Street	Node	Run 2 Speed	Run 2 Delay	Run 3 Speed	Run 3 Delay	Run 4 Speed	Run 4 Delay	Run 5 Speed	Run 5 Delay
Glenanna Rd	40	17.2	42	14.9	39	18.6	40	18.6	40
Liverpool Rd	23	44.1	23	43.5	22	45.9	23	45.9	23
<b>Total</b>	<b>30</b>	<b>61.3</b>	<b>31</b>	<b>58.4</b>	<b>29</b>	<b>64.4</b>	<b>31</b>	<b>64.4</b>	<b>31</b>

Summary of All Intervals

Run Number	1	2	3	4	5	Avg
Start Time	4:45	4:45	4:45	4:45	4:45	4:45
End Time	6:00	6:00	6:00	6:00	6:00	6:00
Total Time (min)	75	75	75	75	75	75
Time Recorded (min)	60	60	60	60	60	60
# of Intervals	2	2	2	2	2	2
# of Recorded Intervals	1	1	1	1	1	1
Vehs Entered	5808	5715	5738	5727	5753	5746
Vehs Exited	5688	5637	5605	5637	5696	5652
Starting Vehs	250	251	239	286	307	263
Ending Vehs	370	329	372	376	364	364
Travel Distance (km)	62.49	61.34	6170	6175	6184	6183
Travel Time (hr)	337.6	383.6	359.8	416.1	368.6	373.2
Total Delay (hr)	215.6	263.3	239.0	295.2	247.3	252.1
Total Stops	9198	9911	8837	9829	9572	9467
Fuel Used (l)	680.2	715.8	693.1	746.2	703.4	707.7

Interval #0 Information Seeding

Start Time	4:45
End Time	5:00
Total Time (min)	15
Volumes adjusted by Growth Factors.	
No data recorded this interval.	

Interval #1 Information Recording

Run Number	1	2	3	4	5	Avg
Start Time	5:00	5:00	5:00	5:00	5:00	5:00
End Time	6:00	6:00	6:00	6:00	6:00	6:00
Total Time (min)	60	60	60	60	60	60
Volumes adjusted by Growth Factors.						
Vehs Entered	5808	5715	5738	5727	5753	5746
Vehs Exited	5688	5637	5605	5637	5696	5652
Starting Vehs	250	251	239	286	307	263
Ending Vehs	370	329	372	376	364	364
Travel Distance (km)	62.49	61.34	6170	6175	6184	6183
Travel Time (hr)	337.6	383.6	359.8	416.1	368.6	373.2
Total Delay (hr)	215.6	263.3	239.0	295.2	247.3	252.1
Total Stops	9198	9911	8837	9829	9572	9467
Fuel Used (l)	680.2	715.8	693.1	746.2	703.4	707.7

Queuing and Blocking Report

19225 | 1294 Kingston Rd  
2028 FT PM: Option 0

Intersection: 1: Glenanna Rd & Kingston Rd

Movement	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB	NB	NB	SB
Directions Served	L	T	R	T	L	T	R	L	T	L	T	R	L	L
Maximum Queue (m)	34.1	126.9	137.6	67.9	40.3	76.1	68.4	30.7	32.8	113.4	32.5	34.8	34.8	34.8
Average Queue (m)	5.7	49.7	55.9	16.1	26.9	35.8	27.5	12.5	18.5	44.2	23.7	28.0	28.0	28.0
95th Queue (m)	21.9	104.8	114.1	53.3	44.4	61.6	51.9	30.5	34.2	91.7	39.1	41.4	41.4	41.4
Link Distance (m)	383.4	383.4	383.4	383.4	534.5	534.5	534.5	534.5	534.5	182.2	182.2	182.2	182.2	182.2
Upstream Blk Time (%)														
Queuing Penalty (veh)														
Storage Bay Dist (m)	42.6			60.4	33.0		23.2	25.4	25.4	25.0	25.0	27.3	27.3	27.3
Storage Blk Time (%)	14	10	0	7	9	9	12	1	19	48	23	42	42	42
Queuing Penalty (veh)	3	14	0	20	15	12	1	19	48	23	42	42	42	42

Intersection: 1: Glenanna Rd & Kingston Rd

Movement	SB	SB
Directions Served	T	R
Maximum Queue (m)	111.5	24.0
Average Queue (m)	45.6	6.6
95th Queue (m)	86.6	20.0
Link Distance (m)	410.7	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)	16.5	
Storage Blk Time (%)	27	0
Queuing Penalty (veh)	58	1

Arterial Level of Service

19225 | 1294 Kingston Rd  
2028 FT PM: Option 0

Arterial Level of Service: NB Liverpool Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (km)	Arterial Speed	Run 1 Speed	Run 1 Delay
Kingston Rd	2	70.9	108.2	0.3	11	16	41.6
South Dwy	3	3.1	7.8	0.1	27	27	3.2
Main Plaza Dwy	4	2.4	8.1	0.1	36	35	2.4
Glenanna Rd	6	6.3	21.6	0.2	36	37	6.1
Total		82.7	145.8	0.6	18	23	53.3

Arterial Level of Service: NB Liverpool Rd

Cross Street	Run 2 Speed	Run 2 Delay	Run 3 Speed	Run 3 Delay	Run 4 Speed	Run 4 Delay	Run 5 Speed
Kingston Rd	8	106.2	16	40.8	9	91.3	10
South Dwy	27	3.1	27	3.1	27	3.1	28
Main Plaza Dwy	35	2.4	36	2.3	36	2.3	35
Glenanna Rd	36	6.4	37	5.6	34	7.4	36
Total	14	118.2	23	51.8	15	104.1	17

Arterial Level of Service: SB Liverpool Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (km)	Arterial Speed	Run 1 Speed	Run 1 Delay
Glenanna Rd	6	6.5	42.3	0.5	43	43	6.7
North Dwy	4	1.6	16.9	0.2	46	46	1.8
South Dwy	3	1.1	7.0	0.1	42	42	1.0
Kingston Rd	2	24.5	28.4	0.1	8	8	24.6
Total		33.8	94.5	0.9	33	33	34.1

Arterial Level of Service: SB Liverpool Rd

Cross Street	Run 2 Speed	Run 2 Delay	Run 3 Speed	Run 3 Delay	Run 4 Speed	Run 4 Delay	Run 5 Speed
Glenanna Rd	43	6.1	43	6.0	43	6.8	43
North Dwy	46	1.5	46	1.6	46	1.7	46
South Dwy	43	0.8	42	1.0	38	1.7	43
Kingston Rd	8	23.3	8	24.4	8	24.0	7
Total	33	31.7	33	32.9	33	34.2	32



Intersection: 4: Liverpool Rd & North Dwy/Main Plaza Dwy

Movement	EB	WB	WB	EB	NB	NB	WB	WB	EB	SB	SB	WB	WB	EB	SB	SB	WB	WB	EB	SB	SB
Directions Served	LTR	L	TR	L	TR	L	TR	L	TR	L	TR	L	TR	L	TR	L	TR	L	TR	L	TR
Maximum Queue (m)	30.9	43.0	29.7	24.9	10.8	15.9	28.4	2.5	4.0												
Average Queue (m)	13.5	21.8	12.3	7.3	0.8	1.4	10.1	0.1	0.2												
95th Queue (m)	26.1	38.2	22.4	18.0	7.0	7.7	21.8	1.8	2.2												
Link Distance (m)	29.6	43.1	43.1		61.3	61.3		190.5	190.5												
Upstream Blk Time (%)	2	1																			
Queuing Penalty (veh)	0	0					30.0	0	0												
Storage Bay Dist (m)							0	0	0												
Storage Blk Time (%)							0	0	0												
Queuing Penalty (veh)							0	0	0												

Intersection: 6: Liverpool Rd & Glenanna Rd

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	WB	WB	WB	EB	EB	EB	SB	SB	SB	WB	WB	WB
Directions Served	L	T	R	L	TR	L	TR	L	TR	L	TR	L	TR	L	TR	L	TR	L	TR	L	TR
Maximum Queue (m)	26.2	39.0	21.2	31.0	85.2	31.7	62.0	49.8	29.4	36.8	30.2										
Average Queue (m)	12.1	13.3	11.1	13.7	32.8	23.2	19.7	17.5	10.4	13.8	10.2										
95th Queue (m)	23.6	28.7	17.8	30.2	62.9	35.2	49.7	36.6	21.6	28.6	22.4										
Link Distance (m)		117.4	117.4		410.7		190.5	190.5		491.4	491.4										
Upstream Blk Time (%)																					
Queuing Penalty (veh)																					
Storage Bay Dist (m)						24.3		24.4		46.2											
Storage Blk Time (%)						1		10		1											
Queuing Penalty (veh)						4		2		4											

Network Summary

Network wide Queuing Penalty: 1110
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Intersection: 2: Liverpool Rd & Kingston Rd

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	WB	WB	WB	EB	EB	EB	SB	SB	SB	WB	WB	WB
Directions Served	L	T	R	L	TR	L	TR	L	TR	L	TR	L	TR	L	TR	L	TR	L	TR	L	TR
Maximum Queue (m)	41.0	68.1	68.2	56.6	103.7	96.2	103.5	48.7	53.6	221.0	219.4										
Average Queue (m)	36.3	57.2	57.4	52.6	61.2	57.1	54.2	2.8	51.1	165.3	152.1										
95th Queue (m)	50.0	80.1	80.2	75.8	115.0	123.1	102.4	24.0	63.5	283.4	284.0										
Link Distance (m)		667.7	667.7		383.4	383.4		244.1	244.1												
Upstream Blk Time (%)		38	43																		
Queuing Penalty (veh)		0	0																		
Storage Bay Dist (m)		33.5			49.1	103.2		61.6	46.2												
Storage Blk Time (%)		13	58		0	14		0	2												
Queuing Penalty (veh)		69	141		193	3	36	0	2												

Intersection: 2: Liverpool Rd & Kingston Rd

Movement	SB	SB	SB	SB	SB	SB	WB	WB	WB	EB	EB	EB	SB	SB	SB	WB	WB	WB	EB	EB	EB
Directions Served	L	T	R	L	TR	L	TR	L	TR	L	TR	L	TR	L	TR	L	TR	L	TR	L	TR
Maximum Queue (m)	30.2	37.5	32.1	33.2																	
Average Queue (m)	17.5	18.6	19.1	15.8																	
95th Queue (m)	29.5	34.1	31.0	29.9																	
Link Distance (m)		31.1	31.1	31.1																	
Upstream Blk Time (%)		3	3	1																	
Queuing Penalty (veh)		0	5	1																	
Storage Bay Dist (m)		47.9																			
Storage Blk Time (%)		3	3																		
Queuing Penalty (veh)		3	3																		

Intersection: 3: Liverpool Rd & South Dwy

Movement	EB	NB	NB	WB	WB	WB	SB	SB	SB	WB	WB	WB	EB	EB	EB	TR	TR	TR	WB	WB	WB
Directions Served	LR	LT	T	TR																	
Maximum Queue (m)	11.8	8.4	30.1	18.5	4.0																
Average Queue (m)	5.0	0.5	4.1	1.4	0.1																
95th Queue (m)	12.5	4.0	17.8	9.0	2.9																
Link Distance (m)		12.0	31.1	31.1	61.3																
Upstream Blk Time (%)		2	0																		
Queuing Penalty (veh)		0	2																		
Storage Bay Dist (m)																					
Storage Blk Time (%)																					
Queuing Penalty (veh)																					

Intersection: 6: Liverpool Rd & Glenanna Rd

Phase	2	4	6	8
Movement(s) Served	NBTL	EBTL	SBTL	WBTL
Maximum Green (s)	57.3	30.1	57.3	30.1
Minimum Green (s)	5.0	8.0	5.0	8.0
Recall	C-Min	None	C-Min	None
Avg. Green (s)	63.1	18.5	63.1	18.5
g/C Ratio	NA	NA	NA	NA
Cycles Skipped (%)	0	0	0	0
Cycles @ Minimum (%)	0	3	0	3
Cycles Maxed Out (%)	100	0	100	0
Cycles with Peds (%)	16	0	0	0
<b>Controller Summary</b>				
Average Cycle Length (s):	NA			
Number of Complete Cycles:	0			

Intersection: 1: Glenanna Rd & Kingston Rd

Phase	1	2	3	4	5	6	8
Movement(s) Served	SBL	NBTL	WBL	EBTL	NBL	SBTL	WBTL
Maximum Green (s)	6.0	36.0	6.0	32.6	6.0	36.0	41.6
Minimum Green (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Recall	None	C-Min	None	None	None	C-Min	None
Avg. Green (s)	7.4	27.1	10.4	38.4	6.6	29.1	49.6
g/C Ratio	-0.01	NA	-0.01	NA	-0.01	NA	NA
Cycles Skipped (%)	3	0	14	0	17	0	0
Cycles @ Minimum (%)	0	0	0	0	0	0	0
Cycles Maxed Out (%)	77	100	17	72	57	100	72
Cycles with Peds (%)	0	80	0	69	0	91	56
<b>Controller Summary</b>							
Average Cycle Length (s):	NA						
Number of Complete Cycles:	0						

Intersection: 2: Liverpool Rd & Kingston Rd

Phase	1	2	3	4	5	6	7	8
Movement(s) Served	SBL	NBTL	WBL	EBTL	NBL	SBTL	EBL	WBTL
Maximum Green (s)	6.0	32.1	9.0	32.6	7.0	31.1	7.0	34.6
Minimum Green (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Recall	None	Min	None	C-Min	None	Min	None	C-Min
Avg. Green (s)	6.1	33.0	9.6	32.7	7.1	30.6	7.3	35.2
g/C Ratio	-0.01	NA	NA	NA	NA	NA	-0.01	NA
Cycles Skipped (%)	14	0	0	0	0	0	3	0
Cycles @ Minimum (%)	0	0	0	0	0	0	0	0
Cycles Maxed Out (%)	80	89	97	100	97	89	86	100
Cycles with Peds (%)	0	69	0	64	0	61	0	50
<b>Controller Summary</b>								
Average Cycle Length (s):	NA							
Number of Complete Cycles:	0							



**Future Total Traffic - Option 1+1A**

**Weekday AM Peak Hour**

Arterial Level of Service: EB Kingston Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (km)	Arterial Speed	Run 1 Speed	Run 1 Delay	Run 1 Speed	Run 1 Delay
Liverpool Rd	2	35.2	74.7	0.7	33	34	35.3	34	35.3
Glenanna Rd	1	32.9	56.0	0.4	27	27	32.8	27	32.8
<b>Total</b>		<b>68.1</b>	<b>130.8</b>	<b>1.1</b>	<b>31</b>	<b>31</b>	<b>68.1</b>	<b>31</b>	<b>68.1</b>

Arterial Level of Service: WB Kingston Rd

Cross Street	Node	Run 2 Speed	Run 2 Delay	Run 3 Speed	Run 3 Delay	Run 4 Speed	Run 4 Delay	Run 5 Speed	Run 5 Delay
Liverpool Rd	33	36.1	33	36.5	34	34.0	34.0	34	34
Glenanna Rd	27	33.8	26	34.5	28	30.8	30.8	27	27
<b>Total</b>	<b>30</b>	<b>69.8</b>	<b>30</b>	<b>71.0</b>	<b>31</b>	<b>64.8</b>	<b>64.8</b>	<b>31</b>	<b>31</b>

Arterial Level of Service: WB Kingston Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (km)	Arterial Speed	Run 1 Speed	Run 1 Delay
Glenanna Rd	1	29.4	61.5	0.5	32	33	29.2
Liverpool Rd	2	54.6	77.6	0.4	19	19	54.1
<b>Total</b>		<b>83.9</b>	<b>139.2</b>	<b>1.0</b>	<b>25</b>	<b>25</b>	<b>83.3</b>

Arterial Level of Service: WB Kingston Rd

Cross Street	Node	Run 2 Speed	Run 2 Delay	Run 3 Speed	Run 3 Delay	Run 4 Speed	Run 4 Delay	Run 5 Speed	Run 5 Delay
Glenanna Rd	31	31.1	32	29.2	32	28.8	28.8	33	33
Liverpool Rd	19	54.4	19	56.0	20	53.6	53.6	19	19
<b>Total</b>	<b>25</b>	<b>85.4</b>	<b>25</b>	<b>85.2</b>	<b>25</b>	<b>82.4</b>	<b>82.4</b>	<b>25</b>	<b>25</b>

Summary of All Intervals

Run Number	1	2	3	4	5	Avg
Start Time	7:45	7:45	7:45	7:45	7:45	7:45
End Time	9:00	9:00	9:00	9:00	9:00	9:00
Total Time (min)	75	75	75	75	75	75
Time Recorded (min)	60	60	60	60	60	60
# of Intervals	2	2	2	2	2	2
# of Recorded Intervals	1	1	1	1	1	1
Vehs Entered	4206	4150	4202	4265	4200	4205
Vehs Exited	4225	4132	4244	4243	4226	4213
Starting Vehs	176	122	168	127	156	147
Ending Vehs	157	140	126	149	130	137
Travel Distance (km)	4505	4463	4504	4556	4545	4515
Travel Time (hr)	144.8	143.6	145.4	146.1	145.9	145.2
Total Delay (hr)	54.8	54.7	55.5	55.0	55.1	55.0
Total Stops	5320	5201	5290	5300	5236	5271
Fuel Used (l)	406.7	404.5	406.1	410.7	410.2	407.6

Interval #0 Information Seeding

Start Time	7:45
End Time	8:00
Total Time (min)	15
Volumes adjusted by Growth Factors.	
No data recorded this interval.	

Interval #1 Information Recording

Start Time	8:00
End Time	9:00
Total Time (min)	60
Volumes adjusted by Growth Factors.	

Run Number	1	2	3	4	5	Avg
Vehs Entered	4206	4150	4202	4265	4200	4205
Vehs Exited	4225	4132	4244	4243	4226	4213
Starting Vehs	176	122	168	127	156	147
Ending Vehs	157	140	126	149	130	137
Travel Distance (km)	4505	4463	4504	4556	4545	4515
Travel Time (hr)	144.8	143.6	145.4	146.1	145.9	145.2
Total Delay (hr)	54.8	54.7	55.5	55.0	55.1	55.0
Total Stops	5320	5201	5290	5300	5236	5271
Fuel Used (l)	406.7	404.5	406.1	410.7	410.2	407.6

Queuing and Blocking Report

19225 | 1294 Kingston Rd  
2028 FT AM: Option 1+1A

Intersection: 1: Glenanna Rd & Kingston Rd

Movement	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB	NB	NB	SB
Directions Served	L	T	R	T	L	T	R	T	L	T	R	T	L	R
Maximum Queue (m)	28.9	57.6	74.5	51.6	40.5	102.2	90.4	30.7	20.0	29.4	20.5	34.6	20.5	34.6
Average Queue (m)	3.0	26.6	31.7	9.0	22.4	49.5	43.2	17.0	6.7	9.2	5.6	17.9	9.2	17.9
95th Queue (m)	14.1	48.5	57.1	26.7	44.6	78.3	72.2	36.5	16.3	21.7	13.9	32.0	21.7	32.0
Link Distance (m)	383.4												383.4	
Upstream Blk Time (%)	534.5												534.5	
Queuing Penalty (veh)	182.2												182.2	
Storage Bay Dist (m)	42.6												42.6	
Storage Blk Time (%)	3	1	0	1	24	22	0	0	0	1	0	0	1	0
Queuing Penalty (veh)	0	1	0	0	3	23	27	0	0	1	0	0	1	0

Intersection: 1: Glenanna Rd & Kingston Rd

Movement	SB	SB
Directions Served	T	R
Maximum Queue (m)	52.9	16.8
Average Queue (m)	14.3	3.4
95th Queue (m)	36.8	13.1
Link Distance (m)	410.7	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)	16.5	
Storage Blk Time (%)	3	0
Queuing Penalty (veh)	7	0

Arterial Level of Service

19225 | 1294 Kingston Rd  
2028 FT AM: Option 1+1A

Arterial Level of Service: NB Liverpool Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (km)	Arterial Speed	Run 1 Speed	Run 1 Delay
Kingston Rd	2	17.9	36.5	0.3	27	27	17.4
South Dwy	3	1.8	6.6	0.1	33	33	1.7
Main Plaza Dwy	4	4.9	10.6	0.1	27	26	5.2
Glenanna Rd	6	4.8	20.0	0.2	39	40	4.6
Total		29.4	73.7	0.6	31	31	28.9

Arterial Level of Service: NB Liverpool Rd

Cross Street	Run 2 Speed	Run 2 Delay	Run 3 Speed	Run 3 Delay	Run 4 Speed	Run 4 Delay	Run 5 Speed	Run 5 Delay
Kingston Rd	27	17.5	27	17.6	26	18.7	26	26
South Dwy	33	1.8	33	1.9	32	2.0	33	33
Main Plaza Dwy	25	5.7	29	4.2	26	5.3	29	29
Glenanna Rd	39	5.0	38	5.2	39	4.9	40	40
Total	30	30.0	31	28.9	30	30.8	31	31

Arterial Level of Service: SB Liverpool Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (km)	Arterial Speed	Run 1 Speed	Run 1 Delay
Glenanna Rd	6	8.6	44.0	0.5	41	41	8.8
North Dwy	4	6.9	22.3	0.2	35	34	7.7
South Dwy	3	3.4	9.4	0.1	31	28	4.2
Kingston Rd	2	21.5	25.3	0.1	8	9	21.2
Total		40.4	101.1	0.9	31	30	41.9

Arterial Level of Service: SB Liverpool Rd

Cross Street	Run 2 Speed	Run 2 Delay	Run 3 Speed	Run 3 Delay	Run 4 Speed	Run 4 Delay	Run 5 Speed	Run 5 Delay
Glenanna Rd	41	8.6	41	8.9	42	8.0	41	41
North Dwy	35	6.9	35	6.9	36	6.5	35	35
South Dwy	31	3.4	32	3.0	31	3.5	32	32
Kingston Rd	8	21.6	9	21.3	9	21.1	8	8
Total	31	40.3	31	40.2	31	39.1	31	31

Intersection: 4: Liverpool Rd & North Dwy/Main Plaza Dwy

Movement	EB	EB	WB	WB	NB	NB	TR	TR	SB	SB	SB	TR
Directions Served	L	TR	L	TR	L	TR	L	TR	L	TR	L	TR
Maximum Queue (m)	23.4	22.0	38.7	15.7	19.3	39.0	44.8	31.2	41.6	51.0		
Average Queue (m)	9.2	9.9	17.8	7.4	5.2	10.7	14.1	12.3	16.2	22.5		
95th Queue (m)	19.8	19.7	32.9	14.9	14.1	28.1	34.0	25.3	33.6	40.4		
Link Distance (m)	25.1	25.1	43.1	43.1	61.3	61.3	61.3	190.5	190.5	190.5		
Upstream Blk Time (%)	0	0	0	0								
Queuing Penalty (veh)	0	0	0	0	30.0	30.0						
Storage Bay Dist (m)	0	0	0	0	0	0	0	0	1	1		
Storage Blk Time (%)												
Queuing Penalty (veh)					0	0	1	1	1	1		

Intersection: 6: Liverpool Rd & Glenanna Rd

Movement	EB	EB	WB	WB	NB	NB	TR	TR	SB	SB	SB	TR
Directions Served	L	T	R	L	TR	L	TR	L	TR	L	TR	TR
Maximum Queue (m)	29.3	54.3	42.5	31.6	55.8	28.9	22.1	28.3	36.6	49.5	51.2	
Average Queue (m)	11.8	26.0	20.2	17.4	22.5	13.6	6.3	8.2	10.6	25.0	21.9	
95th Queue (m)	26.2	48.6	34.8	32.4	44.1	24.7	16.3	20.3	23.8	42.0	39.0	
Link Distance (m)	117.4	117.4	410.7	410.7	190.5	190.5	491.4	491.4	491.4	491.4	491.4	
Upstream Blk Time (%)												
Queuing Penalty (veh)	22.0	24.3	24.3	24.3	24.4	46.2						
Storage Bay Dist (m)	3	16	3	7	2	0	0	0	0	0		
Storage Blk Time (%)												
Queuing Penalty (veh)	4	8	5	5	3	0	0	0	0	0		

Network Summary

Network wide Queuing Penalty: 255

Intersection: 2: Liverpool Rd & Kingston Rd

Movement	EB	EB	WB	WB	NB	NB	TR	TR	SB	SB	SB	TR
Directions Served	L	T	R	L	TR	L	TR	L	TR	L	TR	TR
Maximum Queue (m)	40.8	60.8	72.4	55.8	69.4	85.3	87.7	69.0	52.8	76.2	52.2	40.1
Average Queue (m)	17.3	29.8	33.9	2.9	34.9	49.5	52.7	6.3	25.5	22.3	18.1	5.3
95th Queue (m)	36.8	48.1	54.8	23.1	59.4	74.9	78.3	38.9	47.8	47.7	37.9	20.1
Link Distance (m)	667.7	667.7	667.7	667.7	383.4	383.4	383.4	383.4	383.4	383.4	244.1	244.1
Upstream Blk Time (%)												
Queuing Penalty (veh)	33.5	6	1	0	49.1	103.2	61.6	46.2	2	0	0	0
Storage Bay Dist (m)	0	6	1	0	0	0	6	0	2	0	0	0
Storage Blk Time (%)												
Queuing Penalty (veh)	1	6	4	0	0	0	3	0	6	1	0	0

Intersection: 2: Liverpool Rd & Kingston Rd

Movement	SB	SB	SB	SB	TR	TR
Directions Served	L	T	T	TR		
Maximum Queue (m)	30.1	35.5	38.2	40.8		
Average Queue (m)	11.5	26.6	29.0	31.0		
95th Queue (m)	25.2	37.0	39.5	42.4		
Link Distance (m)	30.4	30.4	30.4	30.4		
Upstream Blk Time (%)	0	9	13	16		
Queuing Penalty (veh)	0	31	45	57		
Storage Bay Dist (m)	30.0					
Storage Blk Time (%)	0	9				
Queuing Penalty (veh)	0	8				

Intersection: 3: Liverpool Rd & South Dwy

Movement	EB	NB	NB	SB	SB	SB	TR
Directions Served	R	T	T	T	T	TR	
Maximum Queue (m)	19.9	7.6	18.1	43.8	40.3	42.1	
Average Queue (m)	7.5	0.3	1.8	8.1	9.0	12.4	
95th Queue (m)	18.1	3.6	10.1	27.7	28.3	33.7	
Link Distance (m)	12.5	30.4	30.4	61.3	61.3	61.3	
Upstream Blk Time (%)	5	0	0	0	0	0	
Queuing Penalty (veh)	0	0	0	0	0	0	
Storage Bay Dist (m)							
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 4: Liverpool Rd & North Dwy/Main Plaza Dwy

Phase	2	4	6	8
Movement(s) Served	NBTL	EBTL	SBTL	WBTL
Maximum Green (s)	59.1	27.1	59.1	27.1
Minimum Green (s)	5.0	5.0	5.0	5.0
Recall	C-Min	None	C-Min	None
Avg. Green (s)	41.7	9.4	41.7	9.4
g/C Ratio	NA	NA	NA	NA
Cycles Skipped (%)	0	0	0	0
Cycles @ Minimum (%)	0	2	0	2
Cycles Maxed Out (%)	100	0	100	0
Cycles with Peds (%)	22	2	7	0
<b>Controller Summary</b>				
Average Cycle Length (s):	NA			
Number of Complete Cycles:	0			

Intersection: 6: Liverpool Rd & Glenanna Rd

Phase	2	4	6	8
Movement(s) Served	NBTL	EBTL	SBTL	WBTL
Maximum Green (s)	59.3	28.1	59.3	28.1
Minimum Green (s)	5.0	8.0	8.0	5.0
Recall	C-Min	None	C-Min	None
Avg. Green (s)	51.9	18.6	51.9	18.6
g/C Ratio	NA	NA	NA	NA
Cycles Skipped (%)	0	0	0	0
Cycles @ Minimum (%)	0	2	0	0
Cycles Maxed Out (%)	100	0	100	0
Cycles with Peds (%)	21	0	21	0
<b>Controller Summary</b>				
Average Cycle Length (s):	NA			
Number of Complete Cycles:	0			

Intersection: 1: Glenanna Rd & Kingston Rd

Phase	1	2	3	4	5	6	8
Movement(s) Served	SBL	NBTL	WBL	EBTL	NBL	SBTL	WBTL
Maximum Green (s)	6.0	36.0	6.0	32.6	6.0	36.0	41.6
Minimum Green (s)	5.0	8.0	5.0	5.0	5.0	8.0	5.0
Recall	None	C-Min	None	None	None	C-Min	None
Avg. Green (s)	10.3	42.1	8.6	24.6	7.2	49.2	32.9
g/C Ratio	-0.01	NA	-0.01	NA	-0.01	NA	NA
Cycles Skipped (%)	14	0	18	0	57	0	0
Cycles @ Minimum (%)	0	0	0	0	0	0	0
Cycles Maxed Out (%)	0	100	0	0	0	100	0
Cycles with Peds (%)	0	60	0	57	0	63	17
<b>Controller Summary</b>							
Average Cycle Length (s):	NA						
Number of Complete Cycles:	0						

Intersection: 2: Liverpool Rd & Kingston Rd

Phase	1	2	3	4	5	6	7	8
Movement(s) Served	SBL	NBTL	WBL	EBTL	NBL	SBTL	EBL	WBTL
Maximum Green (s)	9.0	31.1	11.0	29.0	9.0	31.1	11.0	29.0
Minimum Green (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Recall	None	Max	None	C-Min	None	Max	None	C-Min
Avg. Green (s)	7.9	44.7	10.4	21.9	11.4	37.5	8.9	25.6
g/C Ratio	-0.01	NA	NA	NA	-0.01	NA	-0.01	NA
Cycles Skipped (%)	38	0	0	0	3	0	15	0
Cycles @ Minimum (%)	0	0	0	0	0	0	0	0
Cycles Maxed Out (%)	3	100	71	100	26	100	29	100
Cycles with Peds (%)	0	47	0	42	0	42	0	31
<b>Controller Summary</b>								
Average Cycle Length (s):	NA							
Number of Complete Cycles:	0							



## **Weekday PM Peak Hour**

Arterial Level of Service: EB Kingston Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (km)	Arterial Speed	Run 1 Speed	Run 1 Delay	Run 1 Speed	Run 1 Delay
Liverpool Rd	2	255.5	317.5	0.7	9	8	279.8		
Glenanna Rd	1	28.1	53.0	0.4	28	28	29.0		
<b>Total</b>		<b>283.7</b>	<b>370.5</b>	<b>1.1</b>	<b>12</b>	<b>11</b>	<b>308.8</b>		

Arterial Level of Service: WB Kingston Rd

Cross Street	Node	Run 2 Speed	Run 2 Delay	Run 3 Speed	Run 3 Delay	Run 4 Speed	Run 4 Delay	Run 5 Speed	Run 5 Delay
Liverpool Rd	10	220.4	7	304.3	9	245.4	9		
Glenanna Rd	26	33.7	33	20.5	26	32.8	30		
<b>Total</b>	<b>13</b>	<b>254.1</b>	<b>10</b>	<b>324.8</b>	<b>12</b>	<b>278.2</b>	<b>13</b>		

Arterial Level of Service: WB Kingston Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (km)	Arterial Speed	Run 1 Speed	Run 1 Delay
Glenanna Rd	1	15.6	48.2	0.5	41	41	15.7
Liverpool Rd	2	41.7	64.7	0.4	23	23	41.9
<b>Total</b>		<b>57.4</b>	<b>112.8</b>	<b>1.0</b>	<b>31</b>	<b>31</b>	<b>57.6</b>

Arterial Level of Service: WB Kingston Rd

Cross Street	Node	Run 2 Speed	Run 2 Delay	Run 3 Speed	Run 3 Delay	Run 4 Speed	Run 4 Delay	Run 5 Speed	Run 5 Delay
Glenanna Rd	40	17.3	41	15.8	42	14.2	41		
Liverpool Rd	23	42.0	23	42.4	24	40.5	23		
<b>Total</b>	<b>30</b>	<b>59.3</b>	<b>31</b>	<b>58.2</b>	<b>32</b>	<b>54.6</b>	<b>31</b>		

Summary of All Intervals

Run Number	1	2	3	4	5	Avg
Start Time	4:45	4:45	4:45	4:45	4:45	4:45
End Time	6:00	6:00	6:00	6:00	6:00	6:00
Total Time (min)	75	75	75	75	75	75
Time Recorded (min)	60	60	60	60	60	60
# of Intervals	2	2	2	2	2	2
# of Recorded Intervals	1	1	1	1	1	1
Vehs Entered	5746	5816	5724	5802	5878	5791
Vehs Exited	5629	5723	5686	5702	5751	5698
Starting Vehs	252	279	297	276	277	275
Ending Vehs	369	372	335	376	404	371
Travel Distance (km)	6160	6289	6236	6315	6381	6276
Travel Time (hr)	368.8	340.6	442.9	335.0	328.5	363.2
Total Delay (hr)	248.5	218.0	321.0	211.3	203.6	240.5
Total Stops	10117	11213	10513	10403	10440	10536
Fuel Used (l)	704.2	690.0	774.0	687.1	680.8	707.2

Interval #0 Information Seeding

Start Time	4:45
End Time	5:00
Total Time (min)	15
Volumes adjusted by Growth Factors.	
No data recorded this interval.	

Interval #1 Information Recording

Start Time	5:00
End Time	6:00
Total Time (min)	60
Volumes adjusted by Growth Factors.	

Run Number	1	2	3	4	5	Avg
Vehs Entered	5746	5816	5724	5802	5878	5791
Vehs Exited	5629	5723	5686	5702	5751	5698
Starting Vehs	252	279	297	276	277	275
Ending Vehs	369	372	335	376	404	371
Travel Distance (km)	6160	6289	6236	6315	6381	6276
Travel Time (hr)	368.8	340.6	442.9	335.0	328.5	363.2
Total Delay (hr)	248.5	218.0	321.0	211.3	203.6	240.5
Total Stops	10117	11213	10513	10403	10440	10536
Fuel Used (l)	704.2	690.0	774.0	687.1	680.8	707.2

Queuing and Blocking Report

19225 | 1294 Kingston Rd  
2028 FT.PM: Option 1+1A (Optimized)

Intersection: 1: Glenanna Rd & Kingston Rd

Movement	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB	NB	NB	SB
Directions Served	L	T	R	T	L	T	R	T	L	T	R	T	L	R
Maximum Queue (m)	34.0	174.2	175.3	67.9	40.5	81.6	72.6	30.7	32.7	107.9	32.5	34.8	34.8	L
Average Queue (m)	4.3	63.0	69.0	20.8	26.3	34.8	26.6	10.0	19.3	42.4	22.4	27.7	27.7	L
95th Queue (m)	19.5	139.6	147.5	64.9	43.9	65.2	55.9	24.8	36.2	88.4	38.3	40.7	40.7	L
Link Distance (m)	383.4	383.4			534.5	534.5			182.2					L
Upstream Blk Time (%)														L
Queuing Penalty (veh)														L
Storage Bay Dist (m)	42.6		60.4	33.0		23.2	25.4		25.0	27.3				L
Storage Blk Time (%)	18	12	0	8	8	7	0	8	15	6	15	6	15	L
Queuing Penalty (veh)	4	17	0	25	12	9	1	30	46	19	35	19	35	L

Intersection: 1: Glenanna Rd & Kingston Rd

Movement	SB	SB
Directions Served	T	R
Maximum Queue (m)	87.1	24.0
Average Queue (m)	45.3	9.0
95th Queue (m)	81.7	24.3
Link Distance (m)	410.7	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)	16.5	
Storage Blk Time (%)	26	0
Queuing Penalty (veh)	55	1

Arterial Level of Service

19225 | 1294 Kingston Rd  
2028 FT.PM: Option 1+1A (Optimized)

Arterial Level of Service: NB Liverpool Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (km)	Arterial Speed	Run 1 Speed	Run 1 Delay
Kingston Rd	2	88.6	134.8	0.3	9	10	74.2
South Dwy	3	3.2	7.9	0.1	27	27	3.3
Main Plaza Dwy	4	4.3	10.1	0.1	29	26	5.3
Glenanna Rd	6	6.7	22.1	0.2	35	36	6.3
Total		102.7	174.8	0.6	15	17	89.0

Arterial Level of Service: NB Liverpool Rd

Cross Street	Run 2 Speed	Run 2 Delay	Run 3 Speed	Run 3 Delay	Run 4 Speed	Run 4 Delay	Run 5 Speed
Kingston Rd	8	108.7	7	121.7	11	65.5	11
South Dwy	26	3.4	27	3.1	28	2.9	28
Main Plaza Dwy	29	4.3	28	4.4	31	3.5	30
Glenanna Rd	36	6.4	34	7.4	35	6.9	36
Total	13	122.8	12	136.6	18	78.8	17

Arterial Level of Service: SB Liverpool Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (km)	Arterial Speed	Run 1 Speed	Run 1 Delay
Glenanna Rd	6	6.5	42.1	0.5	43	44	5.3
North Dwy	4	4.8	20.0	0.2	39	40	4.0
South Dwy	3	2.4	8.4	0.1	35	37	1.9
Kingston Rd	2	31.7	35.4	0.1	6	6	30.1
Total		45.3	105.9	0.9	29	30	41.4

Arterial Level of Service: SB Liverpool Rd

Cross Street	Run 2 Speed	Run 2 Delay	Run 3 Speed	Run 3 Delay	Run 4 Speed	Run 4 Delay	Run 5 Speed
Glenanna Rd	41	8.1	43	7.0	44	5.9	44
North Dwy	39	4.7	38	5.1	38	5.1	39
South Dwy	39	1.5	35	2.3	36	2.0	29
Kingston Rd	6	32.4	6	33.4	6	30.6	6
Total	29	46.7	28	47.8	30	43.7	29

Intersection: 4: Liverpool Rd & North Dwy/Main Plaza Dwy

Movement	EB	EB	WB	WB	NB	NB	TR	TR	SB	SB	SB	SB	TR	TR
Directions Served	L	TR	L	TR	L	TR	L	TR	L	TR	L	TR	L	TR
Maximum Queue (m)	20.4	16.4	47.2	29.4	25.7	43.3	45.5	28.8	26.6	35.2				
Average Queue (m)	6.6	7.2	22.8	12.3	7.3	9.9	12.1	11.9	8.0	11.6				
95th Queue (m)	15.9	14.9	40.4	22.5	17.5	30.1	32.9	23.6	19.7	25.6				
Link Distance (m)	25.1	25.1	43.1	43.1	61.3	61.3	61.3	190.5	190.5	190.5				
Upstream Blk Time (%)	0	0	1	0	0	0	0	0	0	0				
Queuing Penalty (veh)	0	0	0	0	1	0	0	0	0	0				
Storage Bay Dist (m)					30.0									
Storage Blk Time (%)					0	0	0	0	1	0				
Queuing Penalty (veh)					0	0	0	1	1	0				

Intersection: 6: Liverpool Rd & Glenanna Rd

Movement	EB	EB	WB	WB	NB	NB	TR	TR	SB	SB	SB	SB	TR	TR
Directions Served	L	T	R	L	TR	L	TR	L	TR	L	TR	L	TR	TR
Maximum Queue (m)	27.1	34.2	19.0	31.6	95.0	31.7	74.1	63.6	27.6	33.7	30.5			
Average Queue (m)	10.3	13.7	10.4	14.4	33.8	22.6	19.3	19.8	10.8	13.5	9.6			
95th Queue (m)	21.7	26.9	17.5	30.7	67.7	36.0	53.3	45.1	22.6	26.8	22.8			
Link Distance (m)	117.4	117.4		410.7	190.5	190.5	491.4	491.4						
Upstream Blk Time (%)														
Queuing Penalty (veh)														
Storage Bay Dist (m)				24.3		24.4			46.2					
Storage Blk Time (%)				1	15	10	1							
Queuing Penalty (veh)				2	8	31	4							

Network Summary

Network wide Queuing Penalty: 1111

Intersection: 2: Liverpool Rd & Kingston Rd

Movement	EB	EB	WB	WB	NB	NB	TR	TR	SB	SB	SB	SB	TR	TR
Directions Served	L	T	R	L	TR	L	TR	L	TR	L	TR	L	TR	R
Maximum Queue (m)	41.0	679.6	680.4	56.6	91.2	90.4	78.3	55.0	53.6	253.3	253.1	59.3		
Average Queue (m)	34.6	531.5	532.6	50.3	49.3	45.5	48.0	6.3	52.2	192.1	180.0	48.5		
95th Queue (m)	51.6	768.2	769.1	79.0	87.0	75.6	70.2	38.7	60.0	299.1	296.0	78.5		
Link Distance (m)	667.7	667.7		383.4	383.4	244.1	244.1							
Upstream Blk Time (%)		26	29											12
Queuing Penalty (veh)		0	0											0
Storage Bay Dist (m)		33.5		49.1	103.2		61.6	46.2						
Storage Blk Time (%)		8	58	57	0	2	3	0	32	36	36	2		
Queuing Penalty (veh)		41	141	189	2	6	3	0	150	108	101	9		

Intersection: 2: Liverpool Rd & Kingston Rd

Movement	SB	SB	SB	SB	TR	TR
Directions Served	L	T	T	TR		
Maximum Queue (m)	30.2	39.2	35.4	36.1		
Average Queue (m)	19.8	21.9	21.3	21.8		
95th Queue (m)	33.1	38.5	35.2	37.7		
Link Distance (m)	30.4	30.4	30.4	30.4		
Upstream Blk Time (%)	9	8	3	5		
Queuing Penalty (veh)	0	17	6	9		
Storage Bay Dist (m)	30.0					
Storage Blk Time (%)	9	9				
Queuing Penalty (veh)	12	10				

Intersection: 3: Liverpool Rd & South Dwy

Movement	EB	NB	NB	SB	SB	SB	TR
Directions Served	R	T	T	T	TR		
Maximum Queue (m)	15.7	22.1	33.0	20.6	13.6	19.3	
Average Queue (m)	5.7	1.7	4.8	3.2	1.1	2.4	
95th Queue (m)	13.4	11.2	20.4	14.0	7.1	12.2	
Link Distance (m)	12.5	30.4	30.4	61.3	61.3	61.3	
Upstream Blk Time (%)	2	0	0				
Queuing Penalty (veh)	0	0	1				
Storage Bay Dist (m)							
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 4: Liverpool Rd & North Dwy/Main Plaza Dwy

Phase	2	4	6	8
Movement(s) Served	NBTL	EBTL	SBTL	WBTL
Maximum Green (s)	64.1	22.1	64.1	22.1
Minimum Green (s)	5.0	5.0	5.0	5.0
Recall	C-Min	None	C-Min	None
Avg. Green (s)	52.3	11.7	52.3	11.7
g/C Ratio	NA	NA	NA	NA
Cycles Skipped (%)	0	0	0	0
Cycles @ Minimum (%)	0	2	0	2
Cycles Maxed Out (%)	100	0	100	0
Cycles with Peds (%)	27	2	9	2
<b>Controller Summary</b>				
Average Cycle Length (s):	NA			
Number of Complete Cycles:	0			

Intersection: 6: Liverpool Rd & Glenanna Rd

Phase	2	4	6	8
Movement(s) Served	NBTL	EBTL	SBTL	WBTL
Maximum Green (s)	57.3	30.1	57.3	30.1
Minimum Green (s)	5.0	8.0	5.0	8.0
Recall	C-Min	None	C-Min	None
Avg. Green (s)	61.8	17.8	61.8	17.8
g/C Ratio	NA	NA	NA	NA
Cycles Skipped (%)	0	0	0	0
Cycles @ Minimum (%)	0	3	0	3
Cycles Maxed Out (%)	100	0	100	0
Cycles with Peds (%)	29	0	0	0
<b>Controller Summary</b>				
Average Cycle Length (s):	NA			
Number of Complete Cycles:	0			

Intersection: 1: Glenanna Rd & Kingston Rd

Phase	1	2	3	4	5	6	8
Movement(s) Served	SBL	NBTL	WBL	EBTL	NBL	SBTL	WBTL
Maximum Green (s)	6.0	36.0	6.0	32.6	6.0	36.0	41.6
Minimum Green (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Recall	None	C-Min	None	None	None	C-Min	None
Avg. Green (s)	7.0	26.2	10.6	39.4	6.4	27.8	51.2
g/C Ratio	-0.01	NA	-0.01	NA	-0.01	NA	NA
Cycles Skipped (%)	6	0	11	0	17	0	0
Cycles @ Minimum (%)	0	0	0	0	0	0	0
Cycles Maxed Out (%)	83	100	14	78	66	100	78
Cycles with Peds (%)	0	71	0	78	0	89	61
<b>Controller Summary</b>							
Average Cycle Length (s):	NA						
Number of Complete Cycles:	0						

Intersection: 2: Liverpool Rd & Kingston Rd

Phase	1	2	3	4	5	6	7	8
Movement(s) Served	SBL	NBTL	WBL	EBTL	NBL	SBTL	EBL	WBTL
Maximum Green (s)	5.0	30.1	10.4	34.2	14.0	21.1	13.0	31.6
Minimum Green (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Recall	None	Min	None	C-Min	None	Min	None	C-Min
Avg. Green (s)	5.0	30.9	10.2	34.3	14.1	21.4	11.5	34.6
g/C Ratio	-0.01	NA	NA	NA	NA	NA	-0.01	NA
Cycles Skipped (%)	9	0	0	0	0	0	3	0
Cycles @ Minimum (%)	89	0	0	0	0	0	0	0
Cycles Maxed Out (%)	91	97	91	100	91	97	38	100
Cycles with Peds (%)	0	67	0	53	0	64	0	57
<b>Controller Summary</b>								
Average Cycle Length (s):	NA							
Number of Complete Cycles:	0							



## **Future Total Traffic - Option 2**

**Weekday AM Peak Hour**

Arterial Level of Service: EB Kingston Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (km)	Arterial Speed	Run 1 Speed	Run 1 Delay	Run 1 Speed	Run 1 Delay
Liverpool Rd	2	35.7	75.6	0.7	33	33	33	33	35.2
Glenanna Rd	1	36.6	59.7	0.4	25	25	25	25	38.0
<b>Total</b>		<b>72.3</b>	<b>135.3</b>	<b>1.1</b>	<b>30</b>	<b>30</b>	<b>29</b>	<b>29</b>	<b>73.1</b>

Arterial Level of Service: WB Kingston Rd

Cross Street	Node	Run 2 Speed	Run 2 Delay	Run 3 Speed	Run 3 Delay	Run 4 Speed	Run 4 Delay	Run 5 Speed	Run 5 Delay
Liverpool Rd	33	35.3	33	34.7	33	35.1	35.1	32	32
Glenanna Rd	24	39.1	27	32.7	27	31.6	31.6	23	23
<b>Total</b>	<b>29</b>	<b>74.4</b>	<b>31</b>	<b>67.4</b>	<b>31</b>	<b>66.7</b>	<b>66.7</b>	<b>28</b>	<b>28</b>

Arterial Level of Service: WB Kingston Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (km)	Arterial Speed	Run 1 Speed	Run 1 Delay
Glenanna Rd	1	28.3	60.2	0.5	33	34	27.1
Liverpool Rd	2	54.6	77.5	0.4	19	20	53.7
<b>Total</b>		<b>82.8</b>	<b>137.7</b>	<b>1.0</b>	<b>25</b>	<b>26</b>	<b>80.8</b>

Arterial Level of Service: WB Kingston Rd

Cross Street	Node	Run 2 Speed	Run 2 Delay	Run 3 Speed	Run 3 Delay	Run 4 Speed	Run 4 Delay	Run 5 Speed	Run 5 Delay
Glenanna Rd	32	30.2	33	27.5	32	29.9	29.9	34	34
Liverpool Rd	19	54.2	19	55.6	20	54.0	54.0	19	19
<b>Total</b>	<b>25</b>	<b>84.4</b>	<b>25</b>	<b>83.1</b>	<b>25</b>	<b>83.9</b>	<b>83.9</b>	<b>25</b>	<b>25</b>

Summary of All Intervals

Run Number	1	2	3	4	5	Avg
Start Time	7:45	7:45	7:45	7:45	7:45	7:45
End Time	9:00	9:00	9:00	9:00	9:00	9:00
Total Time (min)	75	75	75	75	75	75
Time Recorded (min)	60	60	60	60	60	60
# of Intervals	2	2	2	2	2	2
# of Recorded Intervals	1	1	1	1	1	1
Vehs Entered	4222	4204	4244	4214	4121	4198
Vehs Exited	4255	4198	4246	4208	4108	4202
Starting Vehs	177	126	135	126	135	136
Ending Vehs	144	132	133	132	148	139
Travel Distance (km)	4608	4486	4542	4533	4445	4523
Travel Time (hr)	147.5	145.4	146.1	144.6	143.4	145.4
Total Delay (hr)	55.8	56.0	55.4	54.1	54.8	55.2
Total Stops	5277	5329	5291	5148	5161	5242
Fuel Used (l)	413.4	407.1	410.8	406.2	402.8	408.1

Interval #0 Information Seeding

Start Time	7:45
End Time	8:00
Total Time (min)	15
Volumes adjusted by Growth Factors.	
No data recorded this interval.	

Interval #1 Information Recording

Start Time	8:00
End Time	9:00
Total Time (min)	60
Volumes adjusted by Growth Factors.	

Run Number	1	2	3	4	5	Avg
Vehs Entered	4222	4204	4244	4214	4121	4198
Vehs Exited	4255	4198	4246	4208	4108	4202
Starting Vehs	177	126	135	126	135	136
Ending Vehs	144	132	133	132	148	139
Travel Distance (km)	4608	4486	4542	4533	4445	4523
Travel Time (hr)	147.5	145.4	146.1	144.6	143.4	145.4
Total Delay (hr)	55.8	56.0	55.4	54.1	54.8	55.2
Total Stops	5277	5329	5291	5148	5161	5242
Fuel Used (l)	413.4	407.1	410.8	406.2	402.8	408.1



Queuing and Blocking Report

19225 | 1294 Kingston Rd  
2028 FT AM: Option 2

Intersection: 1: Glenanna Rd & Kingston Rd

Movement	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB	NB	NB	SB							
Directions Served	L	T	R	T	R	L	T	R	L	T	R	L	T	R							
Maximum Queue (m)	26.0	70.8	77.6	49.3	40.5	93.2	86.5	30.7	22.0	27.6	17.5	17.5	34.3	L							
Average Queue (m)	3.1	32.9	37.4	8.6	20.9	50.2	44.2	13.9	7.6	8.2	5.8	5.8	17.8	L							
95th Queue (m)	13.6	58.9	65.0	28.6	43.1	78.8	75.4	33.2	17.5	19.4	13.5	13.5	33.2	L							
Link Distance (m)	383.4													383.4							
Upstream Blk Time (%)	534.5													534.5							
Queueing Penalty (veh)	182.2													182.2							
Storage Bay Dist (m)	42.6												60.4	33.0	23.2	25.4	25.0	27.3			
Storage Blk Time (%)	6												2	0	0	23	18	0	0	0	4
Queueing Penalty (veh)	1												2	0	1	22	22	0	0	0	5

Intersection: 1: Glenanna Rd & Kingston Rd

Movement	SB	SB
Directions Served	T	R
Maximum Queue (m)	70.1	22.8
Average Queue (m)	14.6	3.1
95th Queue (m)	39.9	12.4
Link Distance (m)	410.7	
Upstream Blk Time (%)		
Queueing Penalty (veh)		
Storage Bay Dist (m)	16.5	
Storage Blk Time (%)	5	0
Queueing Penalty (veh)	10	0

Arterial Level of Service

19225 | 1294 Kingston Rd  
2028 FT AM: Option 2

Arterial Level of Service: NB Liverpool Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (km)	Arterial Speed	Run 1 Speed	Run 1 Delay
Kingston Rd	2	17.4	36.0	0.3	27	27	16.9
South Dwy	3	1.8	6.5	0.1	33	33	1.8
Main Plaza Dwy	4	4.6	10.4	0.1	28	30	3.9
Glenanna Rd	6	4.8	20.1	0.2	39	39	4.7
Total		28.6	73.0	0.6	31	31	27.3

Arterial Level of Service: NB Liverpool Rd

Cross Street	Run 2 Speed	Run 2 Delay	Run 3 Speed	Run 3 Delay	Run 4 Speed	Run 4 Delay	Run 5 Speed
Kingston Rd	27	17.8	26	18.1	28	16.0	26
South Dwy	33	1.9	32	1.9	33	1.7	33
Main Plaza Dwy	23	6.6	29	4.1	32	3.3	27
Glenanna Rd	38	5.2	39	4.6	38	5.2	39
Total	30	31.5	31	28.7	32	26.2	31

Arterial Level of Service: SB Liverpool Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (km)	Arterial Speed	Run 1 Speed	Run 1 Delay
Glenanna Rd	6	9.4	45.2	0.5	40	40	10.2
North Dwy	4	6.3	21.8	0.2	36	37	5.9
South Dwy	3	3.5	9.6	0.1	30	29	3.8
Kingston Rd	2	21.5	25.2	0.1	9	8	21.7
Total		40.8	101.7	0.9	30	30	41.5

Arterial Level of Service: SB Liverpool Rd

Cross Street	Run 2 Speed	Run 2 Delay	Run 3 Speed	Run 3 Delay	Run 4 Speed	Run 4 Delay	Run 5 Speed
Glenanna Rd	40	9.4	40	10.1	41	8.9	41
North Dwy	35	6.9	34	7.3	37	5.4	36
South Dwy	30	3.5	32	2.9	29	3.7	30
Kingston Rd	8	21.6	9	20.2	8	22.6	9
Total	30	41.4	30	40.5	31	40.6	31

Intersection: 4: Liverpool Rd & North Dwy/Main Plaza Dwy

Movement	EB	EB	WB	WB	NB	NB	TR	TR	SB	SB	TR	TR	SB	SB
Directions Served	L	TR	L	TR	L	TR	L	TR	L	TR	L	TR	L	TR
Maximum Queue (m)	22.5	25.6	43.0	19.5	15.5	39.1	45.1	31.1	42.0	53.7				
Average Queue (m)	8.9	8.5	19.5	7.8	4.8	11.5	13.8	10.6	16.3	22.1				
95th Queue (m)	19.2	20.3	35.9	15.6	12.2	30.6	34.8	22.1	34.4	41.8				
Link Distance (m)	25.1	25.1	43.1	43.1	63.2	63.2			190.5	190.5				
Upstream Blk Time (%)	0	1	1	0	0	0								
Queuing Penalty (veh)	0	0	0	0	0	0			30.0	30.0			1	1
Storage Bay Dist (m)					30.0				0	0			1	1
Storage Blk Time (%)														
Queuing Penalty (veh)					0	0			1	1			1	1

Intersection: 6: Liverpool Rd & Glenanna Rd

Movement	EB	EB	WB	WB	NB	NB	TR	TR	SB	SB	TR	TR	SB	SB
Directions Served	L	T	R	L	TR	L	TR	L	TR	L	TR	L	TR	TR
Maximum Queue (m)	29.0	47.7	42.7	31.4	62.0	29.5	29.6	28.4	34.0	66.1	62.8			
Average Queue (m)	11.5	23.3	21.0	16.1	23.1	12.9	7.3	8.7	9.9	26.1	23.8			
95th Queue (m)	24.7	43.9	34.6	31.7	45.6	24.4	19.3	21.5	23.7	48.3	45.9			
Link Distance (m)		117.4	117.4		410.7	190.5	190.5		491.4	491.4				
Upstream Blk Time (%)														
Queuing Penalty (veh)									46.2	46.2				
Storage Bay Dist (m)					24.3	24.4								
Storage Blk Time (%)		2	15		3	8		1	0	0				1
Queuing Penalty (veh)		3	7		5	5		3	0	0				1

Network Summary

Network wide Queuing Penalty: 248

Intersection: 2: Liverpool Rd & Kingston Rd

Movement	EB	EB	WB	WB	EB	EB	WB	WB	TR	TR	SB	SB	TR	TR	SB	SB
Directions Served	L	T	R	L	T	R	L	T	R	L	T	R	L	T	R	TR
Maximum Queue (m)	40.9	54.7	78.8	56.5	71.2	84.5	85.8	69.0	46.8	50.5	49.4	24.9				
Average Queue (m)	17.8	33.5	35.9	5.6	33.9	49.7	52.7	4.6	22.9	21.4	19.4	5.1				
95th Queue (m)	37.5	51.8	60.8	31.8	58.0	74.7	77.3	32.8	40.4	40.5	39.7	16.3				
Link Distance (m)		667.7	667.7		383.4	383.4			244.1	244.1						
Upstream Blk Time (%)																
Queuing Penalty (veh)					103.2	61.6	46.2		7	0	1	0				
Storage Bay Dist (m)					49.1				0	0	0	0				
Storage Blk Time (%)		1	8		2	0			3	0	1	0				
Queuing Penalty (veh)		1	8		5	0			3	0	1	0				

Intersection: 2: Liverpool Rd & Kingston Rd

Movement	SB	SB	SB	SB	TR	TR	TR	TR	SB	SB	TR	TR	SB	SB
Directions Served	L	T	R	L	T	R	L	T	R	L	T	R	L	T
Maximum Queue (m)	30.1	36.1	39.5	42.2										
Average Queue (m)	9.9	26.7	29.1	31.6										
95th Queue (m)	22.8	37.8	40.1	41.7										
Link Distance (m)		30.4	30.4	30.4										
Upstream Blk Time (%)		0	9	13	15									
Queuing Penalty (veh)		0	33	45	54									
Storage Bay Dist (m)														
Storage Blk Time (%)		0	10											
Queuing Penalty (veh)		0	8											

Intersection: 3: Liverpool Rd & South Dwy

Movement	EB	NB	NB	SB	SB	TR	TR	SB	SB	TR	TR	SB	SB
Directions Served	R	T	T	T	T	T	T	T	T	T	T	T	T
Maximum Queue (m)	22.0	4.8	23.9	36.2	38.0	43.0							
Average Queue (m)	7.6	0.2	2.0	8.8	8.2	10.1							
95th Queue (m)	17.3	3.4	12.0	26.9	26.0	30.6							
Link Distance (m)	12.4	30.4	30.4	63.2	63.2	63.2							
Upstream Blk Time (%)		4	0	0	0	0							
Queuing Penalty (veh)		0	0	0	0	0							
Storage Bay Dist (m)													
Storage Blk Time (%)													
Queuing Penalty (veh)													

Intersection: 4: Liverpool Rd & North Dwy/Main Plaza Dwy

Phase	2	4	6	8
Movement(s) Served	NBTL	EBTL	SBTL	WBTL
Maximum Green (s)	59.1	27.1	59.1	27.1
Minimum Green (s)	5.0	5.0	5.0	5.0
Recall	C-Min	None	C-Min	None
Avg. Green (s)	44.2	9.7	44.2	9.7
g/C Ratio	NA	NA	NA	NA
Cycles Skipped (%)	0	0	0	0
Cycles @ Minimum (%)	0	2	0	2
Cycles Maxed Out (%)	100	0	100	0
Cycles with Peds (%)	19	2	8	0
<b>Controller Summary</b>				
Average Cycle Length (s):	NA			
Number of Complete Cycles:	0			

Intersection: 6: Liverpool Rd & Glenanna Rd

Phase	2	4	6	8
Movement(s) Served	NBTL	EBTL	SBTL	WBTL
Maximum Green (s)	59.3	28.1	59.3	28.1
Minimum Green (s)	5.0	8.0	8.0	5.0
Recall	C-Min	None	C-Min	None
Avg. Green (s)	50.1	18.7	50.1	18.7
g/C Ratio	NA	NA	NA	NA
Cycles Skipped (%)	0	0	0	0
Cycles @ Minimum (%)	0	5	0	0
Cycles Maxed Out (%)	100	0	100	0
Cycles with Peds (%)	19	0	19	0
<b>Controller Summary</b>				
Average Cycle Length (s):	NA			
Number of Complete Cycles:	0			

Intersection: 1: Glenanna Rd & Kingston Rd

Phase	1	2	3	4	5	6	8
Movement(s) Served	SBL	NBTL	WBL	EBTL	NBL	SBTL	WBTL
Maximum Green (s)	6.0	36.0	6.0	32.6	6.0	36.0	41.6
Minimum Green (s)	5.0	8.0	5.0	5.0	5.0	8.0	5.0
Recall	None	C-Min	None	None	None	C-Min	None
Avg. Green (s)	10.4	44.2	8.6	24.7	7.3	49.1	32.5
g/C Ratio	-0.01	NA	-0.01	-0.01	-0.01	NA	NA
Cycles Skipped (%)	26	0	23	3	51	0	0
Cycles @ Minimum (%)	0	0	0	0	0	0	0
Cycles Maxed Out (%)	3	100	0	0	0	100	0
Cycles with Peds (%)	0	63	0	44	0	54	19
<b>Controller Summary</b>							
Average Cycle Length (s):	NA						
Number of Complete Cycles:	0						

Intersection: 2: Liverpool Rd & Kingston Rd

Phase	1	2	3	4	5	6	7	8
Movement(s) Served	SBL	NBTL	WBL	EBTL	NBL	SBTL	EBL	WBTL
Maximum Green (s)	9.0	31.1	11.0	29.0	9.0	31.1	11.0	29.0
Minimum Green (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Recall	None	Max	None	C-Min	None	Max	None	C-Min
Avg. Green (s)	7.4	45.3	10.6	21.9	11.9	37.7	8.9	25.4
g/C Ratio	-0.01	NA	-0.01	NA	-0.01	NA	-0.01	NA
Cycles Skipped (%)	38	0	3	0	6	0	15	0
Cycles @ Minimum (%)	0	0	0	0	0	0	0	0
Cycles Maxed Out (%)	0	100	68	100	26	100	21	100
Cycles with Peds (%)	0	47	0	36	0	50	0	31
<b>Controller Summary</b>								
Average Cycle Length (s):	NA							
Number of Complete Cycles:	0							

## **Weekday PM Peak Hour**

Arterial Level of Service: EB Kingston Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (km)	Arterial Speed	Run 1 Speed	Run 1 Delay	Run 1 Speed	Run 1 Delay
Liverpool Rd	2	249.5	304.8	0.7	9	9	9	232.7	232.7
Glenanna Rd	1	24.6	49.4	0.4	30	29	26.7	26.7	26.7
<b>Total</b>		<b>274.1</b>	<b>354.2</b>	<b>1.1</b>	<b>12</b>	<b>12</b>	<b>259.4</b>		

Arterial Level of Service: WB Kingston Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (km)	Arterial Speed	Run 1 Speed	Run 1 Delay	Run 1 Speed	Run 1 Delay
Liverpool Rd	11	192.0	8	281.1	9	240.4	7	7	7
Glenanna Rd	29	26.5	33	21.0	29	26.7	33	33	33
<b>Total</b>	<b>14</b>	<b>218.5</b>	<b>11</b>	<b>302.1</b>	<b>12</b>	<b>267.1</b>	<b>10</b>		

Arterial Level of Service: WB Kingston Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (km)	Arterial Speed	Run 1 Speed	Run 1 Delay	Run 1 Speed	Run 1 Delay
Glenanna Rd	1	17.6	50.0	0.5	40	41	16.4	41	16.4
Liverpool Rd	2	43.3	66.3	0.4	23	23	43.3	23	43.3
<b>Total</b>		<b>60.9</b>	<b>116.3</b>	<b>1.0</b>	<b>30</b>	<b>30</b>	<b>59.7</b>		

Arterial Level of Service: WB Kingston Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (km)	Arterial Speed	Run 1 Speed	Run 1 Delay	Run 1 Speed	Run 1 Delay
Liverpool Rd	41	16.2	40	16.8	37	21.2	40	40	40
Liverpool Rd	22	45.1	23	43.2	22	44.6	24	24	24
<b>Total</b>	<b>30</b>	<b>61.3</b>	<b>30</b>	<b>60.0</b>	<b>29</b>	<b>65.8</b>	<b>31</b>		

Summary of All Intervals

Run Number	1	2	3	4	5	Avg
Start Time	4:45	4:45	4:45	4:45	4:45	4:45
End Time	6:00	6:00	6:00	6:00	6:00	6:00
Total Time (min)	75	75	75	75	75	75
Time Recorded (min)	60	60	60	60	60	60
# of Intervals	2	2	2	2	2	2
# of Recorded Intervals	1	1	1	1	1	1
Vehs Entered	5653	5807	5773	5764	5742	5747
Vehs Exited	5619	5726	5681	5647	5677	5671
Starting Vehs	264	280	271	241	306	270
Ending Vehs	298	361	363	358	371	350
Travel Distance (km)	6187	6348	6282	6297	6261	6275
Travel Time (hr)	304.5	299.7	338.8	331.7	407.7	336.5
Total Delay (hr)	183.8	175.7	215.9	208.9	285.1	213.9
Total Stops	9930	10030	9364	10601	10374	10057
Fuel Used (l)	646.5	654.1	680.9	677.8	742.1	680.3

Interval #0 Information Seeding

Start Time	4:45
End Time	5:00
Total Time (min)	15
Volumes adjusted by Growth Factors.	
No data recorded this interval.	

Interval #1 Information Recording

Start Time	5:00
End Time	6:00
Total Time (min)	60
Volumes adjusted by Growth Factors.	

Run Number	1	2	3	4	5	Avg
Vehs Entered	5653	5807	5773	5764	5742	5747
Vehs Exited	5619	5726	5681	5647	5677	5671
Starting Vehs	264	280	271	241	306	270
Ending Vehs	298	361	363	358	371	350
Travel Distance (km)	6187	6348	6282	6297	6261	6275
Travel Time (hr)	304.5	299.7	338.8	331.7	407.7	336.5
Total Delay (hr)	183.8	175.7	215.9	208.9	285.1	213.9
Total Stops	9930	10030	9364	10601	10374	10057
Fuel Used (l)	646.5	654.1	680.9	677.8	742.1	680.3

Queuing and Blocking Report

19225 | 1294 Kingston Rd  
2028 FT PM: Option 2 (Optimized)

Intersection: 1: Glenanna Rd & Kingston Rd

Movement	EB	EB	EB	EB	WB	WB	WB	WB	WB	WB	NB	NB	NB	NB	SB	
Directions Served	L	T	R	T	L	T	L	T	L	T	L	T	L	T	R	L
Maximum Queue (m)	42.6	136.3	154.7	67.9	40.5	82.1	82.5	30.7	32.7	103.9	32.5	32.5	34.8	34.8	34.8	34.8
Average Queue (m)	7.2	53.4	58.7	17.8	26.4	37.0	31.5	11.8	20.3	38.6	22.5	22.5	27.2	27.2	27.2	27.2
95th Queue (m)	26.8	107.1	116.4	58.0	43.7	67.2	62.5	29.0	36.6	80.5	37.9	37.9	40.6	40.6	40.6	40.6
Link Distance (m)	383.4 383.4 534.5 534.5 182.2															
Upstream Blk Time (%)																
Queuing Penalty (veh)																
Storage Bay Dist (m)	42.6 60.4 33.0 23.2 25.4 25.4 25.0 27.3															
Storage Blk Time (%)	15 11 0 7 9 10 10 0 7 14 7 14 7 13															
Queuing Penalty (veh)	4 15 0 21 14 13 1 26 43 20 30															

Intersection: 1: Glenanna Rd & Kingston Rd

Movement	SB	SB
Directions Served	T	R
Maximum Queue (m)	92.8	24.0
Average Queue (m)	41.2	7.8
95th Queue (m)	78.8	22.5
Link Distance (m)	410.7	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)	16.5	
Storage Blk Time (%)	27 0	
Queuing Penalty (veh)	57 1	

Arterial Level of Service

19225 | 1294 Kingston Rd  
2028 FT PM: Option 2 (Optimized)

Arterial Level of Service: NB Liverpool Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (km)	Arterial Speed	Run 1 Speed	Run 1 Delay
Kingston Rd	2	67.9	93.0	0.3	11	14	49.2
South Dwy	3	3.2	7.9	0.1	27	27	3.2
Main Plaza Dwy	4	4.2	10.0	0.1	29	29	4.3
Glenanna Rd	6	6.6	22.0	0.2	35	33	7.9
Total		81.8	132.8	0.6	18	21	64.7

Arterial Level of Service: NB Liverpool Rd

Cross Street	Run 2 Speed	Run 2 Delay	Run 3 Speed	Run 3 Delay	Run 4 Speed	Run 4 Delay	Run 5 Speed	Run 5 Delay
Kingston Rd	12	62.8	14	48.9	10	75.9	8	8
South Dwy	27	3.3	27	3.1	28	3.1	27	27
Main Plaza Dwy	29	4.4	30	3.8	29	4.1	28	28
Glenanna Rd	35	6.5	37	5.5	35	6.6	36	36
Total	19	77.0	21	61.3	17	89.7	14	14

Arterial Level of Service: SB Liverpool Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (km)	Arterial Speed	Run 1 Speed	Run 1 Delay
Glenanna Rd	6	7.0	42.6	0.5	43	42	7.7
North Dwy	4	4.8	20.0	0.2	39	39	4.9
South Dwy	3	1.9	8.0	0.1	36	38	1.6
Kingston Rd	2	33.4	37.0	0.1	6	6	34.1
Total		47.0	107.7	0.9	29	28	48.3

Arterial Level of Service: SB Liverpool Rd

Cross Street	Run 2 Speed	Run 2 Delay	Run 3 Speed	Run 3 Delay	Run 4 Speed	Run 4 Delay	Run 5 Speed	Run 5 Delay
Glenanna Rd	42	7.1	43	6.0	42	7.2	42	42
North Dwy	39	4.8	39	5.0	39	5.0	40	40
South Dwy	37	1.6	37	1.7	36	2.0	34	34
Kingston Rd	6	34.0	6	31.8	6	31.4	5	5
Total	29	47.4	29	44.5	29	45.6	28	28

Intersection: 4: Liverpool Rd & North Dwy/Main Plaza Dwy

Movement	EB	EB	WB	WB	NB	NB	TR	TR	SB	SB	SB	TR	TR
Directions Served	L	TR	L	TR	L	TR	L	TR	L	TR	L	TR	TR
Maximum Queue (m)	19.2	14.0	41.2	27.2	28.6	54.0	50.7	25.5	24.5	25.5	24.5	28.8	28.8
Average Queue (m)	7.2	5.8	20.9	11.4	7.4	11.6	11.6	11.6	7.1	7.1	10.8	10.8	10.8
95th Queue (m)	15.9	13.1	36.8	21.3	18.5	34.5	31.8	22.2	17.8	17.8	23.3	23.3	23.3
Link Distance (m)	25.1	25.1	43.1	43.1	63.2	63.2	63.2	190.5	190.5	190.5	190.5	190.5	190.5
Upstream Blk Time (%)	0	0	0	0	0	0	0	0	0	0	0	0	0
Queuing Penalty (veh)	0	0	0	0	0	0	0	30.0	0	0	0	0	0
Storage Bay Dist (m)	0	0	0	0	0	0	0	0	0	0	0	0	0
Storage Blk Time (%)	0	0	0	0	0	0	0	0	0	0	0	0	0
Queuing Penalty (veh)	0	0	0	0	0	0	0	0	0	0	0	0	0

Intersection: 6: Liverpool Rd & Glenanna Rd

Movement	EB	EB	WB	WB	NB	NB	TR	TR	SB	SB	SB	TR	TR
Directions Served	L	T	R	L	TR	L	TR	L	TR	L	TR	L	TR
Maximum Queue (m)	28.8	36.8	18.9	31.6	31.7	70.0	55.3	23.1	31.0	31.0	36.2	31.0	36.2
Average Queue (m)	10.7	14.4	10.8	13.8	34.4	23.1	18.1	16.7	10.5	13.7	11.7	10.5	11.7
95th Queue (m)	23.5	29.7	17.8	31.1	63.9	35.1	51.1	40.7	20.4	27.2	25.8	20.4	25.8
Link Distance (m)	117.4	117.4	410.7	410.7	190.5	190.5	491.4	491.4	491.4	491.4	491.4	491.4	491.4
Upstream Blk Time (%)	0	0	0	0	0	0	0	0	0	0	0	0	0
Queuing Penalty (veh)	0	0	0	0	0	0	0	0	0	0	0	0	0
Storage Bay Dist (m)	22.0	0	24.3	0	16	10	1	46.2	0	0	0	0	0
Storage Blk Time (%)	2	7	0	0	8	32	4	0	0	0	0	0	0
Queuing Penalty (veh)	2	3	1	1	8	32	4	0	0	0	0	0	0

Network Summary

Network wide Queuing Penalty: 1062

Intersection: 2: Liverpool Rd & Kingston Rd

Movement	EB	EB	WB	WB	NB	NB	TR	TR	SB	SB	SB	TR	TR
Directions Served	L	T	R	L	TR	L	TR	L	TR	L	TR	L	TR
Maximum Queue (m)	40.9	661.5	662.4	56.6	93.0	79.1	80.6	61.9	53.6	224.6	213.6	59.3	59.3
Average Queue (m)	36.7	509.7	511.3	50.6	46.3	43.2	46.9	3.2	50.9	157.6	144.6	46.1	46.1
95th Queue (m)	51.3	753.9	755.1	78.5	80.4	66.6	70.0	25.9	62.8	264.0	254.4	78.1	78.1
Link Distance (m)	667.7	667.7	667.7	383.4	383.4	383.4	383.4	383.4	244.1	244.1	244.1	244.1	244.1
Upstream Blk Time (%)	0	0	0	0	0	0	0	0	0	0	0	0	0
Queuing Penalty (veh)	0	0	0	0	0	0	0	0	0	0	0	0	0
Storage Bay Dist (m)	33.5	0	0	49.1	103.2	0	0	0	0	33	30	30	30
Storage Blk Time (%)	12	57	56	0	0	0	0	0	0	2	0	2	0
Queuing Penalty (veh)	62	141	186	3	0	0	0	0	0	154	90	84	10

Intersection: 2: Liverpool Rd & Kingston Rd

Movement	SB	SB	SB	SB	TR	TR
Directions Served	L	T	T	TR		
Maximum Queue (m)	30.2	36.6	30.8	36.0		
Average Queue (m)	17.4	19.1	20.5	23.2		
95th Queue (m)	30.2	33.9	32.3	38.3		
Link Distance (m)	30.4	30.4	30.4	30.4		
Upstream Blk Time (%)	4	4	2	5		
Queuing Penalty (veh)	0	8	4	9		
Storage Bay Dist (m)	30.0					
Storage Blk Time (%)	5	4				
Queuing Penalty (veh)	5	5				

Intersection: 3: Liverpool Rd & South Dwy

Movement	EB	NB	NB	SB	SB	SB	TR	TR
Directions Served	R	T	T	T	T	T		
Maximum Queue (m)	13.0	23.2	32.0	17.8	11.8	18.1		
Average Queue (m)	4.4	1.6	4.1	1.6	0.8	1.8		
95th Queue (m)	11.8	10.1	19.0	10.3	5.5	9.9		
Link Distance (m)	12.4	30.4	30.4	63.2	63.2	63.2		
Upstream Blk Time (%)	1	0	0	0	0	0		
Queuing Penalty (veh)	0	0	0	0	0	0		
Storage Bay Dist (m)								
Storage Blk Time (%)								
Queuing Penalty (veh)								

Intersection: 4: Liverpool Rd & North Dwy/Main Plaza Dwy

Phase	2	4	6	8
Movement(s) Served	NBTL	EBTL	SBTL	WBTL
Maximum Green (s)	64.1	22.1	64.1	22.1
Minimum Green (s)	5.0	5.0	5.0	5.0
Recall	C-Min	None	C-Min	None
Avg. Green (s)	50.8	10.3	50.8	10.3
g/C Ratio	NA	NA	NA	NA
Cycles Skipped (%)	0	0	0	0
Cycles @ Minimum (%)	0	2	0	2
Cycles Maxed Out (%)	100	0	100	0
Cycles with Peds (%)	28	0	11	0
<b>Controller Summary</b>				
Average Cycle Length (s):	NA			
Number of Complete Cycles:	0			

Intersection: 6: Liverpool Rd & Glenanna Rd

Phase	2	4	6	8
Movement(s) Served	NBTL	EBTL	SBTL	WBTL
Maximum Green (s)	57.3	30.1	57.3	30.1
Minimum Green (s)	5.0	8.0	5.0	8.0
Recall	C-Min	None	C-Min	None
Avg. Green (s)	60.9	18.2	60.9	18.2
g/C Ratio	NA	NA	NA	NA
Cycles Skipped (%)	0	0	0	0
Cycles @ Minimum (%)	0	3	0	3
Cycles Maxed Out (%)	100	3	100	3
Cycles with Peds (%)	21	0	0	0
<b>Controller Summary</b>				
Average Cycle Length (s):	NA			
Number of Complete Cycles:	0			

Intersection: 1: Glenanna Rd & Kingston Rd

Phase	1	2	3	4	5	6	8
Movement(s) Served	SBL	NBTL	WBL	EBTL	NBL	SBTL	WBTL
Maximum Green (s)	6.0	36.0	6.0	32.6	6.0	36.0	41.6
Minimum Green (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Recall	None	C-Min	None	None	None	C-Min	None
Avg. Green (s)	7.1	26.4	10.6	39.4	6.8	28.0	50.7
g/C Ratio	-0.01	NA	-0.01	NA	-0.01	NA	NA
Cycles Skipped (%)	3	0	14	0	17	0	0
Cycles @ Minimum (%)	0	0	0	0	0	0	0
Cycles Maxed Out (%)	77	100	14	75	66	100	75
Cycles with Peds (%)	0	80	0	75	0	89	56
<b>Controller Summary</b>							
Average Cycle Length (s):	NA						
Number of Complete Cycles:	0						

Intersection: 2: Liverpool Rd & Kingston Rd

Phase	1	2	3	4	5	6	7	8
Movement(s) Served	SBL	NBTL	WBL	EBTL	NBL	SBTL	EBL	WBTL
Maximum Green (s)	5.0	30.1	10.4	34.2	14.0	21.1	13.0	31.6
Minimum Green (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Recall	None	Min	None	C-Min	None	Min	None	C-Min
Avg. Green (s)	5.2	31.2	10.6	34.4	13.8	21.3	11.4	34.7
g/C Ratio	-0.01	NA	NA	NA	NA	NA	-0.01	NA
Cycles Skipped (%)	14	0	0	0	0	0	3	0
Cycles @ Minimum (%)	83	0	0	0	0	0	0	0
Cycles Maxed Out (%)	86	94	91	100	89	94	41	100
Cycles with Peds (%)	0	69	0	58	0	58	0	49
<b>Controller Summary</b>								
Average Cycle Length (s):	NA							
Number of Complete Cycles:	0							





**Future Total Traffic - Option 3**

**Weekday AM Peak Hour**

Arterial Level of Service: EB Kingston Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (km)	Arterial Speed	Run 1 Speed	Run 1 Delay
Liverpool Rd	2	46.2	86.7	0.7	29	28	47.8
Glenanna Rd	1	36.0	59.2	0.4	25	26	35.3
<b>Total</b>		<b>82.2</b>	<b>145.9</b>	<b>1.1</b>	<b>27</b>	<b>27</b>	<b>83.0</b>

Arterial Level of Service: WB Kingston Rd

Cross Street	Node	Run 2 Speed	Run 2 Delay	Run 3 Speed	Run 3 Delay	Run 4 Speed	Run 4 Delay	Run 5 Speed
Liverpool Rd	28	47.4	29	45.8	29	44.1	29	23
Glenanna Rd	26	35.1	26	33.8	27	33.8	23	23
<b>Total</b>	<b>27</b>	<b>82.4</b>	<b>28</b>	<b>79.6</b>	<b>28</b>	<b>77.9</b>	<b>26</b>	<b>26</b>

Arterial Level of Service: WB Liverpool Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (km)	Arterial Speed	Run 1 Speed	Run 1 Delay
Glenanna Rd	1	28.5	60.5	0.5	33	33	27.7
Liverpool Rd	2	45.7	69.6	0.4	22	21	48.2
<b>Total</b>		<b>74.2</b>	<b>130.2</b>	<b>1.0</b>	<b>27</b>	<b>26</b>	<b>75.9</b>

Arterial Level of Service: WB Kingston Rd

Cross Street	Node	Run 2 Speed	Run 2 Delay	Run 3 Speed	Run 3 Delay	Run 4 Speed	Run 4 Delay	Run 5 Speed
Liverpool Rd	33	28.9	32	29.1	33	28.1	33	33
Glenanna Rd	21	47.1	22	44.7	24	38.9	20	20
<b>Total</b>	<b>26</b>	<b>76.0</b>	<b>27</b>	<b>73.7</b>	<b>28</b>	<b>67.0</b>	<b>26</b>	<b>26</b>

Arterial Level of Service: NB Liverpool Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (km)	Arterial Speed	Run 1 Speed	Run 1 Delay
Kingston Rd	2	18.0	36.4	0.3	27	28	16.6
Main Plaza Dwy	4	7.6	18.1	0.1	28	28	7.9
Glenanna Rd	6	7.0	22.4	0.2	35	35	7.1
<b>Total</b>		<b>32.7</b>	<b>76.9</b>	<b>0.6</b>	<b>29</b>	<b>30</b>	<b>31.5</b>

Arterial Level of Service: NB Kingston Rd

Cross Street	Node	Run 2 Speed	Run 2 Delay	Run 3 Speed	Run 3 Delay	Run 4 Speed	Run 4 Delay	Run 5 Speed
Kingston Rd	25	19.8	26	18.2	26	18.8	28	28
Main Plaza Dwy	30	6.6	28	7.6	28	7.7	27	27
Glenanna Rd	32	8.9	36	6.0	35	7.2	37	37
<b>Total</b>	<b>28</b>	<b>35.3</b>	<b>30</b>	<b>31.8</b>	<b>29</b>	<b>33.7</b>	<b>30</b>	<b>30</b>

Summary of All Intervals

Run Number	1	2	3	4	5	Avg
Start Time	7:45	7:45	7:45	7:45	7:45	7:45
End Time	9:00	9:00	9:00	9:00	9:00	9:00
Total Time (min)	75	75	75	75	75	75
Time Recorded (min)	60	60	60	60	60	60
# of Intervals	2	2	2	2	2	2
# of Recorded Intervals	1	1	1	1	1	1
Vehs Entered	4214	4347	4174	4268	4171	4234
Vehs Exited	4230	4348	4190	4267	4204	4248
Starting Vehs	154	131	138	147	159	145
Ending Vehs	138	130	122	148	126	126
Travel Distance (km)	45.30	46.52	44.71	45.72	44.74	45.40
Travel Time (hr)	147.5	152.2	144.2	147.2	145.2	147.3
Total Delay (hr)	57.0	59.4	55.1	56.0	56.0	56.7
Total Stops	5263	5382	5041	5262	5167	5226
Fuel Used (l)	411.5	421.7	405.4	409.7	404.9	410.6

Interval #0 Information Seeding

Start Time	7:45
End Time	8:00
Total Time (min)	15
Volumes adjusted by Growth Factors.	
No data recorded this interval.	

Interval #1 Information Recording

Start Time	8:00
End Time	9:00
Total Time (min)	60
Volumes adjusted by Growth Factors.	

Run Number	1	2	3	4	5	Avg
Vehs Entered	4214	4347	4174	4268	4171	4234
Vehs Exited	4230	4348	4190	4267	4204	4248
Starting Vehs	154	131	138	147	159	145
Ending Vehs	138	130	122	148	126	126
Travel Distance (km)	45.30	46.52	44.71	45.72	44.74	45.40
Travel Time (hr)	147.5	152.2	144.2	147.2	145.2	147.3
Total Delay (hr)	57.0	59.4	55.1	56.0	56.0	56.7
Total Stops	5263	5382	5041	5262	5167	5226
Fuel Used (l)	411.5	421.7	405.4	409.7	404.9	410.6

Queuing and Blocking Report

19225 | 1294 Kingston Rd  
2028 FT AM: Option 3

Intersection: 1: Glenanna Rd & Kingston Rd

Movement	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB	NB	NB	SB
Directions Served	L	T	R	T	L	T	R	L	T	L	T	R	L	L
Maximum Queue (m)	16.8	79.4	80.6	67.8	40.5	93.7	90.8	30.7	19.0	26.5	21.9	34.6		
Average Queue (m)	2.3	34.8	38.2	10.7	23.0	50.1	43.4	16.4	7.2	9.1	5.9	18.3		
95th Queue (m)	10.9	63.9	67.5	34.0	44.8	81.5	75.4	36.2	16.2	20.3	14.9	32.6		
Link Distance (m)	383.3													383.3
Upstream Blk Time (%)	534.5													534.5
Queuing Penalty (veh)	182.2													182.2
Storage Bay Dist (m)	42.6													42.6
Storage Blk Time (%)	7													7
Queuing Penalty (veh)	1													1

Intersection: 1: Glenanna Rd & Kingston Rd

Movement	SB	SB
Directions Served	T	R
Maximum Queue (m)	52.2	22.8
Average Queue (m)	14.1	3.9
95th Queue (m)	37.8	13.9
Link Distance (m)	410.7	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)	16.5	
Storage Blk Time (%)	3	
Queuing Penalty (veh)	8	

Arterial Level of Service

19225 | 1294 Kingston Rd  
2028 FT AM: Option 3

Arterial Level of Service: SB Liverpool Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (km)	Arterial Speed	Run 1 Speed	Run 1 Delay
Glenanna Rd	6	8.9	44.5	0.5	41	41	8.9
North Dwy	4	6.1	21.5	0.2	36	35	6.6
Kingston Rd	2	24.3	33.8	0.1	15	15	25.3
Total		39.3	99.8	0.9	31	31	40.8

Arterial Level of Service: SB Liverpool Rd

Cross Street	Run 2 Speed	Run 2 Delay	Run 3 Speed	Run 3 Delay	Run 4 Speed	Run 4 Delay	Run 5 Speed
Glenanna Rd	40	9.7	41	8.4	41	8.5	41
North Dwy	36	6.0	37	5.6	35	6.5	37
Kingston Rd	15	25.1	16	21.9	14	27.0	16
Total	30	40.9	32	35.9	30	42.0	32

Queuing and Blocking Report

19225 | 1294 Kingston Rd  
2028 FT AM: Option 3

Intersection: 6: Liverpool Rd & Glenanna Rd

Movement	EB	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB	SB	SB	TR
Directions Served	L	T	R	L	TR	L	TR	L	TR	L	TR	L	TR	L	TR	TR
Maximum Queue (m)	29.4	64.8	39.0	31.6	55.8	30.5	44.8	41.3	23.3	23.3	45.3	45.3	52.5	23.3	45.3	52.5
Average Queue (m)	11.6	24.1	19.0	16.8	24.0	14.0	10.7	13.0	9.5	25.3	23.3	23.3	23.3	9.5	25.3	23.3
95th Queue (m)	25.4	46.7	30.9	31.8	47.3	26.9	29.9	30.9	19.8	40.8	41.9	40.8	41.9	19.8	40.8	41.9
Link Distance (m)	117.4		117.4		410.7		190.5		190.5		491.4		491.4		491.4	
Upstream Blk Time (%)																
Queuing Penalty (veh)																
Storage Bay Dist (m)	22.0		24.3		24.4		46.2		46.2		46.2		46.2		46.2	
Storage Blk Time (%)	3		14		3		8		2		1		0		0	
Queuing Penalty (veh)	4		7		4		5		4		1		0		0	

Network Summary

Network wide Queuing Penalty: 132

Queuing and Blocking Report

19225 | 1294 Kingston Rd  
2028 FT AM: Option 3

Intersection: 2: Liverpool Rd & Kingston Rd

Movement	EB	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB	SB	SB	TR
Directions Served	L	T	R	L	TR	L	TR	L	TR	L	TR	L	TR	L	TR	TR
Maximum Queue (m)	40.9	76.9	83.0	56.0	88.6	87.6	92.5	54.6	47.3	55.2	48.7	55.2	48.7	47.3	55.2	48.7
Average Queue (m)	20.8	39.8	41.0	10.9	39.9	43.6	49.2	3.6	25.0	24.2	20.1	24.2	20.1	25.0	24.2	20.1
95th Queue (m)	42.6	64.1	66.8	46.4	73.7	74.1	80.5	28.7	45.4	45.4	41.9	45.4	41.9	45.4	41.9	45.4
Link Distance (m)	667.7		667.7		383.3		383.3		244.1		244.1		244.1		244.1	
Upstream Blk Time (%)																
Queuing Penalty (veh)																
Storage Bay Dist (m)	33.5		49.1		103.2		61.6		46.2		46.2		46.2		46.2	
Storage Blk Time (%)	1		15		3		0		5		0		1		0	
Queuing Penalty (veh)	1		15		8		0		3		0		1		0	

Intersection: 2: Liverpool Rd & Kingston Rd

Movement	SB	SB	SB	SB	TR
Directions Served	L	T	T	TR	TR
Maximum Queue (m)	37.4	64.5	68.9	82.0	82.0
Average Queue (m)	13.6	36.5	39.8	43.8	43.8
95th Queue (m)	32.7	60.2	62.5	71.7	71.7
Link Distance (m)	107.9		107.9		107.9
Upstream Blk Time (%)	0				
Queuing Penalty (veh)	0				
Storage Bay Dist (m)	30.0				
Storage Blk Time (%)	0				
Queuing Penalty (veh)	0				

Intersection: 4: Liverpool Rd & North Dwy/Main Plaza Dwy

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB	SB	TR
Directions Served	L	TR	L	TR	L	TR	L	TR	L	TR	L	TR
Maximum Queue (m)	24.6	33.7	44.1	16.6	22.2	47.8	46.4	28.3	40.0	46.6	40.0	46.6
Average Queue (m)	9.8	13.9	20.3	7.7	5.5	13.9	15.9	9.8	14.4	22.1	14.4	22.1
95th Queue (m)	20.5	26.3	37.6	14.1	14.7	33.8	36.2	20.9	29.7	38.4	29.7	38.4
Link Distance (m)	25.2	25.2	43.1	43.1	107.9	107.9	107.9	190.5	190.5	190.5	190.5	190.5
Upstream Blk Time (%)	1											
Queuing Penalty (veh)	0											
Storage Bay Dist (m)	30.0											
Storage Blk Time (%)	0											
Queuing Penalty (veh)	0											

Intersection: 4: Liverpool Rd & North Dwy/Main Plaza Dwy

Phase	2	4	6	8
Movement(s) Served	NBTL	EBTL	SBTL	WBTL
Maximum Green (s)	59.1	27.1	59.1	27.1
Minimum Green (s)	5.0	5.0	5.0	5.0
Recall	C-Min	None	C-Min	None
Avg. Green (s)	47.4	10.5	47.4	10.5
g/C Ratio	NA	NA	NA	NA
Cycles Skipped (%)	0	0	0	0
Cycles @ Minimum (%)	0	4	0	4
Cycles Maxed Out (%)	100	0	100	0
Cycles with Peds (%)	20	2	8	0
<b>Controller Summary</b>				
Average Cycle Length (s):	NA			
Number of Complete Cycles:	0			

Intersection: 6: Liverpool Rd & Glenanna Rd

Phase	2	4	6	8
Movement(s) Served	NBTL	EBTL	SBTL	WBTL
Maximum Green (s)	59.3	28.1	59.3	28.1
Minimum Green (s)	5.0	8.0	8.0	5.0
Recall	C-Min	None	C-Min	None
Avg. Green (s)	51.3	19.3	51.3	19.3
g/C Ratio	NA	NA	NA	NA
Cycles Skipped (%)	0	0	0	0
Cycles @ Minimum (%)	0	5	0	0
Cycles Maxed Out (%)	100	0	100	0
Cycles with Peds (%)	12	0	26	0
<b>Controller Summary</b>				
Average Cycle Length (s):	NA			
Number of Complete Cycles:	0			

Intersection: 1: Glenanna Rd & Kingston Rd

Phase	1	2	3	4	5	6	8
Movement(s) Served	SBL	NBTL	WBL	EBTL	NBL	SBTL	WBTL
Maximum Green (s)	6.0	36.0	6.0	32.6	6.0	36.0	41.6
Minimum Green (s)	5.0	8.0	5.0	5.0	5.0	8.0	5.0
Recall	None	C-Min	None	None	None	C-Min	None
Avg. Green (s)	10.9	43.1	9.0	23.7	7.0	49.6	32.1
g/C Ratio	-0.01	NA	-0.01	NA	-0.01	NA	NA
Cycles Skipped (%)	17	0	23	0	51	0	0
Cycles @ Minimum (%)	0	0	0	0	0	0	0
Cycles Maxed Out (%)	0	100	0	0	0	100	0
Cycles with Peds (%)	0	60	0	51	0	63	17
<b>Controller Summary</b>							
Average Cycle Length (s):	NA						
Number of Complete Cycles:	0						

Intersection: 2: Liverpool Rd & Kingston Rd

Phase	1	2	3	4	5	6	7	8
Movement(s) Served	SBL	NBTL	WBL	EBTL	NBL	SBTL	EBL	WBTL
Maximum Green (s)	5.0	38.1	10.5	48.0	13.0	30.1	13.0	48.0
Minimum Green (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Recall	None	Max	None	C-Min	None	Max	None	C-Min
Avg. Green (s)	8.2	62.5	10.3	27.0	13.9	54.9	9.8	29.4
g/C Ratio	-0.01	NA	NA	NA	-0.01	NA	-0.01	NA
Cycles Skipped (%)	25	0	0	0	4	0	14	0
Cycles @ Minimum (%)	0	0	0	0	0	0	0	0
Cycles Maxed Out (%)	0	100	82	100	0	100	18	100
Cycles with Peds (%)	0	52	0	46	0	52	0	39
<b>Controller Summary</b>								
Average Cycle Length (s):	NA							
Number of Complete Cycles:	0							

## **Weekday PM Peak Hour**

Arterial Level of Service: EB Kingston Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (km)	Arterial Speed	Run 1 Speed	Run 1 Delay
Liverpool Rd	2	224.0	249.8	0.7	10	8	281.8
Glenanna Rd	1	20.6	45.4	0.4	33	32	22.5
<b>Total</b>		<b>244.6</b>	<b>315.2</b>	<b>1.1</b>	<b>13</b>	<b>11</b>	<b>304.2</b>

Arterial Level of Service: EB Kingston Rd

Cross Street	Run 2 Speed	Run 2 Delay	Run 3 Speed	Run 3 Delay	Run 4 Speed	Run 4 Delay	Run 5 Speed
Liverpool Rd	9	227.9	17	106.6	9	231.5	8
Glenanna Rd	36	16.9	34	19.5	32	22.2	32
<b>Total</b>	<b>13</b>	<b>244.7</b>	<b>21</b>	<b>126.1</b>	<b>13</b>	<b>253.8</b>	<b>11</b>

Arterial Level of Service: WB Kingston Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (km)	Arterial Speed	Run 1 Speed	Run 1 Delay
Glenanna Rd	1	16.6	48.9	0.5	41	40	16.9
Liverpool Rd	2	43.6	66.6	0.4	23	22	44.0
<b>Total</b>		<b>60.2</b>	<b>115.5</b>	<b>1.0</b>	<b>30</b>	<b>30</b>	<b>60.9</b>

Arterial Level of Service: WB Kingston Rd

Cross Street	Run 2 Speed	Run 2 Delay	Run 3 Speed	Run 3 Delay	Run 4 Speed	Run 4 Delay	Run 5 Speed
Glenanna Rd	41	16.1	41	16.4	40	17.8	41
Liverpool Rd	23	42.6	22	46.3	23	42.4	23
<b>Total</b>	<b>31</b>	<b>58.7</b>	<b>30</b>	<b>62.7</b>	<b>30</b>	<b>60.2</b>	<b>31</b>

Arterial Level of Service: NB Liverpool Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (km)	Arterial Speed	Run 1 Speed	Run 1 Delay
Kingston Rd	2	87.7	120.8	0.3	9	12	61.3
Main Plaza Dwy	4	17.3	27.6	0.1	18	18	17.6
Glenanna Rd	6	15.9	31.3	0.2	25	24	16.9
<b>Total</b>		<b>120.8</b>	<b>179.7</b>	<b>0.6</b>	<b>14</b>	<b>16</b>	<b>95.7</b>

Arterial Level of Service: NB Liverpool Rd

Cross Street	Run 2 Speed	Run 2 Delay	Run 3 Speed	Run 3 Delay	Run 4 Speed	Run 4 Delay	Run 5 Speed
Kingston Rd	8	108.1	7	129.6	11	70.5	12
Main Plaza Dwy	19	16.9	17	18.5	19	16.7	19
Glenanna Rd	24	16.6	25	15.6	25	15.3	26
<b>Total</b>	<b>12</b>	<b>141.6</b>	<b>11</b>	<b>163.6</b>	<b>15</b>	<b>102.5</b>	<b>16</b>

Summary of All Intervals

Run Number	1	2	3	4	5	Avg
Start Time	4:45	4:45	4:45	4:45	4:45	4:45
End Time	6:00	6:00	6:00	6:00	6:00	6:00
Total Time (min)	75	75	75	75	75	75
Time Recorded (min)	60	60	60	60	60	60
# of Intervals	2	2	2	2	2	2
# of Recorded Intervals	1	1	1	1	1	1
Vehs Entered	5659	5773	5794	5706	5640	5711
Vehs Exited	5606	5689	5752	5579	5541	5633
Starting Vehs	319	276	237	256	274	271
Ending Vehs	372	360	279	383	373	352
Travel Distance (km)	6113	6287	6341	6179	6136	6211
Travel Time (hr)	353.3	342.7	316.6	324.6	339.7	335.4
Total Delay (hr)	233.8	220.0	192.6	203.5	219.7	213.9
Total Stops	10320	11636	11507	10888	10284	10929
Fuel Used (l)	686.4	691.9	672.1	663.6	674.4	677.7

Interval #0 Information Seeding

Start Time	4:45
End Time	5:00
Total Time (min)	15
Volumes adjusted by Growth Factors.	
No data recorded this interval.	

Interval #1 Information Recording

Start Time	5:00
End Time	6:00
Total Time (min)	60
Volumes adjusted by Growth Factors.	

Run Number	1	2	3	4	5	Avg
Vehs Entered	5659	5773	5794	5706	5640	5711
Vehs Exited	5606	5689	5752	5579	5541	5633
Starting Vehs	319	276	237	256	274	271
Ending Vehs	372	360	279	383	373	352
Travel Distance (km)	6113	6287	6341	6179	6136	6211
Travel Time (hr)	353.3	342.7	316.6	324.6	339.7	335.4
Total Delay (hr)	233.8	220.0	192.6	203.5	219.7	213.9
Total Stops	10320	11636	11507	10888	10284	10929
Fuel Used (l)	686.4	691.9	672.1	663.6	674.4	677.7



Queuing and Blocking Report

19225 | 1294 Kingston Rd  
2028 FT PM: Option 3 (Optimized)

Intersection: 1: Glenanna Rd & Kingston Rd

Movement	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB	NB	NB	SB
Directions Served	L	T	R	T	L	T	L	T	R	L	T	L	T	R
Maximum Queue (m)	26.5	114.1	122.9	67.8	40.4	79.2	69.8	30.6	32.7	96.1	32.5	34.8	34.8	34.8
Average Queue (m)	3.5	44.9	50.4	13.1	25.0	36.1	27.9	10.8	19.0	37.9	22.1	28.3	28.3	28.3
95th Queue (m)	14.0	89.6	97.5	47.4	42.1	61.9	53.4	27.0	34.2	76.8	38.5	42.6	42.6	42.6
Link Distance (m)	383.3													383.3
Upstream Blk Time (%)	534.5													534.5
Queuing Penalty (veh)	60.4													60.4
Storage Bay Dist (m)	33.0													33.0
Storage Blk Time (%)	7													7
Queuing Penalty (veh)	2													2

Intersection: 1: Glenanna Rd & Kingston Rd

Movement	SB	SB
Directions Served	T	R
Maximum Queue (m)	106.2	24.0
Average Queue (m)	48.0	7.6
95th Queue (m)	87.3	22.2
Link Distance (m)	410.7	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)	16.5	
Storage Blk Time (%)	28	
Queuing Penalty (veh)	60	

Arterial Level of Service

19225 | 1294 Kingston Rd  
2028 FT PM: Option 3 (Optimized)

Arterial Level of Service: SB Liverpool Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (km)	Arterial Speed	Run 1 Speed	Run 1 Delay
Glenanna Rd	6	6.3	41.7	0.5	43	42	7.2
North Dwy	4	5.7	20.8	0.2	37	38	5.7
Kingston Rd	2	41.1	50.8	0.1	10	10	42.7
Total		53.0	113.4	0.9	27	27	55.6

Arterial Level of Service: SB Liverpool Rd

Cross Street	Run 2 Speed	Run 2 Delay	Run 3 Speed	Run 3 Delay	Run 4 Speed	Run 4 Delay	Run 5 Speed	Run 5 Delay
Glenanna Rd	45	5.8	43	6.3	44	5.7	43	43
North Dwy	37	5.9	37	5.8	36	6.1	39	39
Kingston Rd	10	40.5	10	41.2	10	39.8	10	42.7
Total	28	52.2	27	53.3	27	51.6	27	55.6

Queuing and Blocking Report

19225 | 1294 Kingston Rd  
2028 FT PM: Option 3 (Optimized)

Intersection: 6: Liverpool Rd & Glenanna Rd

Movement	EB	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB	SB	SB	TR	TR
Directions Served	L	T	R	L	TR	L	TR	L	T	TR	L	T	TR	L	T	TR	TR
Maximum Queue (m)	24.9	32.8	26.0	31.6	78.2	31.8	88.2	80.9	27.6	33.1	31.5						
Average Queue (m)	9.4	14.8	11.2	13.8	33.8	29.4	50.2	43.5	10.3	12.7	9.7						
95th Queue (m)	21.3	27.9	19.6	30.4	62.8	37.4	88.7	75.3	21.8	25.4	22.5						
Link Distance (m)	117.4			117.4	410.7			190.5	190.5	491.4			491.4				
Upstream Blk Time (%)	0																
Queuing Penalty (veh)	0																
Storage Bay Dist (m)	22.0																
Storage Blk Time (%)	2																
Queuing Penalty (veh)	2																

Network Summary

Network wide Queuing Penalty: 1172

Queuing and Blocking Report

19225 | 1294 Kingston Rd  
2028 FT PM: Option 3 (Optimized)

Intersection: 2: Liverpool Rd & Kingston Rd

Movement	EB	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB	SB	SB	TR	TR
Directions Served	L	T	R	T	R	L	T	TR	L	T	TR	L	T	TR	L	T	TR
Maximum Queue (m)	41.0	589.2	595.9	56.6	109.9	141.4	109.0	54.6	53.6	251.7	243.8						
Average Queue (m)	35.8	452.4	454.8	49.6	67.4	57.0	51.4	1.8	52.0	179.3	167.8						
95th Queue (m)	51.6	720.2	722.1	79.8	118.0	117.5	88.5	20.0	59.7	285.8	285.7						
Link Distance (m)	667.7			667.7	383.3			383.3	244.1	244.1	244.1						
Upstream Blk Time (%)	13																
Queuing Penalty (veh)	0																
Storage Bay Dist (m)	33.5																
Storage Blk Time (%)	11																
Queuing Penalty (veh)	58																

Intersection: 2: Liverpool Rd & Kingston Rd

Movement	SB	SB	SB	SB	TR	TR
Directions Served	L	T	T	TR		
Maximum Queue (m)	35.0	63.5	45.6	46.6		
Average Queue (m)	20.2	20.3	19.5	21.7		
95th Queue (m)	36.7	51.0	35.6	40.1		
Link Distance (m)	107.9			107.9		
Upstream Blk Time (%)	0					
Queuing Penalty (veh)	0					
Storage Bay Dist (m)	30.0					
Storage Blk Time (%)	13					
Queuing Penalty (veh)	16					

Intersection: 4: Liverpool Rd & North Dwy/Main Plaza Dwy

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB	SB	TR	TR	
Directions Served	L	TR	L	TR	L	T	TR	L	T	TR	L	T	TR	
Maximum Queue (m)	24.5	17.5	46.1	28.6	37.3	99.1	110.5	29.8	29.6	35.7				
Average Queue (m)	8.6	9.3	23.6	12.5	17.0	56.7	61.4	11.5	8.9	11.8				
95th Queue (m)	19.5	16.3	41.5	23.4	39.4	99.3	108.6	23.6	21.6	26.8				
Link Distance (m)	25.2		25.2		43.1		43.1		107.9		107.9		190.5	
Upstream Blk Time (%)	0													
Queuing Penalty (veh)	0													
Storage Bay Dist (m)	30.0													
Storage Blk Time (%)	0													
Queuing Penalty (veh)	1													

Intersection: 4: Liverpool Rd & North Dwy/Main Plaza Dwy

Phase	2	4	6	8
Movement(s) Served	NBTL	EBTL	SBTL	WBTL
Maximum Green (s)	64.1	22.1	64.1	22.1
Minimum Green (s)	5.0	5.0	5.0	5.0
Recall	C-Max	None	C-Max	None
Avg. Green (s)	76.4	12.6	76.4	12.6
g/C Ratio	NA	NA	NA	NA
Cycles Skipped (%)	0	0	0	0
Cycles @ Minimum (%)	0	0	0	0
Cycles Maxed Out (%)	100	3	100	3
Cycles with Peds (%)	32	0	12	0
<b>Controller Summary</b>				
Average Cycle Length (s):	NA			
Number of Complete Cycles:	0			

Intersection: 6: Liverpool Rd & Glenanna Rd

Phase	2	4	6	8
Movement(s) Served	NBTL	EBTL	SBTL	WBTL
Maximum Green (s)	57.3	30.1	57.3	30.1
Minimum Green (s)	5.0	8.0	5.0	8.0
Recall	C-Min	None	C-Min	None
Avg. Green (s)	64.3	17.4	64.3	17.4
g/C Ratio	NA	NA	NA	NA
Cycles Skipped (%)	0	0	0	0
Cycles @ Minimum (%)	0	8	0	8
Cycles Maxed Out (%)	100	0	100	0
Cycles with Peds (%)	24	0	0	0
<b>Controller Summary</b>				
Average Cycle Length (s):	NA			
Number of Complete Cycles:	0			

Intersection: 1: Glenanna Rd & Kingston Rd

Phase	1	2	3	4	5	6	8
Movement(s) Served	SBL	NBTL	WBL	EBTL	NBL	SBTL	WBTL
Maximum Green (s)	6.0	36.0	6.0	32.6	6.0	36.0	41.6
Minimum Green (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Recall	None	C-Min	None	None	None	C-Min	None
Avg. Green (s)	7.0	26.6	10.0	39.5	6.6	27.7	51.1
g/C Ratio	-0.01	NA	-0.01	NA	-0.01	NA	NA
Cycles Skipped (%)	6	0	9	0	14	0	0
Cycles @ Minimum (%)	0	0	0	0	0	0	0
Cycles Maxed Out (%)	77	100	14	78	69	100	78
Cycles with Peds (%)	0	71	0	78	0	89	47
<b>Controller Summary</b>							
Average Cycle Length (s):	NA						
Number of Complete Cycles:	0						

Intersection: 2: Liverpool Rd & Kingston Rd

Phase	1	2	3	4	5	6	7	8
Movement(s) Served	SBL	NBTL	WBL	EBTL	NBL	SBTL	EBL	WBTL
Maximum Green (s)	5.0	30.1	10.4	34.2	14.0	21.1	13.0	31.6
Minimum Green (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Recall	None	Min	None	C-Min	None	Min	None	C-Min
Avg. Green (s)	5.1	30.5	10.5	34.4	13.7	21.5	11.6	33.7
g/C Ratio	-0.01	NA	NA	NA	NA	NA	-0.01	NA
Cycles Skipped (%)	6	0	0	0	0	0	3	0
Cycles @ Minimum (%)	92	0	0	0	0	0	0	0
Cycles Maxed Out (%)	94	97	97	100	86	97	47	100
Cycles with Peds (%)	0	81	0	56	0	56	0	50
<b>Controller Summary</b>								
Average Cycle Length (s):	NA							
Number of Complete Cycles:	0							



**Future Total Traffic - Option 4**



Phasing Plan 1

Protected Phase By Approach



**Weekday AM Peak Hour**

Arterial Level of Service: EB Kingston Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (km)	Arterial Speed	Run 1 Speed	Run 1 Delay	Run 1 Speed	Run 1 Delay
Liverpool Rd	2	34.8	75.1	0.7	33	32	32	32	36.9
Glenanna Rd	1	41.4	64.4	0.4	23	25	25	25	37.1
<b>Total</b>		<b>76.1</b>	<b>139.4</b>	<b>1.1</b>	<b>29</b>	<b>29</b>	<b>29</b>	<b>29</b>	<b>74.1</b>

Arterial Level of Service: WB Kingston Rd

Cross Street	Node	Run 2 Speed	Run 2 Delay	Run 3 Speed	Run 3 Delay	Run 4 Speed	Run 4 Delay	Run 5 Speed	Run 5 Delay
Liverpool Rd	34	33.9	34	33.5	33	34.6	34.6	33	33
Glenanna Rd	22	44.3	24	38.9	23	43.3	43.3	23	23
<b>Total</b>	<b>28</b>	<b>78.2</b>	<b>29</b>	<b>72.4</b>	<b>28</b>	<b>77.9</b>	<b>77.9</b>	<b>29</b>	<b>29</b>

Arterial Level of Service: WB Kingston Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (km)	Arterial Speed	Run 1 Speed	Run 1 Delay
Glenanna Rd	1	40.1	72.4	0.5	27	17	84.3
Liverpool Rd	2	28.8	52.5	0.4	29	24	38.7
<b>Total</b>		<b>68.9</b>	<b>124.8</b>	<b>1.0</b>	<b>28</b>	<b>19</b>	<b>123.0</b>

Arterial Level of Service: WB Kingston Rd

Cross Street	Node	Run 2 Speed	Run 2 Delay	Run 3 Speed	Run 3 Delay	Run 4 Speed	Run 4 Delay	Run 5 Speed	Run 5 Delay
Glenanna Rd	32	29.4	32	29.6	32	29.6	32	31	31
Liverpool Rd	29	27.4	31	25.5	28	30.1	30.1	32	32
<b>Total</b>	<b>31</b>	<b>56.7</b>	<b>31</b>	<b>55.1</b>	<b>30</b>	<b>59.6</b>	<b>59.6</b>	<b>32</b>	<b>32</b>

Summary of All Intervals

Run Number	1	2	3	4	5	Avg
Start Time	7:45	7:45	7:45	7:45	7:45	7:45
End Time	9:00	9:00	9:00	9:00	9:00	9:00
Total Time (min)	75	75	75	75	75	75
Time Recorded (min)	60	60	60	60	60	60
# of Intervals	2	2	2	2	2	2
# of Recorded Intervals	1	1	1	1	1	1
Vehs Entered	4195	4342	4342	4286	4210	4276
Vehs Exited	4102	4198	4241	4225	4176	4189
Starting Vehs	229	140	167	202	170	183
Ending Vehs	322	284	268	263	204	271
Travel Distance (km)	4350	4499	4509	4551	4434	4469
Travel Time (hr)	381.6	297.4	227.0	281.2	225.1	282.4
Total Delay (hr)	294.8	207.8	137.1	190.9	136.7	193.4
Total Stops	7107	6958	6653	6956	6568	6851
Fuel Used (l)	598.6	535.9	478.0	525.0	471.6	521.8

Interval #0 Information Seeding

Start Time	7:45
End Time	8:00
Total Time (min)	15
Volumes adjusted by Growth Factors.	
No data recorded this interval.	

Interval #1 Information Recording

Start Time	8:00
End Time	9:00
Total Time (min)	60
Volumes adjusted by Growth Factors.	

Run Number	1	2	3	4	5	Avg
Vehs Entered	4195	4342	4342	4286	4210	4276
Vehs Exited	4102	4198	4241	4225	4176	4189
Starting Vehs	229	140	167	202	170	183
Ending Vehs	322	284	268	263	204	271
Travel Distance (km)	4350	4499	4509	4551	4434	4469
Travel Time (hr)	381.6	297.4	227.0	281.2	225.1	282.4
Total Delay (hr)	294.8	207.8	137.1	190.9	136.7	193.4
Total Stops	7107	6958	6653	6956	6568	6851
Fuel Used (l)	598.6	535.9	478.0	525.0	471.6	521.8

Queuing and Blocking Report

19225 | 1294 Kingston Rd  
2028 FT AM: Option 4 Split Appr

Intersection: 1: Glenanna Rd & Kingston Rd

Movement	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB	NB	NB	SB
Directions Served	L	T	R	T	L	T	R	L	T	L	T	R	L	SB
Maximum Queue (m)	43.8	76.0	75.8	52.5	40.5	137.1	128.6	30.7	23.9	43.9	21.7	34.2	34.2	L
Average Queue (m)	5.9	37.6	41.4	19.8	23.0	67.7	60.5	15.8	7.8	11.8	6.2	17.4	17.4	L
95th Queue (m)	24.1	63.0	65.1	40.4	45.9	166.9	161.3	35.2	19.3	39.7	17.6	31.3	31.3	L
Link Distance (m)	383.4													383.4
Upstream Blk Time (%)	534.5													534.5
Queuing Penalty (veh)	182.2													182.2
Storage Bay Dist (m)	42.6													42.6
Storage Blk Time (%)	7	2	2	60.4	33.0	23.2	25.4	25.0	27.3	25.0	27.3	25.0	27.3	27.3
Queuing Penalty (veh)	1	1	1	3	24	23	27	0	6	0	5	0	4	4

Intersection: 1: Glenanna Rd & Kingston Rd

Movement	SB	SB
Directions Served	T	R
Maximum Queue (m)	43.4	14.0
Average Queue (m)	11.6	2.4
95th Queue (m)	29.8	9.8
Link Distance (m)	410.7	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)	16.5	
Storage Blk Time (%)	4	
Queuing Penalty (veh)	8	

Arterial Level of Service

19225 | 1294 Kingston Rd  
2028 FT AM: Option 4 Split Appr

Arterial Level of Service: NB Liverpool Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (km)	Arterial Speed	Run 1 Speed	Run 1 Delay
Kingston Rd	2	17.9	36.4	0.3	27	26	19.0
South Dwy	3	2.1	6.7	0.1	32	33	1.9
Main Plaza Dwy	4	43.7	50.8	0.1	8	8	42.7
Glenanna Rd	6	21.3	34.9	0.2	20	17	26.4
Total		85.0	128.9	0.6	18	17	90.0

Arterial Level of Service: NB Liverpool Rd

Cross Street	Run 2 Speed	Run 2 Delay	Run 3 Speed	Run 3 Delay	Run 4 Speed	Run 4 Delay	Run 5 Speed	Run 5 Delay
Kingston Rd	26	18.9	27	17.6	28	15.9	26	26
South Dwy	31	2.1	32	2.0	31	2.2	32	3.2
Main Plaza Dwy	8	43.3	7	44.5	7	44.0	7	44.0
Glenanna Rd	17	27.6	23	16.9	20	21.3	25	25
Total	17	91.9	18	80.8	18	83.5	19	19

Arterial Level of Service: SB Liverpool Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (km)	Arterial Speed	Run 1 Speed	Run 1 Delay
Glenanna Rd	6	28.3	63.7	0.5	28	27	32.7
North Dwy	4	130.1	291.6	0.2	5	5	134.0
South Dwy	3	3.8	12.4	0.1	30	30	3.9
Kingston Rd	2	14.4	18.0	0.1	12	12	14.6
Total		176.7	385.8	0.9	13	13	185.1

Arterial Level of Service: SB Liverpool Rd

Cross Street	Run 2 Speed	Run 2 Delay	Run 3 Speed	Run 3 Delay	Run 4 Speed	Run 4 Delay	Run 5 Speed	Run 5 Delay
Glenanna Rd	27	30.7	31	22.9	24	39.0	36	36
North Dwy	5	137.8	5	119.0	5	136.8	5	5
South Dwy	31	3.7	30	3.8	31	3.7	30	3.0
Kingston Rd	12	13.6	11	15.1	12	13.7	11	11
Total	13	185.7	14	160.8	12	193.1	14	14



Intersection: 4: Liverpool Rd & North Dwy/Main Plaza Dwy

Movement	EB	EB	WB	WB	NB	NB	TR	TR	SB	SB	SB	TR	TR	SB	SB
Directions Served	L	TR	L	TR	L	TR	L	TR	L	TR	L	TR	L	TR	TR
Maximum Queue (m)	26.5	35.6	43.7	30.7	37.4	78.3	80.2	37.4	158.2	161.8					
Average Queue (m)	11.2	14.8	22.5	13.1	5.5	50.9	55.9	14.6	150.7	151.7					
95th Queue (m)	23.1	29.8	39.4	26.0	25.7	75.7	80.5	41.8	170.4	167.7					
Link Distance (m)	44.6	44.6	44.4	44.4	75.1	75.1	75.1	152.3	152.3	152.3					
Upstream Blk Time (%)	0	1	1	1	1	2	2	28	35						
Queuing Penalty (veh)	0	0	0	0	4	7	138	171							
Storage Bay Dist (m)					30.0			30.0							
Storage Blk Time (%)					37			0	73						
Queuing Penalty (veh)					12			2	69						

Intersection: 6: Liverpool Rd & Glenanna Rd

Movement	EB	EB	WB	WB	NB	NB	TR	TR	SB	SB	SB	TR	TR	SB	SB
Directions Served	L	T	R	L	TR	L	TR	L	TR	L	TR	L	TR	L	TR
Maximum Queue (m)	26.7	127.1	127.2	31.7	316.6	31.7	69.1	70.3	53.5	97.5	96.2				
Average Queue (m)	7.0	61.1	83.1	24.9	141.7	20.6	28.5	31.0	17.1	49.7	48.7				
95th Queue (m)	20.5	144.9	158.5	40.2	380.6	37.6	60.7	61.9	46.4	90.7	89.9				
Link Distance (m)	117.4	117.4	117.4	410.7	410.7	152.3	152.3	491.4	491.4	491.4					
Upstream Blk Time (%)	21	47	9												
Queuing Penalty (veh)	0	0	0	18				46.2							
Storage Bay Dist (m)	22.0			24.3		24.4									
Storage Blk Time (%)	1	8		56		11		9		13					
Queuing Penalty (veh)	2	4		80		8		11		10					

Network Summary

Network wide Queuing Penalty: 688

Intersection: 2: Liverpool Rd & Kingston Rd

Movement	EB	EB	WB	WB	NB	NB	TR	TR	SB	SB	SB	TR	TR	SB	SB
Directions Served	L	T	R	L	TR	L	TR	L	TR	L	TR	L	TR	L	TR
Maximum Queue (m)	40.8	69.9	70.9	56.5	62.3	72.4	74.5	54.0	50.3	53.4	48.4	20.4			
Average Queue (m)	17.2	32.5	34.8	6.1	29.3	27.3	29.7	1.8	24.8	22.1	20.6	4.1			
95th Queue (m)	35.3	56.1	60.2	34.6	52.3	58.0	61.8	19.8	45.4	41.7	41.8	13.7			
Link Distance (m)		667.7	667.7			383.4	383.4				244.1	244.1			
Upstream Blk Time (%)															
Queuing Penalty (veh)															
Storage Bay Dist (m)	33.5			49.1	103.2			61.6	46.2						
Storage Blk Time (%)	1	7	2	0	0	3	0	1	0	0	0				
Queuing Penalty (veh)	2	7	5	0	0	1	0	3	0	0	0				

Intersection: 2: Liverpool Rd & Kingston Rd

Movement	SB	SB	SB	SB	SB	SB	TR	TR	SB	SB	SB	TR	TR	SB	SB
Directions Served	L	T	T	TR											
Maximum Queue (m)	24.5	28.4	30.2	31.5											
Average Queue (m)	8.6	15.1	16.2	16.5											
95th Queue (m)	19.0	26.3	29.0	29.0											
Link Distance (m)		30.4	30.4	30.4											
Upstream Blk Time (%)	0	0	1	1											
Queuing Penalty (veh)	0	1	3	5											
Storage Bay Dist (m)	30.9														
Storage Blk Time (%)	0	0	0	0											
Queuing Penalty (veh)	1	0	0	0											

Intersection: 3: Liverpool Rd & South Dwy

Movement	EB	NB	NB	SB	SB	SB	TR	TR	SB	SB	SB	TR	TR	SB	SB
Directions Served	R	T	T	T	T	T									
Maximum Queue (m)	17.6	9.8	20.2	1.8	3.0										
Average Queue (m)	6.1	0.5	1.8	0.1	0.1										
95th Queue (m)	14.2	4.0	10.3	1.3	2.1										
Link Distance (m)	9.5	30.4	30.4	75.1	75.1										
Upstream Blk Time (%)	2	0	0												
Queuing Penalty (veh)	0	0	0												
Storage Bay Dist (m)															
Storage Blk Time (%)															
Queuing Penalty (veh)															

Intersection: 4: Liverpool Rd & North Dwy/Main Plaza Dwy

Phase	2	4	6	8
Movement(s) Served	NBTL	EBTL	SBTL	WBTL
Maximum Green (s)	18.1	18.1	18.1	18.1
Minimum Green (s)	5.0	5.0	5.0	5.0
Recall	C-Min	None	Min	None
Avg. Green (s)	27.4	9.7	24.9	12.0
g/C Ratio	NA	-0.01	NA	NA
Cycles Skipped (%)	0	3	0	0
Cycles @ Minimum (%)	0	0	0	0
Cycles Maxed Out (%)	100	3	100	0
Cycles with Peds (%)	31	3	9	0
<b>Controller Summary</b>				
Average Cycle Length (s):	NA			
Number of Complete Cycles:	0			

Intersection: 6: Liverpool Rd & Glenanna Rd

Phase	2	4	6	8
Movement(s) Served	NBTL	EBTL	SBTL	WBTL
Maximum Green (s)	59.3	28.1	59.3	28.1
Minimum Green (s)	5.0	8.0	8.0	5.0
Recall	C-Min	None	C-Min	None
Avg. Green (s)	51.7	32.3	51.7	32.3
g/C Ratio	NA	NA	NA	NA
Cycles Skipped (%)	0	0	0	0
Cycles @ Minimum (%)	0	0	0	0
Cycles Maxed Out (%)	100	67	100	67
Cycles with Peds (%)	19	0	22	0
<b>Controller Summary</b>				
Average Cycle Length (s):	NA			
Number of Complete Cycles:	0			

Intersection: 1: Glenanna Rd & Kingston Rd

Phase	1	2	3	4	5	6	8
Movement(s) Served	SBL	NBTL	WBL	EBTL	NBL	SBTL	WBTL
Maximum Green (s)	6.0	36.0	6.0	32.6	6.0	36.0	41.6
Minimum Green (s)	5.0	8.0	5.0	5.0	5.0	8.0	5.0
Recall	None	C-Min	None	None	None	C-Min	None
Avg. Green (s)	9.5	43.3	8.5	25.1	7.1	48.8	33.4
g/C Ratio	-0.01	NA	-0.01	NA	-0.01	NA	NA
Cycles Skipped (%)	17	0	26	0	53	0	0
Cycles @ Minimum (%)	0	0	0	0	0	0	0
Cycles Maxed Out (%)	9	100	3	11	6	100	11
Cycles with Peds (%)	0	60	0	47	0	60	19
<b>Controller Summary</b>							
Average Cycle Length (s):	NA						
Number of Complete Cycles:	0						

Intersection: 2: Liverpool Rd & Kingston Rd

Phase	1	2	3	4	5	6	7	8
Movement(s) Served	SBL	NBTL	WBL	EBTL	NBL	SBTL	EBL	WBTL
Maximum Green (s)	9.0	31.1	11.0	29.0	9.0	31.1	11.0	29.0
Minimum Green (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Recall	None	C-Max	None	Min	None	C-Max	None	Min
Avg. Green (s)	7.7	44.9	9.8	23.8	11.9	37.2	9.1	25.2
g/C Ratio	-0.01	NA	-0.01	NA	-0.01	NA	-0.01	NA
Cycles Skipped (%)	41	0	9	0	6	0	14	0
Cycles @ Minimum (%)	0	0	0	0	0	0	0	0
Cycles Maxed Out (%)	3	100	49	17	37	100	26	17
Cycles with Peds (%)	0	46	0	33	0	51	0	33
<b>Controller Summary</b>								
Average Cycle Length (s):	NA							
Number of Complete Cycles:	0							



**Weekday PM Peak Hour**

Arterial Level of Service: EB Kingston Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (km)	Arterial Speed	Run 1 Speed	Run 1 Delay	Run 1 Speed	Run 1 Delay
Liverpool Rd	2	169.5	217.3	0.7	12	7	295.7		
Glenanna Rd	1	21.2	46.0	0.4	33	35	18.2		
<b>Total</b>		190.7	263.3	1.1	16	11	313.8		

Arterial Level of Service: WB Kingston Rd

Cross Street	Node	Run 2 Speed	Run 2 Delay	Run 3 Speed	Run 3 Delay	Run 4 Speed	Run 4 Delay	Run 5 Speed	Run 5 Delay
Liverpool Rd	11	187.3	20	83.2	18	95.7	12		
Glenanna Rd	33	20.8	32	21.3	35	17.6	28		
<b>Total</b>	15	208.1	24	104.5	22	113.3	15		

Arterial Level of Service: WB Kingston Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (km)	Arterial Speed	Run 1 Speed	Run 1 Delay
Glenanna Rd	1	16.6	49.2	0.5	40	40	16.6
Liverpool Rd	2	43.4	66.2	0.4	23	23	42.6
<b>Total</b>		60.0	115.4	1.0	30	30	59.3

Arterial Level of Service: WB Kingston Rd

Cross Street	Node	Run 2 Speed	Run 2 Delay	Run 3 Speed	Run 3 Delay	Run 4 Speed	Run 4 Delay	Run 5 Speed	Run 5 Delay
Glenanna Rd	41	15.9	41	15.4	40	16.9	39		
Liverpool Rd	22	44.6	24	40.6	22	44.8	22		
<b>Total</b>	30	60.4	31	56.0	30	61.7	30		

Summary of All Intervals

Run Number	1	2	3	4	5	Avg
Start Time	4:45	4:45	4:45	4:45	4:45	4:45
End Time	6:00	6:00	6:00	6:00	6:00	6:00
Total Time (min)	75	75	75	75	75	75
Time Recorded (min)	60	60	60	60	60	60
# of Intervals	2	2	2	2	2	2
# of Recorded Intervals	1	1	1	1	1	1
Vehs Entered	5894	5808	5688	5659	5737	5754
Vehs Exited	5785	5629	5654	5573	5692	5667
Starting Vehs	331	242	280	257	328	286
Ending Vehs	440	421	314	343	373	378
Travel Distance (km)	6292	6118	6096	6053	6202	6152
Travel Time (hr)	533.2	435.7	463.6	404.6	402.4	447.9
Total Delay (hr)	410.1	316.2	344.2	286.2	281.1	327.6
Total Stops	11579	11475	10692	10396	11907	11208
Fuel Used (l)	856.5	762.3	785.3	732.0	738.2	774.8

Interval #0 Information Seeding

Start Time	4:45
End Time	5:00
Total Time (min)	15
Volumes adjusted by Growth Factors.	
No data recorded this interval.	

Interval #1 Information Recording

Start Time	5:00
End Time	6:00
Total Time (min)	60
Volumes adjusted by Growth Factors.	

Run Number	1	2	3	4	5	Avg
Vehs Entered	5894	5808	5688	5659	5737	5754
Vehs Exited	5785	5629	5654	5573	5692	5667
Starting Vehs	331	242	280	257	328	286
Ending Vehs	440	421	314	343	373	378
Travel Distance (km)	6292	6118	6096	6053	6202	6152
Travel Time (hr)	533.2	435.7	463.6	404.6	402.4	447.9
Total Delay (hr)	410.1	316.2	344.2	286.2	281.1	327.6
Total Stops	11579	11475	10692	10396	11907	11208
Fuel Used (l)	856.5	762.3	785.3	732.0	738.2	774.8

Queuing and Blocking Report

19225 | 1294 Kingston Rd  
2028 FT PM: Option 4 Split Appr

Intersection: 1: Glenanna Rd & Kingston Rd

Movement	EB	EB	EB	EB	WB	WB	WB	WB	WB	WB	NB	NB	NB	NB	SB	SB
Directions Served	L	T	R	T	L	T	R	T	L	T	L	T	R	T	R	L
Maximum Queue (m)	30.1	136.1	147.2	67.8	40.4	87.8	72.5	30.7	32.8	90.6	32.5	34.8	34.8	34.8	34.8	34.8
Average Queue (m)	4.4	45.3	50.0	13.9	25.0	36.4	29.9	14.3	20.3	38.2	24.2	26.9	26.9	26.9	26.9	26.9
95th Queue (m)	19.0	95.1	101.3	41.9	40.7	68.4	58.9	32.4	34.7	72.5	39.7	41.8	41.8	41.8	41.8	41.8
Link Distance (m)	383.4 383.4 534.5 534.5 182.2															
Upstream Blk Time (%)	534.5 534.5 182.2															
Queuing Penalty (veh)	410.7															
Storage Bay Dist (m)	42.6															
Storage Blk Time (%)	11 7 0 0 5 7 8 0 6 14 7 13															
Queuing Penalty (veh)	3 10 0 0 15 12 11 1 21 44 21 30															

Intersection: 1: Glenanna Rd & Kingston Rd

Movement	SB	SB
Directions Served	T	R
Maximum Queue (m)	113.4	24.0
Average Queue (m)	48.0	6.9
95th Queue (m)	93.2	21.1
Link Distance (m)	410.7	
Upstream Blk Time (%)	410.7	
Queuing Penalty (veh)	410.7	
Storage Bay Dist (m)	16.5	
Storage Blk Time (%)	32 0	
Queuing Penalty (veh)	68 1	

Arterial Level of Service

19225 | 1294 Kingston Rd  
2028 FT PM: Option 4 Split Appr

Arterial Level of Service: NB Liverpool Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (km)	Arterial Speed	Run 1 Speed	Run 1 Delay
Kingston Rd	2	165.3	483.7	0.3	5	5	168.8
South Dwy	3	6.1	10.8	0.1	20	20	5.9
Main Plaza Dwy	4	32.2	40.7	0.1	10	10	32.8
Glenanna Rd	6	6.8	20.8	0.2	33	34	6.3
Total		210.4	556.0	0.6	9	9	213.8

Arterial Level of Service: SB Liverpool Rd

Cross Street	Run 2 Speed	Run 2 Delay	Run 3 Speed	Run 3 Delay	Run 4 Speed	Run 4 Delay	Run 5 Speed
Kingston Rd	5	168.0	5	167.8	5	166.0	6
South Dwy	19	6.5	20	6.2	20	5.9	20
Main Plaza Dwy	9	34.0	10	32.6	10	30.4	10
Glenanna Rd	29	9.4	34	6.6	35	5.8	34
Total	9	217.9	9	213.3	9	208.0	9

Arterial Level of Service: SB Liverpool Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (km)	Arterial Speed	Run 1 Speed	Run 1 Delay
Glenanna Rd	6	6.9	42.4	0.5	43	44	6.8
North Dwy	4	40.8	52.4	0.2	13	13	41.2
South Dwy	3	4.0	12.5	0.1	30	30	4.1
Kingston Rd	2	24.4	28.0	0.1	8	7	25.0
Total		76.1	135.3	0.9	23	23	77.2

Arterial Level of Service: SB Liverpool Rd

Cross Street	Run 2 Speed	Run 2 Delay	Run 3 Speed	Run 3 Delay	Run 4 Speed	Run 4 Delay	Run 5 Speed
Glenanna Rd	43	6.8	43	7.2	42	8.1	44
North Dwy	13	41.7	13	41.8	13	39.9	14
South Dwy	30	4.0	30	4.3	31	3.6	30
Kingston Rd	8	25.0	8	23.9	8	23.4	8
Total	23	77.6	23	77.1	23	75.0	23

Intersection: 4: Liverpool Rd & North Dwy/Main Plaza Dwy

Movement	EB	EB	WB	WB	NB	NB	TR	TR	SB	SB	SB	SB	TR	TR
Directions Served	L	TR	L	TR	L	TR	L	TR	L	TR	L	TR	L	TR
Maximum Queue (m)	25.8	27.1	45.0	42.2	37.4	79.2	82.0	37.5	75.1	79.1				
Average Queue (m)	9.3	10.6	24.6	20.2	13.3	60.8	63.6	15.2	41.3	47.1				
95th Queue (m)	21.3	22.1	42.3	36.7	41.0	88.3	89.6	38.6	69.0	71.4				
Link Distance (m)	44.7	44.7	41.1	41.1	73.0	73.0			152.3	152.3				
Upstream Blk Time (%)			2	1		3	5							
Queueing Penalty (veh)			0	0	30.0	33								
Storage Bay Dist (m)			0	46	0	46	0	20						
Storage Blk Time (%)									1	15				
Queueing Penalty (veh)														

Intersection: 6: Liverpool Rd & Glenanna Rd

Movement	EB	EB	WB	WB	NB	NB	TR	TR	SB	SB	SB	SB	TR	TR
Directions Served	L	T	R	L	TR	L	TR	L	TR	L	TR	L	TR	TR
Maximum Queue (m)	27.4	35.3	20.3	31.6	92.2	31.7	65.0	49.5	27.6	30.3	28.8			
Average Queue (m)	10.4	13.7	10.8	13.4	34.0	20.8	15.9	12.8	9.6	13.5	10.7			
95th Queue (m)	22.2	28.9	18.3	31.2	66.2	35.6	48.9	36.2	21.6	26.4	24.5			
Link Distance (m)			117.4	117.4	410.7		152.3	152.3		491.4	491.4			
Upstream Blk Time (%)														
Queueing Penalty (veh)										46.2				
Storage Bay Dist (m)			22.0	24.3	2	15	8	1						
Storage Blk Time (%)			3	4	2	8	25	3						
Queueing Penalty (veh)			2	2	3	8	25	3						

Network Summary

Network wide Queueing Penalty: 1272

Intersection: 2: Liverpool Rd & Kingston Rd

Movement	EB	EB	WB	WB	NB	NB	TR	TR	SB	SB	SB	SB	TR	TR
Directions Served	L	T	R	L	TR	L	TR	L	TR	L	TR	L	TR	TR
Maximum Queue (m)	41.0	506.0	506.4	56.6	88.0	81.3	85.0	40.8	53.6	258.7	258.3	59.3		
Average Queue (m)	34.6	346.3	348.8	50.3	41.0	44.7	48.5	5.4	50.7	248.7	247.9	54.6		
95th Queue (m)	51.7	669.6	669.2	79.0	74.9	68.5	71.9	35.8	63.5	258.8	260.6	76.7		
Link Distance (m)		667.7	667.7		383.4	383.4			244.1	244.1				
Upstream Blk Time (%)		11	12						62	40				
Queueing Penalty (veh)		0	0											
Storage Bay Dist (m)		33.5		49.1	103.2		61.6	46.2						
Storage Blk Time (%)		10	55	53	0	0	3	0	13	60	64	2		
Queueing Penalty (veh)		54	134	175	2	1	0	2	0	60	183	178	9	

Intersection: 2: Liverpool Rd & Kingston Rd

Movement	SB	SB	SB	SB	TR	TR
Directions Served	L	T	T	TR		
Maximum Queue (m)	29.9	40.6	32.6	36.2		
Average Queue (m)	19.1	21.3	21.5	20.6		
95th Queue (m)	31.9	36.4	32.3	35.1		
Link Distance (m)		30.4	30.4	30.4		
Upstream Blk Time (%)		3	3	2	2	
Queueing Penalty (veh)		0	6	4	5	
Storage Bay Dist (m)		30.9				
Storage Blk Time (%)		3	3			
Queueing Penalty (veh)		3	3			

Intersection: 3: Liverpool Rd & South Dwy

Movement	EB	NB	NB	SB	SB	SB	SB	TR	TR
Directions Served	R	T	T	T	T				
Maximum Queue (m)	12.4	38.1	46.2	18.1	14.8				
Average Queue (m)	4.3	17.7	21.2	1.9	1.1				
95th Queue (m)	10.6	41.8	46.9	9.7	7.8				
Link Distance (m)		9.5	30.4	30.4	73.0	73.0			
Upstream Blk Time (%)		2	3	6					
Queueing Penalty (veh)		0	18	38					
Storage Bay Dist (m)									
Storage Blk Time (%)									
Queueing Penalty (veh)									

Actuated Signals, Observed Splits

19225 | 1294 Kingston Rd  
2028 FT PM: Option 4 Split Appr

Intersection: 4: Liverpool Rd & North Dwy/Main Plaza Dwy

Phase	2	4	6	8
Movement(s) Served	NBTL	EBTL	SBTL	WBTL
Maximum Green (s)	18.1	18.1	18.1	18.1
Minimum Green (s)	5.0	5.0	5.0	5.0
Recall	C-Min	None	Min	None
Avg. Green (s)	35.7	8.6	17.5	13.8
g/C Ratio	NA	-0.01	NA	NA
Cycles Skipped (%)	0	14	0	0
Cycles @ Minimum (%)	0	0	0	0
Cycles Maxed Out (%)	100	0	78	0
Cycles with Peds (%)	40	3	11	0
<b>Controller Summary</b>				
Average Cycle Length (s):	NA			
Number of Complete Cycles:	0			

Intersection: 6: Liverpool Rd & Glenanna Rd

Phase	2	4	6	8
Movement(s) Served	NBTL	EBTL	SBTL	WBTL
Maximum Green (s)	57.3	30.1	57.3	30.1
Minimum Green (s)	5.0	8.0	5.0	8.0
Recall	C-Min	None	C-Min	None
Avg. Green (s)	62.0	18.7	62.0	18.7
g/C Ratio	NA	NA	NA	NA
Cycles Skipped (%)	0	0	0	0
Cycles @ Minimum (%)	0	3	0	3
Cycles Maxed Out (%)	100	0	100	0
Cycles with Peds (%)	24	0	0	0
<b>Controller Summary</b>				
Average Cycle Length (s):	NA			
Number of Complete Cycles:	0			

Actuated Signals, Observed Splits

19225 | 1294 Kingston Rd  
2028 FT PM: Option 4 Split Appr

Intersection: 1: Glenanna Rd & Kingston Rd

Phase	1	2	3	4	5	6	8
Movement(s) Served	SBL	NBTL	WBL	EBTL	NBL	SBTL	WBTL
Maximum Green (s)	6.0	36.0	6.0	32.6	6.0	36.0	41.6
Minimum Green (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Recall	None	C-Min	None	None	None	C-Min	None
Avg. Green (s)	6.9	25.8	10.0	40.1	6.6	26.6	51.8
g/C Ratio	-0.01	NA	-0.01	NA	-0.01	NA	NA
Cycles Skipped (%)	6	0	9	0	11	0	0
Cycles @ Minimum (%)	0	0	0	0	0	0	0
Cycles Maxed Out (%)	80	100	11	74	69	100	74
Cycles with Peds (%)	0	67	0	74	0	86	54
<b>Controller Summary</b>							
Average Cycle Length (s):	NA						
Number of Complete Cycles:	0						

Intersection: 2: Liverpool Rd & Kingston Rd

Phase	1	2	3	4	5	6	7	8
Movement(s) Served	SBL	NBTL	WBL	EBTL	NBL	SBTL	EBL	WBTL
Maximum Green (s)	5.0	30.1	10.4	34.2	14.0	21.1	13.0	31.6
Minimum Green (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Recall	None	C-Min	None	Min	None	C-Min	None	Min
Avg. Green (s)	5.1	30.7	10.4	34.4	13.0	22.6	11.1	33.8
g/C Ratio	-0.01	NA	NA	NA	-0.01	NA	NA	NA
Cycles Skipped (%)	6	0	0	0	3	0	0	0
Cycles @ Minimum (%)	91	0	0	0	0	0	0	0
Cycles Maxed Out (%)	94	100	86	97	64	100	46	97
Cycles with Peds (%)	0	63	0	58	0	60	0	50
<b>Controller Summary</b>								
Average Cycle Length (s):	NA							
Number of Complete Cycles:	0							



## Phasing Plan 2

Exclusive North and South Left Phases, Permissive North-South Phase and Protected East and West Phases



**Weekday AM Peak Hour**

Arterial Level of Service: EB Kingston Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (km)	Arterial Speed	Run 1 Speed	Run 1 Delay	Run 1 Speed	Run 1 Delay
Liverpool Rd	2	35.6	75.6	0.7	33	32	32	32	37.3
Glenanna Rd	1	42.8	65.7	0.4	23	22	22	22	44.4
<b>Total</b>		<b>78.4</b>	<b>141.3</b>	<b>1.1</b>	<b>28</b>	<b>28</b>	<b>28</b>	<b>28</b>	<b>81.8</b>

Arterial Level of Service: WB Kingston Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (km)	Arterial Speed	Run 1 Speed	Run 1 Delay	Run 1 Speed	Run 1 Delay
Liverpool Rd	34	34.0	33	35.3	32	32	37.1	32	33
Glenanna Rd	25	38.4	23	43.7	23	23	42.1	22	22
<b>Total</b>	<b>30</b>	<b>72.5</b>	<b>28</b>	<b>79.0</b>	<b>28</b>	<b>28</b>	<b>79.1</b>	<b>28</b>	<b>28</b>

Arterial Level of Service: WB Kingston Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (km)	Arterial Speed	Run 1 Speed	Run 1 Delay	Run 1 Speed	Run 1 Delay
Glenanna Rd	1	29.5	61.5	0.5	32	32	32	32	28.9
Liverpool Rd	2	24.9	48.2	0.4	31	31	31	31	24.4
<b>Total</b>		<b>54.4</b>	<b>109.7</b>	<b>1.0</b>	<b>32</b>	<b>32</b>	<b>32</b>	<b>32</b>	<b>53.3</b>

Arterial Level of Service: WB Kingston Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (km)	Arterial Speed	Run 1 Speed	Run 1 Delay	Run 1 Speed	Run 1 Delay
Liverpool Rd	32	29.9	31	31.4	33	33	28.7	32	32
Liverpool Rd	30	26.7	32	23.9	31	31	24.5	31	31
<b>Total</b>	<b>31</b>	<b>56.6</b>	<b>32</b>	<b>55.2</b>	<b>32</b>	<b>32</b>	<b>53.2</b>	<b>32</b>	<b>32</b>

Summary of All Intervals

Run Number	1	2	3	4	5	Avg
Start Time	7:45	7:45	7:45	7:45	7:45	7:45
End Time	9:00	9:00	9:00	9:00	9:00	9:00
Total Time (min)	75	75	75	75	75	75
Time Recorded (min)	60	60	60	60	60	60
# of Intervals	2	2	2	2	2	2
# of Recorded Intervals	1	1	1	1	1	1
Vehs Entered	4548	4458	4326	4335	4241	4381
Vehs Exited	4593	4468	4323	4331	4259	4396
Starting Vehs	207	172	151	154	175	175
Ending Vehs	162	162	154	158	157	158
Travel Distance (km)	4778	4660	4501	4497	4461	4579
Travel Time (hr)	172.6	172.7	161.7	163.0	160.2	166.0
Total Delay (hr)	77.2	79.3	71.9	72.9	71.2	74.5
Total Stops	6599	6535	6202	6270	6179	6357
Fuel Used (l)	449.6	442.7	423.0	421.2	417.5	430.8

Interval #0 Information Seeding

Start Time	7:45
End Time	8:00
Total Time (min)	15
Volumes adjusted by Growth Factors.	
No data recorded this interval.	

Interval #1 Information Recording

Start Time	8:00
End Time	9:00
Total Time (min)	60
Volumes adjusted by Growth Factors.	

Run Number	1	2	3	4	5	Avg
Vehs Entered	4548	4458	4326	4335	4241	4381
Vehs Exited	4593	4468	4323	4331	4259	4396
Starting Vehs	207	172	151	154	175	175
Ending Vehs	162	162	154	158	157	158
Travel Distance (km)	4778	4660	4501	4497	4461	4579
Travel Time (hr)	172.6	172.7	161.7	163.0	160.2	166.0
Total Delay (hr)	77.2	79.3	71.9	72.9	71.2	74.5
Total Stops	6599	6535	6202	6270	6179	6357
Fuel Used (l)	449.6	442.7	423.0	421.2	417.5	430.8

Queuing and Blocking Report

19225 | 1294 Kingston Rd  
2028 FT AM: Option 4 N-S Prot Left

Intersection: 1: Glenanna Rd & Kingston Rd

Movement	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB	NB	NB	SB
Directions Served	L	T	R	T	L	T	R	L	T	L	T	R	L	SB
Maximum Queue (m)	35.0	67.2	71.2	59.6	40.5	112.5	107.6	30.7	30.7	18.6	25.7	25.8	34.4	L
Average Queue (m)	3.4	37.2	41.0	19.1	22.8	50.5	43.4	14.4	7.4	8.6	6.3	18.3	18.3	R
95th Queue (m)	17.1	58.3	62.8	43.4	45.1	85.2	80.1	33.5	16.3	20.3	16.3	33.0	33.0	L
Link Distance (m)	383.4													383.4
Upstream Blk Time (%)	534.5													534.5
Queueing Penalty (veh)	60.4													60.4
Storage Bay Dist (m)	33.0													33.0
Storage Blk Time (%)	7	1	0	2	23	21	0	0	0	0	0	0	0	3
Queueing Penalty (veh)	1	1	1	6	22	26	0	0	1	0	0	1	0	4

Intersection: 1: Glenanna Rd & Kingston Rd

Movement	SB	SB
Directions Served	T	R
Maximum Queue (m)	46.6	15.3
Average Queue (m)	12.4	2.4
95th Queue (m)	30.7	10.3
Link Distance (m)	410.7	
Upstream Blk Time (%)		
Queueing Penalty (veh)		
Storage Bay Dist (m)	16.5	
Storage Blk Time (%)	4	
Queueing Penalty (veh)	9	

Arterial Level of Service

19225 | 1294 Kingston Rd  
2028 FT AM: Option 4 N-S Prot Left

Arterial Level of Service: NB Liverpool Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (km)	Arterial Speed	Run 1 Speed	Run 1 Delay
Kingston Rd	2	16.7	35.2	0.3	28	26	18.9
South Dwy	3	1.9	6.6	0.1	32	31	2.1
Main Plaza Dwy	4	36.2	43.1	0.1	9	9	36.8
Glenanna Rd	6	7.8	21.4	0.2	32	34	6.7
Total		62.5	106.3	0.6	21	21	64.6

Arterial Level of Service: NB Liverpool Rd

Cross Street	Run 2 Speed	Run 2 Delay	Run 3 Speed	Run 3 Delay	Run 4 Speed	Run 4 Delay	Run 5 Speed
Kingston Rd	27	17.6	30	14.2	27	17.3	29
South Dwy	33	1.9	33	1.8	32	2.0	33
Main Plaza Dwy	8	40.1	9	37.4	10	32.0	9
Glenanna Rd	33	7.4	32	8.2	31	8.7	33
Total	20	67.1	21	61.7	22	60.0	22

Arterial Level of Service: SB Liverpool Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (km)	Arterial Speed	Run 1 Speed	Run 1 Delay
Glenanna Rd	6	8.8	44.2	0.5	41	43	7.8
North Dwy	4	49.6	64.3	0.2	11	12	47.1
South Dwy	3	8.2	16.7	0.1	23	24	7.5
Kingston Rd	2	14.9	18.5	0.1	12	11	16.1
Total		81.4	143.6	0.9	22	23	78.5

Arterial Level of Service: SB Liverpool Rd

Cross Street	Run 2 Speed	Run 2 Delay	Run 3 Speed	Run 3 Delay	Run 4 Speed	Run 4 Delay	Run 5 Speed
Glenanna Rd	40	9.4	41	9.5	41	8.5	41
North Dwy	10	58.7	11	50.7	12	47.3	12
South Dwy	23	7.7	23	7.8	21	9.3	22
Kingston Rd	13	12.6	14	12.1	10	18.2	11
Total	21	88.4	22	80.1	22	83.3	23

Queuing and Blocking Report

19225 | 1294 Kingston Rd  
2028 FT AM: Option 4 N-S Prot Left

Intersection: 4: Liverpool Rd & North Dwy/Main Plaza Dwy

Movement	EB	EB	WB	WB	NB	NB	TR	TR	SB	SB	TR	TR	SB	SB
Directions Served	L	TR	L	TR	L	TR	L	TR	L	TR	L	TR	L	TR
Maximum Queue (m)	27.2	44.2	43.9	28.8	37.4	72.3	75.6	37.5	152.8	154.8				
Average Queue (m)	10.7	16.5	20.8	12.6	7.8	46.3	49.7	21.6	86.3	90.4				
95th Queue (m)	21.9	33.6	37.2	26.7	30.6	71.3	73.7	45.6	140.9	141.6				
Link Distance (m)	44.6	44.6	44.4	44.4	75.1	75.1	75.1	152.3	152.3	152.3				
Upstream Blk Time (%)	0	0	0	0	1	1	1	0	0	1				
Queuing Penalty (veh)	0	0	0	0	3	4	4	2	4	4				
Storage Bay Dist (m)	0	0	0	0	30.0	30.0	30.0	3	47	47				
Storage Blk Time (%)	0	0	0	0	0	0	0	13	44	44				
Queuing Penalty (veh)	0	0	0	0	10	10	10	13	44	44				

Intersection: 6: Liverpool Rd & Glenanna Rd

Movement	EB	EB	WB	WB	NB	NB	TR	TR	SB	SB	TR	TR	SB	SB
Directions Served	L	T	R	L	TR	L	TR	L	TR	L	TR	L	TR	TR
Maximum Queue (m)	28.0	48.6	37.3	31.6	60.1	30.2	43.0	44.9	35.0	58.5	61.7			
Average Queue (m)	9.8	22.1	19.5	15.7	21.0	15.6	9.4	14.4	10.3	24.8	23.9			
95th Queue (m)	23.6	40.2	32.6	32.1	44.4	30.1	29.5	35.3	23.2	45.1	47.3			
Link Distance (m)	117.4	117.4	117.4	410.7	152.3	152.3	152.3	491.4	491.4	491.4				
Upstream Blk Time (%)														
Queuing Penalty (veh)	22.0		24.3	24.3	24.4	46.2								
Storage Bay Dist (m)	2	13	3	6	4	1								
Storage Blk Time (%)	2	6	4	4	7	1								
Queuing Penalty (veh)	2	6	4	4	7	1								

Network Summary

Network wide Queuing Penalty: 298

Queuing and Blocking Report

19225 | 1294 Kingston Rd  
2028 FT AM: Option 4 N-S Prot Left

Intersection: 2: Liverpool Rd & Kingston Rd

Movement	EB	EB	WB	WB	NB	NB	TR	TR	SB	SB	TR	TR	SB	SB
Directions Served	L	T	R	L	TR	L	TR	L	TR	L	TR	L	TR	TR
Maximum Queue (m)	40.9	76.2	80.1	56.0	69.2	65.8	66.3	53.7	52.1	64.0	47.1	20.1		
Average Queue (m)	19.4	33.6	34.1	6.3	30.9	23.5	25.5	2.7	25.0	24.0	17.4	4.8		
95th Queue (m)	41.4	57.9	58.4	34.6	56.3	52.1	54.0	24.4	47.2	48.4	38.2	14.9		
Link Distance (m)	667.7	667.7	667.7	383.4	383.4	383.4	244.1	244.1	244.1	244.1				
Upstream Blk Time (%)														
Queuing Penalty (veh)	33.5		49.1	103.2	61.6	46.2								
Storage Bay Dist (m)	0	8	2	0	1	0	2	1	0	2	1	0		
Storage Blk Time (%)	1	8	4	0	1	0	4	1	0	4	1	0		
Queuing Penalty (veh)	1	8	4	0	1	0	4	1	0	4	1	0		

Intersection: 2: Liverpool Rd & Kingston Rd

Movement	SB	SB	SB	SB	TR	TR	TR	TR	SB	SB	TR	TR	SB	SB
Directions Served	L	T	R	L	TR	L	TR	L	TR	L	TR	L	TR	TR
Maximum Queue (m)	30.1	37.0	44.1	43.2										
Average Queue (m)	11.4	27.1	28.0	27.8										
95th Queue (m)	25.8	41.0	45.7	45.9										
Link Distance (m)	30.4	30.4	30.4	30.4										
Upstream Blk Time (%)	0	9	9	9										
Queuing Penalty (veh)	0	32	30	30										
Storage Bay Dist (m)	30.9													
Storage Blk Time (%)	0	9												
Queuing Penalty (veh)	0	8												

Intersection: 3: Liverpool Rd & South Dwy

Movement	EB	NB	NB	SB	SB	TR	TR	TR	SB	SB	TR	TR	SB	SB
Directions Served	R	T	T	T	T									
Maximum Queue (m)	15.6	8.1	21.8	71.3	72.6									
Average Queue (m)	5.9	0.5	1.3	24.6	23.8									
95th Queue (m)	14.5	4.4	9.6	59.2	62.9									
Link Distance (m)	9.5	30.4	30.4	75.1	75.1									
Upstream Blk Time (%)	4	0	0	0	0									
Queuing Penalty (veh)	0	0	0	1	2									
Storage Bay Dist (m)														
Storage Blk Time (%)														
Queuing Penalty (veh)														

Actuated Signals, Observed Splits

19225 | 1294 Kingston Rd  
2028 FT AM: Option 4 N-S Prot Left

Intersection: 4: Liverpool Rd & North Dwy/Main Plaza Dwy

Phase	2	4	6	8	9	10
Movement(s) Served	NBT	EBTL	SBT	WBTL	NBL	SBL
Maximum Green (s)	19.1	18.1	19.1	18.1	6.0	6.0
Minimum Green (s)	5.0	5.0	5.0	5.0	5.0	5.0
Recall	C-Min	None	Min	None	Min	Min
Avg. Green (s)	32.9	9.8	32.9	11.7	6.1	9.3
g/C Ratio	-0.01	-0.01	-0.01	-0.01	NA	NA
Cycles Skipped (%)	3	11	3	6	0	0
Cycles @ Minimum (%)	0	0	0	0	39	11
Cycles Maxed Out (%)	97	3	65	0	0	6
Cycles with Peds (%)	30	0	11	0	0	0
<b>Controller Summary</b>						
Average Cycle Length (s):	NA					
Number of Complete Cycles:	0					

Intersection: 6: Liverpool Rd & Glenanna Rd

Phase	2	4	6	8
Movement(s) Served	NBTL	EBTL	SBTL	WBTL
Maximum Green (s)	59.3	28.1	59.3	28.1
Minimum Green (s)	5.0	8.0	8.0	5.0
Recall	C-Min	None	C-Min	None
Avg. Green (s)	47.0	17.6	47.0	17.6
g/C Ratio	NA	NA	NA	NA
Cycles Skipped (%)	0	0	0	0
Cycles @ Minimum (%)	0	4	0	0
Cycles Maxed Out (%)	100	0	100	0
Cycles with Peds (%)	17	0	20	0
<b>Controller Summary</b>				
Average Cycle Length (s):	NA			
Number of Complete Cycles:	0			

Actuated Signals, Observed Splits

19225 | 1294 Kingston Rd  
2028 FT AM: Option 4 N-S Prot Left

Intersection: 1: Glenanna Rd & Kingston Rd

Phase	1	2	3	4	5	6	8
Movement(s) Served	SBL	NBTL	WBL	EBTL	NBL	SBTL	WBTL
Maximum Green (s)	6.0	36.0	6.0	32.6	6.0	36.0	41.6
Minimum Green (s)	5.0	8.0	5.0	5.0	5.0	8.0	5.0
Recall	None	C-Min	None	None	None	C-Min	None
Avg. Green (s)	10.0	43.8	8.7	24.0	7.6	49.1	32.8
g/C Ratio	-0.01	NA	-0.01	NA	-0.01	NA	NA
Cycles Skipped (%)	20	0	23	0	53	0	0
Cycles @ Minimum (%)	0	0	0	0	0	0	0
Cycles Maxed Out (%)	3	100	0	0	0	100	0
Cycles with Peds (%)	0	63	0	47	0	57	19
<b>Controller Summary</b>							
Average Cycle Length (s):	NA						
Number of Complete Cycles:	0						

Intersection: 2: Liverpool Rd & Kingston Rd

Phase	1	2	3	4	5	6	7	8
Movement(s) Served	SBL	NBTL	WBL	EBTL	NBL	SBTL	EBL	WBTL
Maximum Green (s)	9.0	31.1	11.0	29.0	9.0	31.1	11.0	29.0
Minimum Green (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Recall	None	C-Max	None	Min	None	C-Max	None	Min
Avg. Green (s)	8.3	46.5	9.5	23.4	12.4	37.5	8.6	25.5
g/C Ratio	-0.01	NA	-0.01	NA	-0.01	NA	-0.01	NA
Cycles Skipped (%)	56	0	8	0	9	0	17	0
Cycles @ Minimum (%)	0	0	0	0	0	0	0	0
Cycles Maxed Out (%)	3	100	44	17	37	100	23	17
Cycles with Peds (%)	0	49	0	39	0	46	0	28
<b>Controller Summary</b>								
Average Cycle Length (s):	NA							
Number of Complete Cycles:	0							

## **Weekday PM Peak Hour**

Arterial Level of Service: EB Kingston Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (km)	Arterial Speed	Run 1 Speed	Run 1 Delay	Run 1 Speed	Run 1 Delay
Liverpool Rd	2	281.5	348.5	0.7	8	8	8	8	293.3
Glenanna Rd	1	21.4	46.2	0.4	32	31	31	31	24.4
<b>Total</b>		<b>302.8</b>	<b>394.8</b>	<b>1.1</b>	<b>11</b>	<b>11</b>	<b>11</b>	<b>11</b>	<b>317.7</b>

Arterial Level of Service: WB Kingston Rd

Cross Street	Node	Run 2 Speed	Run 2 Delay	Run 3 Speed	Run 3 Delay	Run 4 Speed	Run 4 Delay	Run 5 Speed	Run 5 Delay
Liverpool Rd	8	286.5	8	283.0	8	293.1	8	293.1	9
Glenanna Rd	34	19.6	33	20.2	30	24.8	30	24.8	35
<b>Total</b>	<b>11</b>	<b>306.1</b>	<b>11</b>	<b>303.2</b>	<b>11</b>	<b>317.9</b>	<b>11</b>	<b>317.9</b>	<b>12</b>

Arterial Level of Service: WB Kingston Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (km)	Arterial Speed	Run 1 Speed	Run 1 Delay
Glenanna Rd	1	17.5	49.8	0.5	40	39	18.1
Liverpool Rd	2	44.7	67.7	0.4	22	22	46.1
<b>Total</b>		<b>62.2</b>	<b>117.5</b>	<b>1.0</b>	<b>30</b>	<b>29</b>	<b>64.2</b>

Arterial Level of Service: WB Kingston Rd

Cross Street	Node	Run 2 Speed	Run 2 Delay	Run 3 Speed	Run 3 Delay	Run 4 Speed	Run 4 Delay	Run 5 Speed	Run 5 Delay
Glenanna Rd	41	16.1	40	17.0	40	18.1	40	18.1	39
Liverpool Rd	22	44.2	22	46.6	23	43.5	23	43.5	23
<b>Total</b>	<b>30</b>	<b>60.3</b>	<b>29</b>	<b>63.6</b>	<b>30</b>	<b>61.6</b>	<b>30</b>	<b>61.6</b>	<b>30</b>

Summary of All Intervals

Run Number	1	2	3	4	5	Avg
Start Time	4:45	4:45	4:45	4:45	4:45	4:45
End Time	6:00	6:00	6:00	6:00	6:00	6:00
Total Time (min)	75	75	75	75	75	75
Time Recorded (min)	60	60	60	60	60	60
# of Intervals	2	2	2	2	2	2
# of Recorded Intervals	1	1	1	1	1	1
Vehs Entered	597	5671	5572	5631	5619	5618
Vehs Exited	550	5580	5442	5568	5539	5536
Starting Vehs	356	313	275	337	320	319
Ending Vehs	403	404	405	400	400	402
Travel Distance (km)	6016	6040	5893	6031	5990	5994
Travel Time (hr)	616.9	549.8	606.9	542.3	479.0	559.0
Total Delay (hr)	499.2	431.9	491.5	424.7	361.6	441.8
Total Stops	11757	11281	11403	11892	11458	11559
Fuel Used (l)	913.9	855.1	895.1	849.8	789.3	860.6

Interval #0 Information Seeding

Start Time	4:45
End Time	5:00
Total Time (min)	15
Volumes adjusted by Growth Factors.	
No data recorded this interval.	

Interval #1 Information Recording

Start Time	5:00
End Time	6:00
Total Time (min)	60
Volumes adjusted by Growth Factors.	

Run Number	1	2	3	4	5	Avg
Vehs Entered	597	5671	5572	5631	5619	5618
Vehs Exited	550	5580	5442	5568	5539	5536
Starting Vehs	356	313	275	337	320	319
Ending Vehs	403	404	405	400	400	402
Travel Distance (km)	6016	6040	5893	6031	5990	5994
Travel Time (hr)	616.9	549.8	606.9	542.3	479.0	559.0
Total Delay (hr)	499.2	431.9	491.5	424.7	361.6	441.8
Total Stops	11757	11281	11403	11892	11458	11559
Fuel Used (l)	913.9	855.1	895.1	849.8	789.3	860.6

Queuing and Blocking Report

19225 | 1294 Kingston Rd  
2028 FT PM: Option 4 N-S Prot Left

Intersection: 1: Glenanna Rd & Kingston Rd

Movement	EB	EB	EB	EB	WB	WB	WB	WB	WB	WB	NB	NB	NB	NB	SB	SB
Directions Served	L	T	R	T	L	T	R	T	L	T	L	T	R	T	R	L
Maximum Queue (m)	25.5	129.4	139.0	67.8	40.4	80.5	71.4	30.7	32.7	82.5	32.5	82.5	32.5	34.8		
Average Queue (m)	4.7	44.8	49.9	15.4	25.7	36.9	28.6	11.3	20.4	38.8	23.9	27.0	23.9	27.0		
95th Queue (m)	18.4	93.9	101.8	47.6	44.2	65.2	56.5	28.3	36.0	75.0	38.5	38.5	38.5	40.8		
Link Distance (m)	383.4 383.4															
Upstream Blk Time (%)	534.5 534.5															
Queuing Penalty (veh)	182.2															
Storage Bay Dist (m)	42.6															
Storage Blk Time (%)	11 7 0 6 9 9 9 9 9 9 0 5 15 7 18															
Queuing Penalty (veh)	3 11 0 18 14 12 0 18 46 21 42															

Intersection: 1: Glenanna Rd & Kingston Rd

Movement	SB	SB
Directions Served	T	R
Maximum Queue (m)	107.1	24.0
Average Queue (m)	45.5	8.1
95th Queue (m)	89.1	22.8
Link Distance (m)	410.7	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)	16.5	
Storage Blk Time (%)	24 0	
Queuing Penalty (veh)	51 1	

Arterial Level of Service

19225 | 1294 Kingston Rd  
2028 FT PM: Option 4 N-S Prot Left

Arterial Level of Service: NB Liverpool Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (km)	Arterial Speed	Run 1 Speed	Run 1 Delay
Kingston Rd	2	180.8	642.6	0.3	5	4	196.8
South Dwy	3	11.7	16.3	0.1	13	13	11.7
Main Plaza Dwy	4	38.5	47.7	0.1	8	8	39.8
Glenanna Rd	6	12.8	26.5	0.2	26	26	13.2
Total		243.7	733.2	0.6	8	7	261.5

Arterial Level of Service: SB Liverpool Rd

Cross Street	Run 2 Speed	Run 2 Delay	Run 3 Speed	Run 3 Delay	Run 4 Speed	Run 4 Delay	Run 5 Speed
Kingston Rd	5	179.1	5	193.0	5	170.7	5
South Dwy	12	13.3	13	12.4	15	9.4	13
Main Plaza Dwy	8	42.4	8	41.5	10	31.2	8
Glenanna Rd	25	13.8	26	12.6	26	13.0	28
Total	8	248.6	7	259.5	8	224.4	8

Arterial Level of Service: SB Liverpool Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (km)	Arterial Speed	Run 1 Speed	Run 1 Delay
Glenanna Rd	6	6.6	42.4	0.5	43	44	5.4
North Dwy	4	23.6	35.1	0.2	20	20	23.1
South Dwy	3	3.4	11.9	0.1	32	31	3.8
Kingston Rd	2	38.9	42.5	0.1	5	5	39.7
Total		72.5	131.9	0.9	23	24	72.0

Arterial Level of Service: SB Liverpool Rd

Cross Street	Run 2 Speed	Run 2 Delay	Run 3 Speed	Run 3 Delay	Run 4 Speed	Run 4 Delay	Run 5 Speed
Glenanna Rd	42	7.7	42	7.1	42	6.7	44
North Dwy	19	24.1	19	25.4	21	21.4	19
South Dwy	32	3.2	31	3.6	32	3.3	33
Kingston Rd	5	36.8	5	36.2	5	40.4	5
Total	24	71.8	23	72.3	24	71.8	23



Queuing and Blocking Report

19225 | 1294 Kingston Rd  
2028 FT PM: Option 4 N-S Prot Left

Intersection: 4: Liverpool Rd & North Dwy/Main Plaza Dwy

Movement	EB	EB	TR	TR	WB	WB	L	TR	NB	NB	TR	TR	SB	SB	TR	TR
Directions Served	L	TR	L	TR	L	TR	L	TR	L	TR	L	TR	L	TR	L	TR
Maximum Queue (m)	23.3	27.0	44.9	41.5	37.4	84.9	85.4	37.3	62.6	67.0						
Average Queue (m)	8.5	10.8	22.2	20.2	20.7	73.7	75.8	13.2	29.5	35.8						
95th Queue (m)	19.8	22.6	39.9	36.8	44.1	94.1	93.9	33.1	52.3	59.5						
Link Distance (m)	44.7	44.7	44.4	44.4	44.4	75.1	75.1	152.3	152.3	152.3						
Upstream Blk Time (%)	0	1	0	0	0	16	18									
Queuing Penalty (veh)	0	0	0	0	0	99	116									
Storage Bay Dist (m)					30.0			30.0								
Storage Blk Time (%)					1	47	0	8								
Queuing Penalty (veh)					3	47	1	6								

Intersection: 6: Liverpool Rd & Glenanna Rd

Movement	EB	EB	TR	TR	WB	WB	L	TR	NB	NB	TR	TR	SB	SB	TR	TR
Directions Served	L	TR	L	TR	L	TR	L	TR	L	TR	L	TR	L	TR	L	TR
Maximum Queue (m)	29.3	39.2	21.3	31.6	86.6	31.8	77.5	71.3	25.4	34.0	27.7					
Average Queue (m)	10.6	16.2	10.7	14.3	40.4	27.5	36.1	32.4	9.9	13.0	10.5					
95th Queue (m)	24.9	32.8	17.8	31.7	72.9	37.4	77.5	64.2	20.9	26.2	23.2					
Link Distance (m)	117.4	117.4		410.7	152.3	152.3	491.4	491.4								
Upstream Blk Time (%)																
Queuing Penalty (veh)																
Storage Bay Dist (m)	22.0			24.3	24.4	46.2										
Storage Blk Time (%)	2	7		2	27	18	4									
Queuing Penalty (veh)	2	3		3	15	56	12									

Network Summary

Network wide Queuing Penalty: 1765

Queuing and Blocking Report

19225 | 1294 Kingston Rd  
2028 FT PM: Option 4 N-S Prot Left

Intersection: 2: Liverpool Rd & Kingston Rd

Movement	EB	EB	TR	TR	WB	WB	L	TR	NB	NB	TR	TR	SB	SB	TR	TR
Directions Served	L	TR	L	TR	L	TR	L	TR	L	TR	L	TR	L	TR	L	TR
Maximum Queue (m)	41.0	682.3	683.0	56.6	88.5	97.8	88.7	68.0	53.6	257.9	256.4	59.3				
Average Queue (m)	36.8	563.4	565.6	48.8	46.9	47.9	48.5	3.5	50.5	249.6	249.0	52.9				
95th Queue (m)	50.1	786.2	786.6	80.4	85.7	83.6	72.9	27.0	65.9	254.0	255.0	80.1				
Link Distance (m)	667.7	667.7		383.4	383.4	244.1	244.1									
Upstream Blk Time (%)	32	36														
Queuing Penalty (veh)	0	0														
Storage Bay Dist (m)	33.5			49.1	103.2	61.6	46.2									
Storage Blk Time (%)	27	51	56	0	3	2	0	17	63	66	1					
Queuing Penalty (veh)	142	125	185	2	9	2	0	79	190	184	3					

Intersection: 2: Liverpool Rd & Kingston Rd

Movement	SB	SB	TR	TR	WB	WB	L	TR	NB	NB	TR	TR	SB	SB	TR	TR
Directions Served	L	TR	L	TR	L	TR	L	TR	L	TR	L	TR	L	TR	L	TR
Maximum Queue (m)	30.2	41.9	34.4	35.6												
Average Queue (m)	20.8	24.0	23.1	23.3												
95th Queue (m)	34.4	39.0	35.4	37.1												
Link Distance (m)	30.4	30.4	30.4	30.4												
Upstream Blk Time (%)	4	6	4	4												
Queuing Penalty (veh)	0	11	8	7												
Storage Bay Dist (m)	30.9															
Storage Blk Time (%)	4	6														
Queuing Penalty (veh)	5	7														

Intersection: 3: Liverpool Rd & South Dwy

Movement	EB	NB	NB	TR	TR	WB	WB	L	TR	SB	SB	TR	TR
Directions Served	R	T	T	T	T								
Maximum Queue (m)	12.6	41.9	46.1	23.0	19.7								
Average Queue (m)	4.7	30.7	32.2	3.0	1.8								
95th Queue (m)	11.6	46.4	48.7	13.3	10.1								
Link Distance (m)	9.5	30.4	30.4	75.1	75.1								
Upstream Blk Time (%)	2	14	18										
Queuing Penalty (veh)	0	91	115										
Storage Bay Dist (m)													
Storage Blk Time (%)													
Queuing Penalty (veh)													

Actuated Signals, Observed Splits

19225 | 1294 Kingston Rd  
2028 FT PM: Option 4 N-S Prot Left

Intersection: 4: Liverpool Rd & North Dwy/Main Plaza Dwy

Phase	2	4	6	8	9	10
Movement(s) Served	NBT	EBTL	SBTL	WBTL	NBL	SBL
Maximum Green (s)	19.1	18.1	19.1	18.1	6.0	6.0
Minimum Green (s)	5.0	5.0	5.0	5.0	5.0	5.0
Recall	C-Min	None	Min	None	None	None
Avg. Green (s)	32.3	8.5	32.3	13.9	9.3	9.3
g/C Ratio	NA	-0.01	NA	NA	-0.01	-0.01
Cycles Skipped (%)	0	11	0	0	9	14
Cycles @ Minimum (%)	0	0	0	0	0	0
Cycles Maxed Out (%)	100	0	97	0	6	9
Cycles with Peds (%)	39	3	17	0	0	0
<b>Controller Summary</b>						
Average Cycle Length (s):	NA					
Number of Complete Cycles:	0					

Intersection: 6: Liverpool Rd & Glenanna Rd

Phase	2	4	6	8
Movement(s) Served	NBTL	EBTL	SBTL	WBTL
Maximum Green (s)	57.3	30.1	57.3	30.1
Minimum Green (s)	5.0	8.0	5.0	8.0
Recall	C-Min	None	C-Min	None
Avg. Green (s)	65.6	19.3	65.6	19.3
g/C Ratio	NA	NA	NA	NA
Cycles Skipped (%)	0	0	0	0
Cycles @ Minimum (%)	0	8	0	8
Cycles Maxed Out (%)	100	3	100	3
Cycles with Peds (%)	28	0	0	0
<b>Controller Summary</b>				
Average Cycle Length (s):	NA			
Number of Complete Cycles:	0			

Actuated Signals, Observed Splits

19225 | 1294 Kingston Rd  
2028 FT PM: Option 4 N-S Prot Left

Intersection: 1: Glenanna Rd & Kingston Rd

Phase	1	2	3	4	5	6	8
Movement(s) Served	SBL	NBTL	WBL	EBTL	NBL	SBTL	WBTL
Maximum Green (s)	6.0	36.0	6.0	32.6	6.0	36.0	41.6
Minimum Green (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Recall	None	C-Min	None	None	None	C-Min	None
Avg. Green (s)	7.1	26.8	10.1	38.9	6.9	28.4	50.2
g/C Ratio	-0.01	NA	-0.01	NA	-0.01	NA	NA
Cycles Skipped (%)	6	0	14	0	17	0	0
Cycles @ Minimum (%)	0	0	0	0	0	0	0
Cycles Maxed Out (%)	72	100	14	64	60	100	64
Cycles with Peds (%)	0	77	0	72	0	89	53
<b>Controller Summary</b>							
Average Cycle Length (s):	NA						
Number of Complete Cycles:	0						

Intersection: 2: Liverpool Rd & Kingston Rd

Phase	1	2	3	4	5	6	7	8
Movement(s) Served	SBL	NBTL	WBL	EBTL	NBL	SBTL	EBL	WBTL
Maximum Green (s)	5.0	30.1	10.4	34.2	14.0	21.1	13.0	31.6
Minimum Green (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Recall	None	C-Min	None	Min	None	C-Min	None	Min
Avg. Green (s)	5.2	30.8	10.2	34.1	12.9	23.8	12.6	32.1
g/C Ratio	-0.01	NA	NA	NA	-0.01	NA	NA	NA
Cycles Skipped (%)	6	0	0	0	11	0	0	0
Cycles @ Minimum (%)	89	0	0	0	0	0	0	0
Cycles Maxed Out (%)	91	100	91	92	54	100	82	92
Cycles with Peds (%)	0	75	0	58	0	58	0	47
<b>Controller Summary</b>								
Average Cycle Length (s):	NA							
Number of Complete Cycles:	0							



**Future Total Traffic - Option 4A**

**Weekday AM Peak Hour**

Arterial Level of Service: EB Kingston Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (km)	Arterial Speed	Run 1 Speed	Run 1 Delay	Run 1 Speed	Run 1 Delay
Liverpool Rd	2	35.8	75.2	0.7	33	33	33	33	36.0
Glenanna Rd	1	27.4	50.9	0.4	30	29	27.9	29	27.9
<b>Total</b>		<b>63.2</b>	<b>126.0</b>	<b>1.1</b>	<b>32</b>	<b>31</b>	<b>63.9</b>	<b>31</b>	<b>63.9</b>

Arterial Level of Service: WB Kingston Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (km)	Arterial Speed	Run 1 Speed	Run 1 Delay	Run 1 Speed	Run 1 Delay
Liverpool Rd	33	35.2	34	35.2	33	33	37.4	34	34
Glenanna Rd	28	30.0	28	29.6	32	23.6	31	31	31
<b>Total</b>	<b>31</b>	<b>65.2</b>	<b>31</b>	<b>64.9</b>	<b>32</b>	<b>61.0</b>	<b>33</b>	<b>33</b>	<b>33</b>

Arterial Level of Service: WB Kingston Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (km)	Arterial Speed	Run 1 Speed	Run 1 Delay	Run 1 Speed	Run 1 Delay
Glenanna Rd	1	27.3	59.4	0.5	33	33	27.8	33	27.8
Liverpool Rd	2	47.0	70.2	0.4	21	22	46.2	22	46.2
<b>Total</b>		<b>74.3</b>	<b>129.6</b>	<b>1.0</b>	<b>27</b>	<b>27</b>	<b>74.0</b>	<b>27</b>	<b>74.0</b>

Arterial Level of Service: WB Kingston Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (km)	Arterial Speed	Run 1 Speed	Run 1 Delay	Run 1 Speed	Run 1 Delay
Liverpool Rd	21	48.9	22	46.1	22	45.5	21	21	21
<b>Total</b>	<b>26</b>	<b>75.6</b>	<b>27</b>	<b>73.3</b>	<b>27</b>	<b>72.5</b>	<b>27</b>	<b>27</b>	<b>27</b>

Summary of All Intervals

Run Number	1	2	3	4	5	Avg
Start Time	7:45	7:45	7:45	7:45	7:45	7:45
End Time	9:00	9:00	9:00	9:00	9:00	9:00
Total Time (min)	75	75	75	75	75	75
Time Recorded (min)	60	60	60	60	60	60
# of Intervals	2	2	2	2	2	2
# of Recorded Intervals	1	1	1	1	1	1
Vehs Entered	4206	4320	4172	4179	4145	4207
Vehs Exited	4193	4305	4147	4174	4201	4204
Starting Vehs	124	131	120	140	170	133
Ending Vehs	137	146	145	145	114	135
Travel Distance (km)	4503	4638	4464	4484	4556	4529
Travel Time (hr)	144.1	150.9	143.4	142.9	147.9	145.9
Total Delay (hr)	54.2	58.6	54.5	53.3	57.1	55.5
Total Stops	5416	5609	5464	5336	5513	5467
Fuel Used (l)	406.9	422.9	403.3	404.8	412.4	410.1

Interval #0 Information Seeding

Start Time	7:45
End Time	8:00
Total Time (min)	15
Volumes adjusted by Growth Factors.	
No data recorded this interval.	

Interval #1 Information Recording

Start Time	8:00
End Time	9:00
Total Time (min)	60
Volumes adjusted by Growth Factors.	

Run Number	1	2	3	4	5	Avg
Vehs Entered	4206	4320	4172	4179	4145	4207
Vehs Exited	4193	4305	4147	4174	4201	4204
Starting Vehs	124	131	120	140	170	133
Ending Vehs	137	146	145	145	114	135
Travel Distance (km)	4503	4638	4464	4484	4556	4529
Travel Time (hr)	144.1	150.9	143.4	142.9	147.9	145.9
Total Delay (hr)	54.2	58.6	54.5	53.3	57.1	55.5
Total Stops	5416	5609	5464	5336	5513	5467
Fuel Used (l)	406.9	422.9	403.3	404.8	412.4	410.1

Queuing and Blocking Report

19225 | 1294 Kingston Rd  
2028 FT AM: Option 4A North Dwy+Plaza Shifted

Intersection: 1: Glenanna Rd & Kingston Rd

Movement	EB	EB	EB	EB	WB	WB	WB	WB	WB	WB	NB	NB	NB	NB	SB
Directions Served	L	T	R	T	R	L	T	R	L	T	R	L	T	R	L
Maximum Queue (m)	15.5	72.2	81.4	61.8	40.4	85.1	80.0	30.7	21.4	32.6	26.8	34.3			
Average Queue (m)	1.9	24.2	28.6	15.6	22.0	45.9	38.9	13.0	7.6	8.9	5.9	18.3			
95th Queue (m)	9.7	53.9	59.3	42.0	43.6	72.0	68.8	30.9	16.6	22.9	16.0	33.1			
Link Distance (m)	383.4 383.4 534.5 534.5 182.2														
Upstream Blk Time (%)															
Queueing Penalty (veh)															
Storage Bay Dist (m)	42.6 60.4 33.0 23.2 25.4 25.0 27.3														
Storage Blk Time (%)	4 1 0 1 20 17 0 0 1 0 3														
Queueing Penalty (veh)	0 1 0 0 2 20 21 0 0 1 0 4														

Intersection: 1: Glenanna Rd & Kingston Rd

Movement	SB	SB
Directions Served	T	R
Maximum Queue (m)	56.4	17.3
Average Queue (m)	14.1	3.2
95th Queue (m)	37.7	12.3
Link Distance (m)	410.7	
Upstream Blk Time (%)		
Queueing Penalty (veh)		
Storage Bay Dist (m)	16.5	
Storage Blk Time (%)	3 0	
Queueing Penalty (veh)	7 0	

Arterial Level of Service

19225 | 1294 Kingston Rd  
2028 FT AM: Option 4A North Dwy+Plaza Shifted

Arterial Level of Service: NB Liverpool Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (km)	Arterial Speed	Run 1 Speed	Run 1 Delay
Kingston Rd	2	18.5	37.0	0.3	26	26	18.7
South Dwy	3	1.8	6.5	0.1	33	33	1.8
Main Plaza Dwy	4	7.1	14.8	0.1	26	24	7.9
Glenanna Rd	6	6.3	19.8	0.2	35	35	6.3
Total		33.7	78.1	0.6	29	29	34.7

Arterial Level of Service: SB Liverpool Rd

Cross Street	Run 2 Speed	Run 2 Delay	Run 3 Speed	Run 3 Delay	Run 4 Speed	Run 4 Delay	Run 5 Speed
Kingston Rd	27	17.1	26	18.1	26	18.5	28
South Dwy	34	1.7	33	1.8	33	1.7	33
Main Plaza Dwy	27	6.4	26	7.1	26	7.0	26
Glenanna Rd	36	5.6	33	7.1	36	5.6	34
Total	30	30.8	29	34.2	29	32.8	28

Arterial Level of Service: SB Liverpool Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (km)	Arterial Speed	Run 1 Speed	Run 1 Delay
Glenanna Rd	6	8.4	44.0	0.5	41	40	9.4
North Dwy	4	8.2	21.7	0.2	32	34	6.7
South Dwy	3	6.3	14.3	0.1	27	30	4.7
Kingston Rd	2	24.9	28.6	0.1	8	8	23.3
Total		47.9	108.6	0.9	29	30	44.1

Arterial Level of Service: SB Liverpool Rd

Cross Street	Run 2 Speed	Run 2 Delay	Run 3 Speed	Run 3 Delay	Run 4 Speed	Run 4 Delay	Run 5 Speed
Glenanna Rd	41	8.3	42	7.9	41	8.6	42
North Dwy	31	8.6	31	8.7	32	7.9	30
South Dwy	24	8.1	26	6.7	30	4.7	25
Kingston Rd	7	26.9	8	23.8	8	24.0	7
Total	28	51.8	29	47.1	29	45.1	28

Queuing and Blocking Report

19225 | 1294 Kingston Rd  
2028 FT AM: Option 4A North Dwy+Plaza Shifted

Intersection: 4: Liverpool Rd & North Dwy/Main Plaza Dwy

Movement	EB	EB	WB	WB	NB	NB	TR	TR	SB	SB	SB	TR	TR
Directions Served	L	TR	L	TR	L	TR	L	TR	L	TR	L	TR	TR
Maximum Queue (m)	22.8	20.5	31.8	20.7	29.6	49.0	52.4	32.9	42.6	46.2	51.0	51.0	51.0
Average Queue (m)	8.6	8.6	13.8	8.8	7.1	19.0	21.1	12.0	19.4	25.5	25.5	25.5	25.5
95th Queue (m)	18.6	17.7	24.7	18.5	18.8	38.3	41.1	22.7	36.1	41.6	41.6	41.6	41.6
Link Distance (m)	49.0	49.0	76.2	76.2	90.6	90.6	90.6	165.9	165.9	165.9	165.9	165.9	165.9
Upstream Blk Time (%)													
Queuing Penalty (veh)						30.0							
Storage Bay Dist (m)					0	1	0	1	0	1	0	1	0
Storage Blk Time (%)					0	0	0	1	1	1	1	1	1
Queuing Penalty (veh)					0	0	0	1	1	1	1	1	1

Intersection: 6: Liverpool Rd & Glenanna Rd

Movement	EB	EB	WB	WB	NB	NB	TR	TR	SB	SB	SB	TR	TR
Directions Served	L	T	R	L	TR	L	TR	L	TR	L	TR	L	TR
Maximum Queue (m)	29.2	54.6	37.9	31.0	52.8	27.7	24.2	34.4	22.6	45.3	44.8	44.8	44.8
Average Queue (m)	11.0	23.6	20.1	15.1	21.9	12.4	7.5	11.4	8.2	24.5	21.2	21.2	21.2
95th Queue (m)	25.4	44.5	32.2	29.9	43.9	23.6	18.2	25.8	17.1	39.8	38.3	38.3	38.3
Link Distance (m)	117.3	117.3	410.7	410.7	165.9	165.9	165.9	491.4	491.4	491.4	491.4	491.4	491.4
Upstream Blk Time (%)													
Queuing Penalty (veh)													
Storage Bay Dist (m)					24.3	24.4			46.2				
Storage Blk Time (%)					2	15	1	5	1	0	0	0	0
Queuing Penalty (veh)					3	7	1	4	2	0	0	0	0

Network Summary

Network wide Queuing Penalty: 281

Queuing and Blocking Report

19225 | 1294 Kingston Rd  
2028 FT AM: Option 4A North Dwy+Plaza Shifted

Intersection: 2: Liverpool Rd & Kingston Rd

Movement	EB	EB	WB	WB	NB	NB	TR	TR	SB	SB	SB	TR	TR
Directions Served	L	T	R	L	TR	L	TR	L	TR	L	TR	L	TR
Maximum Queue (m)	40.8	58.4	70.9	56.5	59.5	73.2	76.4	55.2	50.1	56.0	47.0	47.0	47.0
Average Queue (m)	14.9	29.6	32.8	4.9	30.9	46.2	49.5	3.2	25.1	23.7	19.8	19.8	19.8
95th Queue (m)	34.1	49.3	55.5	30.5	53.3	67.2	69.1	26.7	45.2	45.8	39.2	39.2	39.2
Link Distance (m)	667.7	667.7	383.4	383.4	383.4	383.4	383.4	244.1	244.1	244.1	244.1	244.1	244.1
Upstream Blk Time (%)													
Queuing Penalty (veh)													
Storage Bay Dist (m)					33.5	49.1	103.2		61.6	46.2			
Storage Blk Time (%)					1	5	1	0	3	0	1	0	0
Queuing Penalty (veh)					1	5	4	0	1	0	3	0	0

Intersection: 2: Liverpool Rd & Kingston Rd

Movement	SB	SB	SB	SB	TR	TR
Directions Served	L	T	T	TR		
Maximum Queue (m)	30.0	38.2	42.0	41.0		
Average Queue (m)	11.4	30.1	30.5	31.6		
95th Queue (m)	27.0	37.0	39.1	41.3		
Link Distance (m)	30.4	30.4	30.4	30.4		
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (m)						
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 3: Liverpool Rd & South Dwy

Movement	EB	NB	SB	SB	TR	TR
Directions Served	R	T	T	T		
Maximum Queue (m)	12.4	21.9	62.9	70.1		
Average Queue (m)	5.2	1.9	20.4	20.4		
95th Queue (m)	11.7	11.1	48.1	52.8		
Link Distance (m)	9.4	30.4	90.6	90.6		
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (m)						
Storage Blk Time (%)						
Queuing Penalty (veh)						

Actuated Signals, Observed Splits

19225 | 1294 Kingston Rd  
2028 FT AM: Option 4A North Dwy+Plaza Shifted

Intersection: 4: Liverpool Rd & North Dwy/Main Plaza Dwy

Phase	2	4	6	8
Movement(s) Served	NBTL	EBTL	SBTL	WBTL
Maximum Green (s)	59.1	27.1	59.1	27.1
Minimum Green (s)	5.0	5.0	5.0	5.0
Recall	C-Min	None	Min	None
Avg. Green (s)	26.6	8.9	26.6	8.9
g/C Ratio	NA	NA	NA	NA
Cycles Skipped (%)	0	0	0	0
Cycles @ Minimum (%)	0	0	0	0
Cycles Maxed Out (%)	100	0	1	0
Cycles with Peds (%)	17	0	7	0
<b>Controller Summary</b>				
Average Cycle Length (s):	NA			
Number of Complete Cycles:	0			

Intersection: 6: Liverpool Rd & Glenanna Rd

Phase	2	4	6	8
Movement(s) Served	NBTL	EBTL	SBTL	WBTL
Maximum Green (s)	57.3	30.1	57.3	30.1
Minimum Green (s)	5.0	8.0	5.0	8.0
Recall	C-Min	None	C-Min	None
Avg. Green (s)	49.3	17.6	49.3	17.6
g/C Ratio	NA	NA	NA	NA
Cycles Skipped (%)	0	0	0	0
Cycles @ Minimum (%)	0	2	0	2
Cycles Maxed Out (%)	100	0	100	0
Cycles with Peds (%)	20	0	0	0
<b>Controller Summary</b>				
Average Cycle Length (s):	NA			
Number of Complete Cycles:	0			

Actuated Signals, Observed Splits

19225 | 1294 Kingston Rd  
2028 FT AM: Option 4A North Dwy+Plaza Shifted

Intersection: 1: Glenanna Rd & Kingston Rd

Phase	1	2	3	4	5	6	8
Movement(s) Served	SBL	NBTL	WBL	EBTL	NBL	SBTL	WBTL
Maximum Green (s)	6.0	36.0	6.0	32.6	6.0	36.0	41.6
Minimum Green (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Recall	None	C-Min	None	None	None	C-Min	None
Avg. Green (s)	11.3	41.9	8.8	25.4	6.9	48.3	33.5
g/C Ratio	-0.01	NA	-0.01	NA	-0.01	NA	NA
Cycles Skipped (%)	17	0	23	0	46	0	0
Cycles @ Minimum (%)	0	0	0	0	0	0	0
Cycles Maxed Out (%)	3	100	0	0	0	100	0
Cycles with Peds (%)	0	71	0	77	0	91	56
<b>Controller Summary</b>							
Average Cycle Length (s):	NA						
Number of Complete Cycles:	0						

Intersection: 2: Liverpool Rd & Kingston Rd

Phase	1	2	3	4	5	6	7	8
Movement(s) Served	SBL	NBTL	WBL	EBTL	NBL	SBTL	EBL	WBTL
Maximum Green (s)	5.0	30.1	10.4	34.2	14.0	21.1	13.0	31.6
Minimum Green (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Recall	None	C-Min	None	Min	None	C-Min	None	Min
Avg. Green (s)	7.5	43.8	12.3	20.9	13.2	34.2	8.8	26.3
g/C Ratio	-0.01	NA	NA	NA	-0.01	NA	-0.01	NA
Cycles Skipped (%)	40	0	0	0	10	0	17	0
Cycles @ Minimum (%)	0	0	0	0	0	0	0	0
Cycles Maxed Out (%)	0	100	38	0	3	100	6	0
Cycles with Peds (%)	0	72	0	56	0	56	0	46
<b>Controller Summary</b>								
Average Cycle Length (s):	NA							
Number of Complete Cycles:	0							



## **Weekday PM Peak Hour**

Arterial Level of Service

19225 | 1294 Kingston Rd  
2028 FT PM: Option 4A North Dwy+Plaza Shifted

Arterial Level of Service: EB Kingston Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (km)	Arterial Speed	Run 1 Speed	Run 1 Delay	Run 1 Speed	Run 1 Delay
Liverpool Rd	2	196.9	242.1	0.7	11	9	246.3	9	246.3
Glenanna Rd	1	20.8	45.7	0.4	33	35	18.5	35	18.5
<b>Total</b>		<b>217.7</b>	<b>287.8</b>	<b>1.1</b>	<b>14</b>	<b>12</b>	<b>264.8</b>	<b>12</b>	<b>264.8</b>

Arterial Level of Service: WB Kingston Rd

Cross Street	Node	Speed	Run 2 Delay	Run 2 Speed	Run 3 Delay	Run 3 Speed	Run 4 Delay	Run 4 Speed	Run 5 Delay	Run 5 Speed
Liverpool Rd	10	205.1	12	167.0	10	220.2	14	220.2	14	220.2
Glenanna Rd	37	16.1	35	18.5	26	32.8	34	32.8	34	32.8
<b>Total</b>	<b>14</b>	<b>221.3</b>	<b>16</b>	<b>185.4</b>	<b>13</b>	<b>253.0</b>	<b>18</b>	<b>253.0</b>	<b>18</b>	<b>253.0</b>

Arterial Level of Service: WB Kingston Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (km)	Arterial Speed	Run 1 Speed	Run 1 Delay	Run 1 Speed	Run 1 Delay
Glenanna Rd	1	16.4	48.9	0.5	41	42	15.2	42	15.2
Liverpool Rd	2	42.5	65.4	0.4	23	23	43.1	23	43.1
<b>Total</b>		<b>58.9</b>	<b>114.2</b>	<b>1.0</b>	<b>31</b>	<b>31</b>	<b>58.3</b>	<b>31</b>	<b>58.3</b>

Arterial Level of Service: WB Kingston Rd

Cross Street	Node	Speed	Run 2 Delay	Run 2 Speed	Run 3 Delay	Run 3 Speed	Run 4 Delay	Run 4 Speed	Run 5 Delay	Run 5 Speed
Glenanna Rd	41	16.1	42	15.4	40	17.6	39	17.6	39	17.6
Liverpool Rd	23	41.8	24	40.2	22	44.6	23	44.6	23	44.6
<b>Total</b>	<b>31</b>	<b>57.9</b>	<b>31</b>	<b>55.7</b>	<b>30</b>	<b>62.1</b>	<b>30</b>	<b>62.1</b>	<b>30</b>	<b>62.1</b>

SimTraffic Simulation Summary

19225 | 1294 Kingston Rd  
2028 FT PM: Option 4A North Dwy+Plaza Shifted

Summary of All Intervals

Run Number	1	2	3	4	5	Avg
Start Time	4:45	4:45	4:45	4:45	4:45	4:45
End Time	6:00	6:00	6:00	6:00	6:00	6:00
Total Time (min)	75	75	75	75	75	75
Time Recorded (min)	60	60	60	60	60	60
# of Intervals	2	2	2	2	2	2
# of Recorded Intervals	1	1	1	1	1	1
Vehs Entered	5779	5773	5813	5699	5870	5787
Vehs Exited	5710	5631	5731	5641	5745	5691
Starting Vehs	282	236	249	255	206	244
Ending Vehs	351	378	331	313	331	339
Travel Distance (km)	6320	6258	6356	6225	6365	6305
Travel Time (hr)	340.8	312.0	279.7	309.3	270.8	302.5
Total Delay (hr)	217.0	189.9	155.4	187.1	146.2	179.1
Total Stops	10570	10003	10234	10384	10195	10277
Fuel Used (l)	688.7	660.0	639.1	654.8	632.3	655.0

Interval #0 Information Seeding

Start Time 4:45  
End Time 5:00  
Total Time (min) 15  
Volumes adjusted by Growth Factors.  
No data recorded this interval.

Interval #1 Information Recording

Start Time 5:00  
End Time 6:00  
Total Time (min) 60  
Volumes adjusted by Growth Factors.

Run Number	1	2	3	4	5	Avg
Vehs Entered	5779	5773	5813	5699	5870	5787
Vehs Exited	5710	5631	5731	5641	5745	5691
Starting Vehs	282	236	249	255	206	244
Ending Vehs	351	378	331	313	331	339
Travel Distance (km)	6320	6258	6356	6225	6365	6305
Travel Time (hr)	340.8	312.0	279.7	309.3	270.8	302.5
Total Delay (hr)	217.0	189.9	155.4	187.1	146.2	179.1
Total Stops	10570	10003	10234	10384	10195	10277
Fuel Used (l)	688.7	660.0	639.1	654.8	632.3	655.0

Queuing and Blocking Report

19225 | 1294 Kingston Rd  
2028 FT PM: Option 4A North Dwy+Plaza Shifted

Intersection: 1: Glenanna Rd & Kingston Rd

Movement	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB	NB	NB	SB
Directions Served	L	T	R	T	L	T	R	L	T	L	T	R	L	SB
Maximum Queue (m)	25.3	112.5	117.0	67.8	40.4	79.7	67.9	30.7	32.7	114.0	32.5	32.5	34.8	L
Average Queue (m)	4.0	46.1	52.4	18.5	26.4	35.7	28.0	12.5	19.3	40.6	23.6	23.6	27.6	L
95th Queue (m)	16.4	95.9	104.5	51.5	43.7	63.4	54.6	29.4	35.0	90.0	37.8	37.8	41.3	L
Link Distance (m)	383.4													383.4
Upstream Blk Time (%)	534.5													534.5
Queueing Penalty (veh)	0													0
Storage Bay Dist (m)	42.6													42.6
Storage Blk Time (%)	10													10
Queueing Penalty (veh)	2													2

Intersection: 1: Glenanna Rd & Kingston Rd

Movement	SB	SB
Directions Served	T	R
Maximum Queue (m)	106.1	24.0
Average Queue (m)	46.7	8.8
95th Queue (m)	90.0	23.7
Link Distance (m)	410.7	
Upstream Blk Time (%)		
Queueing Penalty (veh)		
Storage Bay Dist (m)	16.5	
Storage Blk Time (%)	25	
Queueing Penalty (veh)	53	

Arterial Level of Service

19225 | 1294 Kingston Rd  
2028 FT PM: Option 4A North Dwy+Plaza Shifted

Arterial Level of Service: NB Liverpool Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (km)	Arterial Speed	Run 1 Speed	Run 1 Delay
Kingston Rd	2	57.7	77.3	0.3	13	10	73.5
South Dwy	3	3.0	7.7	0.1	28	28	2.9
Main Plaza Dwy	4	9.6	17.2	0.1	22	22	9.6
Glenanna Rd	6	9.7	23.4	0.2	29	31	8.9
Total		80.0	125.5	0.6	18	16	95.0

Arterial Level of Service: NB Liverpool Rd

Cross Street	Run 2 Speed	Run 2 Delay	Run 3 Speed	Run 3 Delay	Run 4 Speed	Run 4 Delay	Run 5 Speed
Kingston Rd	12	65.3	15	47.4	14	51.8	14
South Dwy	28	2.9	28	2.8	28	3.1	27
Main Plaza Dwy	23	8.9	22	9.5	21	10.5	22
Glenanna Rd	31	8.6	30	9.5	27	11.7	29
Total	17	85.6	20	69.1	19	77.0	19

Arterial Level of Service: SB Liverpool Rd

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (km)	Arterial Speed	Run 1 Speed	Run 1 Delay
Glenanna Rd	6	6.4	41.9	0.5	43	44	6.6
North Dwy	4	6.7	20.1	0.2	34	35	6.7
South Dwy	3	2.2	10.1	0.1	38	38	2.3
Kingston Rd	2	31.0	34.7	0.1	6	6	32.3
Total		46.3	106.7	0.9	29	29	47.8

Arterial Level of Service: SB Liverpool Rd

Cross Street	Run 2 Speed	Run 2 Delay	Run 3 Speed	Run 3 Delay	Run 4 Speed	Run 4 Delay	Run 5 Speed
Glenanna Rd	44	6.0	44	5.6	43	6.7	42
North Dwy	34	6.6	34	7.0	35	6.0	34
South Dwy	38	2.2	38	2.1	37	2.5	38
Kingston Rd	6	32.2	6	29.9	6	31.4	7
Total	29	47.0	29	44.7	29	46.6	29

Queuing and Blocking Report

19225 | 1294 Kingston Rd  
2028 FT PM: Option 4A North Dwy+Plaza Shifted

Intersection: 4: Liverpool Rd & North Dwy/Main Plaza Dwy

Movement	EB	EB	WB	WB	NB	NB	TR	TR	SB	SB	SB	TR	TR
Directions Served	L	TR	L	TR	L	TR	L	TR	L	TR	L	TR	TR
Maximum Queue (m)	24.0	23.2	46.6	35.9	37.3	90.8	90.7	28.1	25.6	29.0			
Average Queue (m)	7.7	8.4	19.3	15.1	14.8	39.3	42.4	13.1	10.2	13.8			
95th Queue (m)	18.8	19.4	35.4	27.5	33.1	81.1	85.4	24.5	20.7	24.8			
Link Distance (m)	49.0	49.0	76.6	76.6	90.6	90.6	166.5	166.5	166.5	166.5			
Upstream Blk Time (%)					0	0							
Queuing Penalty (veh)					1	1							
Storage Bay Dist (m)			30.0			30.0							
Storage Blk Time (%)			0		6	0							
Queuing Penalty (veh)			1		6	1							

Intersection: 6: Liverpool Rd & Glenanna Rd

Movement	EB	EB	WB	WB	NB	NB	TR	TR	SB	SB	SB	TR	TR
Directions Served	L	T	R	L	TR	L	TR	L	TR	L	TR	L	TR
Maximum Queue (m)	27.6	42.9	16.5	31.6	98.7	31.8	89.0	68.3	23.8	29.8	30.1		
Average Queue (m)	11.1	15.4	10.5	14.5	37.5	25.9	32.3	28.9	9.9	12.2	11.0		
95th Queue (m)	24.4	32.6	16.9	32.4	74.4	36.9	77.6	60.2	21.0	24.3	24.2		
Link Distance (m)	117.3	117.3		410.7	166.5	166.5	491.4	491.4	491.4	491.4	491.4		
Upstream Blk Time (%)													
Queuing Penalty (veh)					2	2							
Storage Bay Dist (m)			24.3		24.4		46.2						
Storage Blk Time (%)			3		7		2						
Queuing Penalty (veh)			2		3		11						

Network Summary

Network wide Queuing Penalty: 1018

Queuing and Blocking Report

19225 | 1294 Kingston Rd  
2028 FT PM: Option 4A North Dwy+Plaza Shifted

Intersection: 2: Liverpool Rd & Kingston Rd

Movement	EB	EB	WB	WB	EB	EB	WB	WB	TR	TR	SB	SB	TR	TR
Directions Served	L	T	R	L	TR	L	TR	L	TR	L	TR	L	TR	TR
Maximum Queue (m)	41.0	603.1	609.3	56.6	87.4	90.6	92.6	54.5	53.6	232.7	209.2			
Average Queue (m)	37.4	408.0	409.4	50.4	47.6	48.4	49.3	3.9	50.0	134.5	115.5			
95th Queue (m)	50.5	683.9	683.9	79.1	93.2	88.4	77.9	29.7	64.8	224.8	210.8			
Link Distance (m)	667.7	667.7		383.4	383.4	383.4	383.4	244.1	244.1	244.1	244.1			
Upstream Blk Time (%)			10		12									
Queuing Penalty (veh)			0		0									
Storage Bay Dist (m)			33.5		49.1	103.2		61.6	46.2					
Storage Blk Time (%)			11		56	57		2	0	20	35			
Queuing Penalty (veh)			58		136	187		2	0	93	104			

Intersection: 2: Liverpool Rd & Kingston Rd

Movement	SB	SB	SB	SB	TR	TR
Directions Served	L	T	TR			
Maximum Queue (m)	31.0	36.9	32.8	34.4		
Average Queue (m)	17.2	19.8	18.3	17.8		
95th Queue (m)	30.4	35.0	30.6	31.7		
Link Distance (m)	30.4	30.4	30.4	30.4		
Upstream Blk Time (%)	3	3	1	1		
Queuing Penalty (veh)	0	6	2	2		
Storage Bay Dist (m)	30.9					
Storage Blk Time (%)	3	3				
Queuing Penalty (veh)	3	4				

Intersection: 3: Liverpool Rd & South Dwy

Movement	EB	NB	NB	SB	SB	SB	TR
Directions Served	R	T	T	T	T		
Maximum Queue (m)	11.1	19.5	30.6	18.6	11.1		
Average Queue (m)	4.1	1.3	4.5	1.3	0.6		
95th Queue (m)	10.6	9.0	19.0	8.9	5.1		
Link Distance (m)	9.4	30.4	30.4	90.6	90.6		
Upstream Blk Time (%)	2	0	0				
Queuing Penalty (veh)	0	0	1				
Storage Bay Dist (m)							
Storage Blk Time (%)							
Queuing Penalty (veh)							

Actuated Signals, Observed Splits

19225 | 1294 Kingston Rd  
2028 FT PM: Option 4A North Dwy+Plaza Shifted

Intersection: 4: Liverpool Rd & North Dwy/Main Plaza Dwy

Phase	2	4	6	8
Movement(s) Served	NBTL	EBTL	SBTL	WBTL
Maximum Green (s)	64.1	22.1	64.1	22.1
Minimum Green (s)	5.0	5.0	5.0	5.0
Recall	C-Min	None	Min	None
Avg. Green (s)	34.5	11.4	34.5	11.4
g/C Ratio	NA	NA	NA	NA
Cycles Skipped (%)	0	0	0	0
Cycles @ Minimum (%)	0	0	0	0
Cycles Maxed Out (%)	100	0	2	0
Cycles with Peds (%)	24	0	10	0
<b>Controller Summary</b>				
Average Cycle Length (s):	NA			
Number of Complete Cycles:	0			

Intersection: 6: Liverpool Rd & Glenanna Rd

Phase	2	4	6	8
Movement(s) Served	NBTL	EBTL	SBTL	WBTL
Maximum Green (s)	57.3	30.1	57.3	30.1
Minimum Green (s)	5.0	8.0	5.0	8.0
Recall	C-Min	None	C-Min	None
Avg. Green (s)	62.8	19.0	62.8	19.0
g/C Ratio	NA	NA	NA	NA
Cycles Skipped (%)	0	0	0	0
Cycles @ Minimum (%)	0	3	0	3
Cycles Maxed Out (%)	100	3	100	3
Cycles with Peds (%)	22	0	0	0
<b>Controller Summary</b>				
Average Cycle Length (s):	NA			
Number of Complete Cycles:	0			

Actuated Signals, Observed Splits

19225 | 1294 Kingston Rd  
2028 FT PM: Option 4A North Dwy+Plaza Shifted

Intersection: 1: Glenanna Rd & Kingston Rd

Phase	1	2	3	4	5	6	8
Movement(s) Served	SBL	NBTL	WBL	EBTL	NBL	SBTL	WBTL
Maximum Green (s)	6.0	36.0	6.0	32.6	6.0	36.0	41.6
Minimum Green (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Recall	None	C-Min	None	None	None	C-Min	None
Avg. Green (s)	6.6	27.0	10.1	38.9	6.3	28.2	50.6
g/C Ratio	-0.01	NA	-0.01	NA	-0.01	NA	NA
Cycles Skipped (%)	3	0	9	0	14	0	0
Cycles @ Minimum (%)	0	0	0	0	0	0	0
Cycles Maxed Out (%)	83	100	26	83	66	100	83
Cycles with Peds (%)	0	74	0	72	0	91	53
<b>Controller Summary</b>							
Average Cycle Length (s):	NA						
Number of Complete Cycles:	0						

Intersection: 2: Liverpool Rd & Kingston Rd

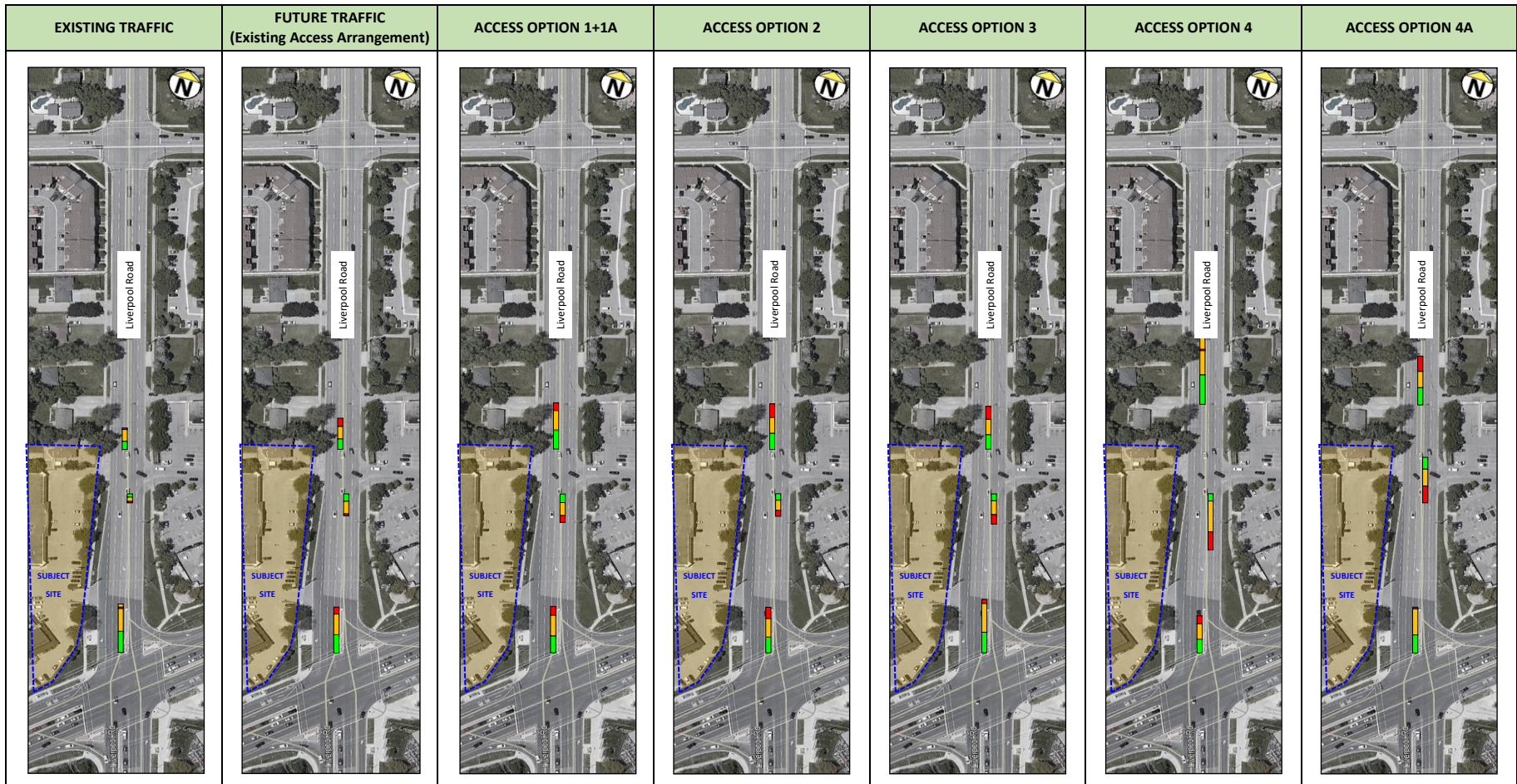
Phase	1	2	3	4	5	6	7	8
Movement(s) Served	SBL	NBTL	WBL	EBTL	NBL	SBTL	EBL	WBTL
Maximum Green (s)	5.0	30.1	10.4	34.2	14.0	21.1	13.0	31.6
Minimum Green (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Recall	None	C-Min	None	Min	None	C-Min	None	Min
Avg. Green (s)	5.1	31.1	10.4	34.3	13.5	21.5	11.5	33.5
g/C Ratio	-0.01	NA	NA	NA	NA	NA	NA	NA
Cycles Skipped (%)	11	0	0	0	0	0	0	0
Cycles @ Minimum (%)	86	0	0	0	0	0	0	0
Cycles Maxed Out (%)	86	100	89	94	81	100	50	94
Cycles with Peds (%)	0	75	0	61	0	50	0	50
<b>Controller Summary</b>								
Average Cycle Length (s):	NA							
Number of Complete Cycles:	0							



# APPENDIX D

Vehicle Queues

Figure D1: Projected Vehicle Queues - Weekday AM Peak Hour



**LEGEND**




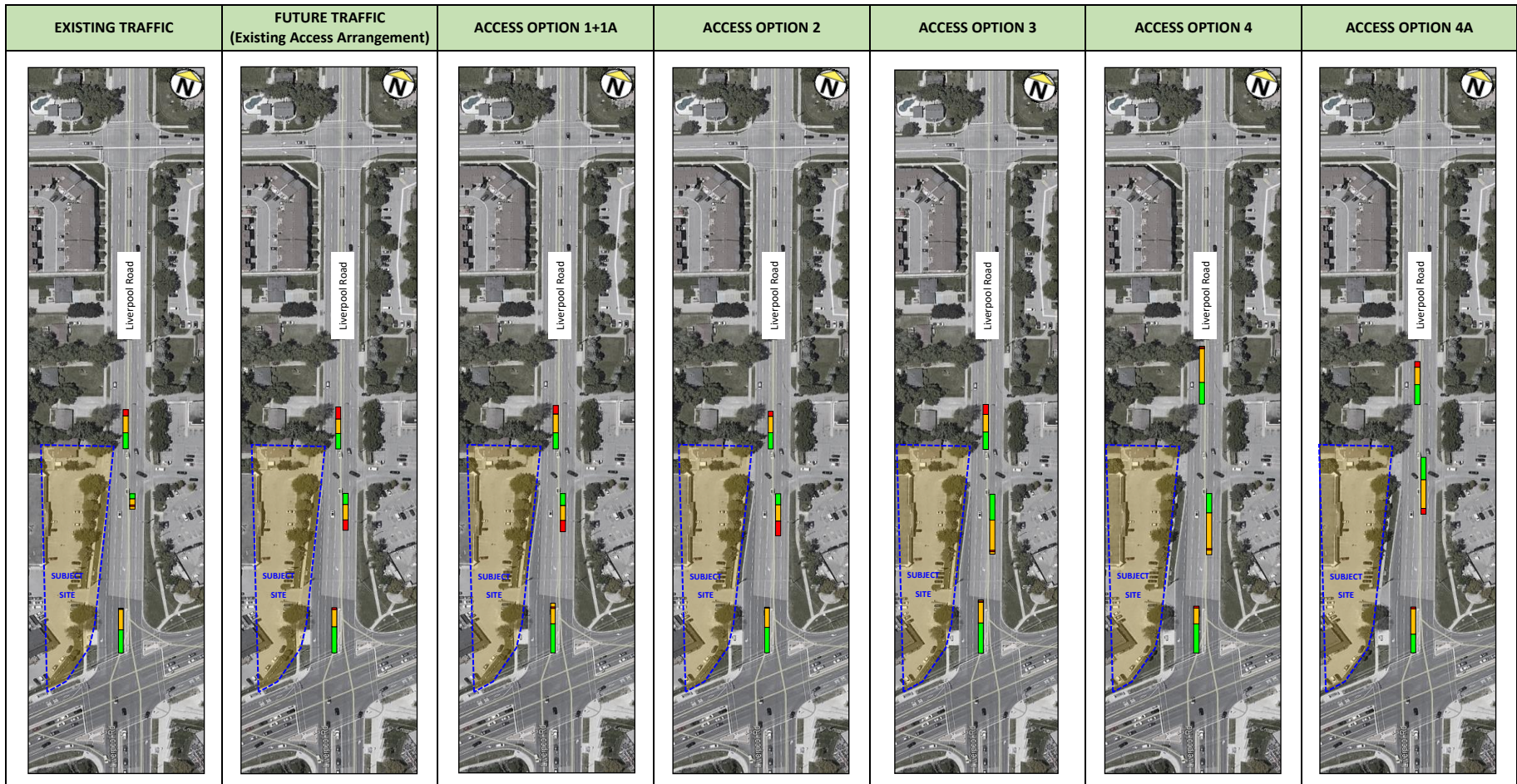
-  AVERAGE QUEUE
-  50<sup>th</sup> PERCENTILE QUEUE
-  95<sup>th</sup> PERCENTILE QUEUE








Figure D2: Projected Vehicle Queues - Weekday PM Peak Hour



**LEGEND**

-  AVERAGE QUEUE
-  50<sup>th</sup> PERCENTILE QUEUE
-  95<sup>th</sup> PERCENTILE QUEUE







# APPENDIX G

## **Future Total Intersection Capacity Analysis**



**Year 2028**

The background of the page features several thick, overlapping, curved lines in various shades of grey. These lines sweep across the page from the top and right sides towards the bottom left, creating a sense of dynamic movement and depth. The lines vary in thickness and opacity, with some appearing more prominent than others.

**AM Peak Hour**

HCM Signalized Intersection Capacity Analysis  
 1: Glenanna Rd & Kingston Rd  
 2028 FT AM: Option 2

Queues  
 1: Glenanna Rd & Kingston Rd  
 2028 FT AM: Option 2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	10	411	92	96	590	122	52	73	64	190	102	26
Traffic Volume (vph)	10	411	92	96	590	122	52	73	64	190	102	26
Future Volume (vph)	10	411	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	6.4	3.0	6.4	3.0	7.0	3.0	7.0	3.0	7.0	7.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frbp, ped/bikes	1.00	1.00	0.91	1.00	1.00	0.96	1.00	1.00	0.93	1.00	1.00	0.93
Frbp, ped/bikes	0.99	1.00	1.00	0.99	1.00	1.00	0.97	1.00	1.00	0.97	1.00	0.97
Fit	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	0.95
Satd. Flow (prot)	1568	3305	1303	1646	3400	1464	1667	1860	1397	1641	1773	1436
Flt Permitted	0.41	1.00	1.00	0.31	1.00	1.00	0.69	1.00	1.00	0.66	1.00	1.00
Satd. Flow (perm)	674	3305	1303	534	3400	1464	1203	1860	1397	1134	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	447	100	104	641	133	57	79	70	207	111	28
RTOR Reduction (vph)	0	0	80	0	0	65	0	0	42	0	0	15
Lane Group Flow (vph)	11	447	20	104	641	68	57	79	28	207	111	13
Conf. Peds. (#/hr)	8	25	25	25	8	35	34	34	34	34	34	35
Heavy Vehicles (%)	9%	8%	8%	4%	5%	1%	0%	1%	3%	2%	6%	0%
Turn Type	Perm	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm
Permitted Phases	4	4	8	8	8	2	2	2	2	6	6	6
Actuated Green, G (s)	20.0	20.0	31.6	31.6	31.6	46.4	40.4	40.4	40.4	55.0	46.0	46.0
Effective Green, g (s)	20.0	20.0	31.6	31.6	31.6	46.4	40.4	40.4	40.4	55.0	46.0	46.0
Actuated g/C Ratio	0.20	0.20	0.32	0.32	0.32	0.46	0.40	0.40	0.40	0.55	0.46	0.46
Clearance Time (s)	6.4	6.4	6.4	3.0	6.4	3.0	7.0	3.0	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	3.0
Lane Grp Cap (vph)	134	661	260	264	1074	462	586	751	564	682	815	660
v/s Ratio Prot	c0.14	0.03	c0.19	0.03	c0.19	0.01	0.04	0.01	0.04	c0.04	0.06	0.06
v/s Ratio Perm	0.02	0.02	0.09	0.05	0.05	0.04	0.02	0.02	0.02	c0.13	0.01	0.01
Uniform Delay, d1	0.08	0.68	0.08	0.39	0.60	0.15	0.10	0.11	0.05	0.30	0.14	0.02
Progression Factor	0.61	0.81	0.16	1.00	1.00	1.00	1.00	1.00	1.00	0.72	0.81	1.00
Incremental Delay, d2	0.3	2.6	0.1	1.0	0.9	0.1	0.1	0.3	0.2	0.3	0.3	0.1
Delay (s)	20.2	32.5	5.2	26.4	29.7	24.7	14.9	18.8	18.3	8.6	13.0	14.8
Level of Service	C	C	A	C	C	C	B	B	B	A	B	B
Approach Delay (s)	C	27.3	C	C	28.6	C	17.6	B	B	10.5	B	B
Approach LOS	C	C	C	C	C	C	B	B	B	B	B	B
Intersection Summary												
HCM 2000 Control Delay	23.9 HCM 2000 Level of Service C											
HCM 2000 Volume to Capacity ratio	0.44											
Actuated Cycle Length (s)	100.0 Sum of lost time (s) 19.4											
Intersection Capacity Utilization	54.2% ICU Level of Service A											
Analysis Period (min)	15											
C Critical Lane Group	C											

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	10	411	92	96	590	122	52	73	64	190	102	26
Traffic Volume (vph)	10	411	92	96	590	122	52	73	64	190	102	26
Future Volume (vph)	10	411	92	96	590	122	52	73	64	190	102	26
Lane Group Flow (vph)	11	447	100	104	641	133	57	79	70	207	111	28
Turn Type	Perm	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm
Permitted Phases	4	4	4	4	8	8	2	2	2	6	6	6
Detector Phase	4	4	4	4	8	8	2	2	2	6	6	6
Switch Phase	4	4	4	4	8	8	2	2	2	6	6	6
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)	24.4	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	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%	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	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	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	0.0
Total Lost Time (s)	6.4	6.4	6.4	3.0	6.4	3.0	7.0	3.0	7.0	3.0	7.0	7.0
Lead/Lag	Lag	Lag	Lag	Lead	Lead	Lead	Lag	Lag	Lag	Lead	Lag	Lag
Lead/Lag Optimize?	None	None	None	None	None	None	None	None	None	None	None	None
Recall Mode	0.08	0.68	0.29	0.35	0.61	0.26	0.09	0.10	0.11	0.28	0.13	0.04
v/c Ratio	20.3	34.9	2.8	24.2	31.0	8.8	11.7	23.3	2.8	9.0	15.7	1.6
Control 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
Queue Delay	20.3	34.9	2.8	24.2	31.0	8.8	11.7	23.3	2.8	9.0	15.7	1.6
Total Delay	1.0	23.4	0.2	14.5	57.2	5.4	4.6	9.8	0.0	10.6	17.2	0.2
Queue Length 50th (m)	m2.4	24.7	0.1	23.2	65.6	16.5	12.5	24.7	5.4	26.0	32.5	2.3
Queue Length 95th (m)	393.2			523.9			174.6				416.6	
Internal Link Dist (m)	42.6	60.4	33.0	23.2	25.4	25.4	25.0	27.3	25.0	27.3	25.0	27.3
Turn Bay Length (m)	219	1077	498	293	1414	664	654	802	660	728	843	737
Base Capacity (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Stallion Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillover 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	0.05	0.42	0.20	0.35	0.45	0.20	0.09	0.10	0.11	0.28	0.13	0.04
Intersection Summary												
Cycle Length: 100												
Offset: 0 (0%), Referenced to phase 2:NBL and 6:SBTL, Start of Green												
Natural Cycle: 70												
Control Type: Actuated-Coordinated												
m Volume for 95th percentile queue is metered by upstream signal.												

HCM Signalized Intersection Capacity Analysis  
 2: Liverpool Rd & Kingston Rd  
 19225 | 1294 Kingston Rd  
 2028 FT AM: Option 2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR
Lane Configurations	←	←	←	←	←	←	←	←	←	←	←
Traffic Volume (vph)	102	394	254	178	493	49	215	455	122	83	867
Future Volume (vph)	102	394	254	178	493	49	215	455	122	83	867
Ideal Flow (vphpl)	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	3.5	3.2	3.5	3.2	3.5
Total Lost time (s)	3.0	7.0	3.0	3.0	7.0	3.0	6.9	6.9	3.0	6.9	3.2
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
Frbp. ped/bikes	1.00	1.00	0.96	1.00	1.00	0.96	1.00	1.00	0.95	1.00	0.99
Frbp. ped/bikes	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98
Flt	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	1329	1675	4912
Flt Permitted	0.34	1.00	1.00	0.40	1.00	1.00	0.16	1.00	1.00	0.47	1.00
Satd. Flow (perm)	596	3368	1462	682	3400	1487	287	3500	1329	830	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
Adj. Flow (vph)	111	428	276	193	536	53	234	495	133	90	942
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	14
Lane Group Flow (vph)	111	428	276	193	536	53	234	495	52	90	1041
Conf. Peds. (#/hr)	15	19	9	15	22	15	22	25	25	25	22
Heavy Vehicles (%)	4%	6%	1%	5%	5%	0%	2%	2%	10%	2%	4%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA
Permitted Phases	4	4	8	8	8	8	2	2	2	6	6
Actuated Green, G (s)	32.7	23.4	23.4	35.3	24.7	24.7	49.1	39.4	39.4	41.0	34.3
Effective Green, g (s)	32.7	23.4	23.4	35.3	24.7	24.7	49.1	39.4	39.4	41.0	34.3
Actuated g/C Ratio	0.33	0.23	0.23	0.35	0.25	0.25	0.49	0.39	0.39	0.41	0.34
Clearance Time (s)	3.0	7.0	3.0	3.0	7.0	3.0	6.9	6.9	3.0	6.9	3.0
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)	293	788	342	342	839	367	306	1379	523	396	1684
v/s Ratio Prot	0.04	0.13	0.06	0.16	0.16	0.09	0.14	0.02	0.21	0.02	0.21
v/s Ratio Perm	0.09	0.19	0.14	0.14	0.04	0.28	0.04	0.08	0.04	0.08	0.08
Uniform Delay, d1	0.38	0.54	0.81	0.56	0.64	0.14	0.76	0.36	0.10	0.23	0.62
Progression Factor	24.5	33.6	36.2	23.9	33.7	29.4	17.0	21.4	19.1	18.4	27.4
Incremental Delay, d2	0.8	2.7	18.2	2.0	3.5	0.8	10.8	0.7	0.4	0.3	1.6
Delay (s)	25.3	36.3	54.4	58.5	65.3	57.7	27.9	22.1	19.5	14.7	23.2
Level of Service	C	D	D	E	E	E	C	C	B	B	C
Approach Delay (s)	40.9			63.1			23.3				22.5
Approach LOS	D			E			C				C
Intersection Summary											
HCM 2000 Control Delay	35.7 HCM 2000 Level of Service										
HCM 2000 Volume to Capacity ratio	0.77										
Actuated Cycle Length (s)	100.0										
Intersection Capacity Utilization	74.3%										
Analysis Period (min)	15										
c Critical Lane Group											

Queues  
 2: Liverpool Rd & Kingston Rd  
 19225 | 1294 Kingston Rd  
 2028 FT AM: Option 2

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR
Lane Configurations	←	←	←	←	←	←	←	←	←	←	←
Traffic Volume (vph)	102	394	254	178	493	49	215	455	122	83	867
Future Volume (vph)	102	394	254	178	493	49	215	455	122	83	867
Lane Group Flow (vph)	111	428	276	193	536	53	234	495	133	90	1055
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA
Projected Phases	7	4	4	3	8	8	5	2	2	6	6
Permitted Phases	4	4	4	3	8	8	5	2	2	1	6
Switch Phase	7	4	4	3	8	8	5	2	2	1	6
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	None	None	C-Min	None	None	None	None	None	Max
v/c Ratio	0.35	0.53	0.79	0.52	0.62	0.14	0.75	0.36	0.22	0.20	0.63
Control Delay	20.2	35.0	51.7	48.8	63.3	54.2	34.2	24.4	5.6	11.9	23.8
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	20.2	35.0	51.7	48.8	63.3	54.2	34.2	24.4	5.6	11.9	23.8
Queue Length 50th (m)	13.6	39.6	52.4	39.1	61.0	0.0	25.9	39.0	0.0	6.6	66.4
Queue Length 95th (m)	23.0	52.1	78.5	59.9	78.5	24.0	73.0	58.1	13.3	13.5	54.5
Internal Link Dist (m)	667.5										
Turn Bay Length (m)	33.5	49.1	103.2	61.6	46.2	61.6	46.2	51.8	30.0	30.0	30.0
Base Capacity (vph)	347	976	423	378	986	431	311	1379	604	463	1673
Stallion Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillover 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	0.32	0.44	0.65	0.51	0.54	0.12	0.75	0.36	0.22	0.19	0.63
Intersection Summary											
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.											
Spills and Phases: 2: Liverpool Rd & Kingston Rd											
Diagram showing lane groups and phases with cycle times: 12.5 s, 36 s, 1.4 s, 36 s, 1.4 s, 36 s, 1.4 s, 36 s, 1.4 s, 36 s, 1.4 s, 36 s.											

Queues  
4: Liverpool Rd & North Dwy/Main Plaza Dwy

HCM Unsignalized Intersection Capacity Analysis  
3: Liverpool Rd & South Dwy

19225 | 1294 Kingston Rd  
2028 FT AM: Option 2



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	51	0	106	0	28	415	94	866
Future Volume (vph)	51	0	106	0	28	415	94	866
Lane Group Flow (vph)	55	55	115	64	30	628	102	961
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Projected Phases	4	4	8	8	2	2	6	6
Permitted Phases	4	4	8	8	2	2	6	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	24.9	24.9
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	0.0
Total Lost Time (s)	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9
LeadLag								
LeadLag Optimize?								
Recall Mode	None	None	None	None	C-Min	C-Min	C-Min	C-Min
v/c Ratio	0.30	0.18	0.63	0.12	0.08	0.26	0.20	0.38
Control Delay	40.8	1.3	54.6	0.4	2.8	1.9	5.4	5.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	40.8	1.3	54.6	0.4	2.8	1.9	5.4	5.1
Queue Length 50th (m)	10.2	0.0	22.4	0.0	0.8	6.4	5.7	29.3
Queue Length 95th (m)	20.6	0.0	38.5	0.0	1.3	3.3	13.2	44.5
Internal Link Dist (m)	19.8		34.1		56.6		192.1	
Turn Bay Length (m)			30.0		30.0		30.0	
Base Capacity (vph)	351	470	350	706	366	2383	522	2510
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.16	0.12	0.33	0.09	0.08	0.26	0.20	0.38

Intersection Summary  
Cycle Length: 100  
Actuated Cycle Length: 100  
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBTL, Start of Green  
Natural Cycle: 50  
Control Type: Actuated-Coordinated

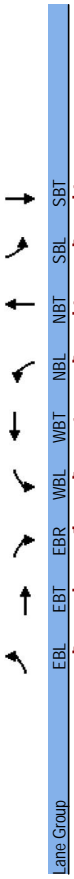


Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↔	↔	↔	↔	↔
Traffic Volume (veh/h)	0	31	0	606	1023	0
Future Volume (Veh/h)	0	31	0	606	1023	0
Sign Control	Stop	Free	Free	Free	Free	Free
Grade	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	34	0	659	1112	0
Pedestrians	4					
Lane Width (m)	3.2					
Walking Speed (m/s)	1.2					
Percent Blockage	0					
Right turn flare (veh)				None	TWLT	2
Median storage (veh)						
Upstream signal (m)				59	80	
pX, platoon unblocked	0.94	0.93	0.93			
vC, conflicting volume	1446	375	1116			
vC1, stage 1 conf vol	1116					
vC2, stage 2 conf vol	330					
vCu, unblocked vol	901	71	867			
IC, single (s)	6.8	7.1	4.1			
IC, 2 stage (s)	5.8					
IF (s)	3.5	3.4	2.2			
p0 queue free %	100	96	100			
cM capacity (veh/h)	340	887	729			
Direction, Lane #	EB.1	NB.1	NB.2	SB.1	SB.2	SB.3
Volume Total	34	330	330	371	371	371
Volume Left	0	0	0	0	0	0
Volume Right	34	0	0	0	0	0
cSH	887	1700	1700	1700	1700	1700
Volume to Capacity	0.04	0.19	0.22	0.22	0.22	0.22
Queue Length 95th (m)	1.0	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
Lane LOS	A	A	A	A	A	A
Approach Delay (s)	9.2	0.0	0.0	0.0	0.0	0.0
Approach LOS	A	A	A	A	A	A
Intersection Summary						
Average Delay			0.2			
Intersection Capacity Utilization			29.8%			
ICU Level of Service			A			
Analysis Period (min)			15			

Queues  
6: Liverpool Rd & Glenanna Rd

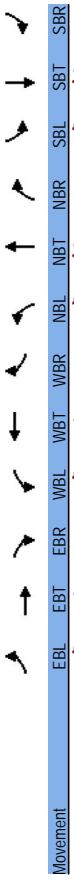
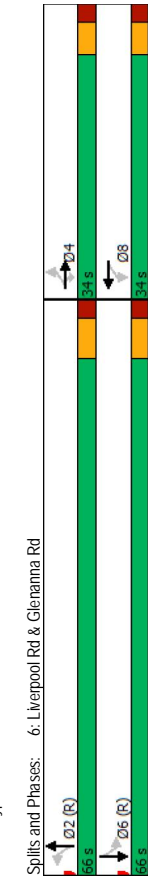
HCM Signalized Intersection Capacity Analysis  
4: Liverpool Rd & North Dwy/Main Plaza Dwy

19225 | 1294 Kingston Rd  
2028 FT AM: Option 2



Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	4	4	4	8	8	2	2	6	6
Traffic Volume (vph)	47	138	250	70	87	113	381	73	658
Future Volume (vph)	47	138	250	70	87	113	381	73	658
Ideal Flow (vphpl)	51	150	272	76	156	123	448	79	790
Lane Width	Perm	Perm	Perm	Perm	Perm	NA	Perm	NA	Perm
Total Lost 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 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	45.5	49.9	19.1	53.4	39.6	5.1	2.9	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	19.1	53.4	39.6	5.1	2.9	5.3	5.3
Queue Length 50th (m)	9.6	29.2	10.6	15.1	25.0	3.8	6.6	4.0	23.7
Queue Length 95th (m)	20.1	46.4	35.2	28.7	42.7	12.2	16.4	10.9	41.1
Internal Link Dist (m)						416.6	192.1		478.0
Turn Bay Length (m)	22.0		24.3	24.3	24.4	24.4	46.2		
Base Capacity (vph)	270	498	579	282	505	444	2468	623	2507
Stallion 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:NBT and 6:SBTL, Start of Green  
Natural Cycle: 55  
Control Type: Actuated-Coordinated



Movement	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	1	1	1	2	2	2	2	2	2
Traffic Volume (vph)	51	0	51	106	0	59	28	415	163
Future Volume (vph)	51	0	51	106	0	59	28	415	163
Ideal Flow (vphpl)	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	3.2	3.5
Total Lost Time (s)	6.9	6.9	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	1.00	1.00	0.95	1.00	0.95
Frbp, ped/bikes	1.00	0.99	1.00	1.00	0.99	1.00	0.98	1.00	0.98
Frbp, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Flt Protected	0.95	1.00	0.95	1.00	0.85	1.00	0.95	1.00	0.95
Satd. Flow (prot)	1722	1382	1705	1575	1720	3269	1663	3485	
Flt Permitted	0.72	1.00	0.72	1.00	0.72	1.00	0.28	1.00	0.41
Satd. Flow (perm)	1297	1382	1294	1575	1294	3269	724	3485	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	55	0	55	115	0	64	30	451	177
RTOR Reduction (vph)	0	47	0	0	55	0	28	0	0
Lane Group Flow (vph)	55	8	0	115	9	0	30	600	102
Conf. Peds. (#/hr)	1	1	1	1	1	1	4	14	14
Heavy Vehicles (%)	0%	0%	14%	1%	0%	0%	4%	0%	2%
Turn Type	Perm	NA	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases	4			8		2		6	
Permitted Phases	4			8		2		6	
Actuated Green, G (s)	14.2	14.2	14.2	14.2	14.2	72.0	72.0	72.0	72.0
Effective Green, g (s)	14.2	14.2	14.2	14.2	14.2	72.0	72.0	72.0	72.0
Actuated g/C Ratio	0.14	0.14	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	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
Lane Grp Cap (vph)	184	196	183	223	183	366	2353	521	2509
v/s Ratio Prot	0.01			0.01		0.18		0.14	
v/s Ratio Perm	0.04			c0.09		0.06		0.20	
Uniform Delay, d1	38.4	37.0	37.0	40.4	37.0	4.2	4.8	4.6	5.4
Progression Factor	1.00	1.00	1.00	1.00	1.00	0.42	0.36	0.81	0.78
Incremental Delay, d2	0.9	0.1	0.1	6.6	0.1	0.4	0.3	0.8	0.4
Delay (s)	39.4	37.1	37.1	47.0	37.1	2.2	2.0	4.5	4.6
Level of Service	D	D	D	D	D	A	A	A	A
Approach Delay (s)		38.2		43.5		2.0		4.6	
Approach LOS		D		D		A		A	

Intersection Summary  
HCM 2000 Control Delay  
HCM 2000 Volume to Capacity ratio  
Actuated Cycle Length (s)  
Intersection Capacity Utilization  
Analysis Period (min)  
Critical Lane Group



HCM Signalized Intersection Capacity Analysis  
 6: Liverpool Rd & Glenanna Rd

19225 | 1294 Kingston Rd  
 2028 FT AM: Option 2



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	381	31	73	658	69
Future Volume (vph)	47	138	250	70	87	56	113	381	31	73	658	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	5.9	6.7	6.7	6.7	6.7	6.7	6.7
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frbp. ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00	0.99	1.00	1.00
Frbp. ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00	0.99	1.00	1.00
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)	1658	1773	1513	1675	1717	1658	3358	1639	3410	1639	3410	3410
Flt Permitted	0.55	1.00	1.00	0.57	1.00	0.35	1.00	0.49	1.00	0.49	1.00	1.00
Satd. Flow (perm)	963	1773	1513	1006	1717	605	3358	850	3410	850	3410	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	414	34	79	715	75
RTOR Reduction (vph)	0	0	185	0	28	0	0	4	0	0	5	0
Lane Group Flow (vph)	51	150	87	76	128	0	123	444	0	79	785	0
Confl. Peds. (#/hr)							11		8		8	
Heavy Vehicles (%)	4%	6%	2%	3%	3%	3%	3%	4%	14%	4%	3%	0%
Turn Type	Perm	NA	Perm	Perm	NA	NA	Perm	NA	NA	Perm	NA	NA
Protected Phases	4		4	8		8		2		6		6
Permitted Phases	4		4	8		8		2		6		6
Actuated Green, G (s)	14.0	14.0	14.0	14.0	14.0	14.0	73.4	73.4	34	73.4	73.4	73.4
Effective Green, g (s)	14.0	14.0	14.0	14.0	14.0	14.0	73.4	73.4	34	73.4	73.4	73.4
Actuated g/C Ratio	0.14	0.14	0.14	0.14	0.14	0.14	0.73	0.73	0.73	0.73	0.73	0.73
Clearance Time (s)	5.9	5.9	5.9	5.9	5.9	5.9	6.7	6.7	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	3.0	3.0	3.0
Lane Grp Cap (vph)	134	248	211	140	240	240	444	2464	623	2502	623	2502
w/s Ratio Prot	c0.08					0.07		0.13			c0.23	
w/s Ratio Perm	0.05		0.06	0.08		0.08	0.20		0.09		0.09	
w/c Ratio	0.38	0.60	0.41	0.54	0.54	0.28	0.18	0.13	0.31	0.13	0.31	0.31
Uniform Delay, d1	39.1	40.4	39.2	40.0	40.0	4.4	4.1	3.9	4.6	3.9	4.6	4.6
Progression Factor	1.00	1.00	1.00	1.01	1.00	0.63	0.63	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.8	4.1	1.3	4.2	2.3	1.5	0.2	0.4	0.3	0.4	0.3	0.3
Delay (s)	40.9	44.5	40.6	44.7	42.2	4.3	2.7	4.3	4.9	4.3	4.9	4.9
Level of Service	D	D	D	D	D	A	A	A	A	A	A	A
Approach Delay (s)		41.9			43.0		3.1		4.9		4.9	
Approach LOS		D			D		A		A		A	
<b>Intersection Summary</b>												
HCM 2000 Control Delay	16.7 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	62.4% ICU Level of Service B											
Analysis Period (min)	15											
c Critical Lane Group												

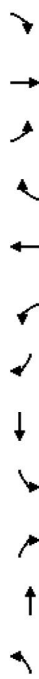




**PM Peak Hour**

HCM Signalized Intersection Capacity Analysis  
 1: Glenanna Rd & Kingston Rd

19225 | 1294 Kingston Rd  
 2028 FT PM: Option 2 (Optimized)



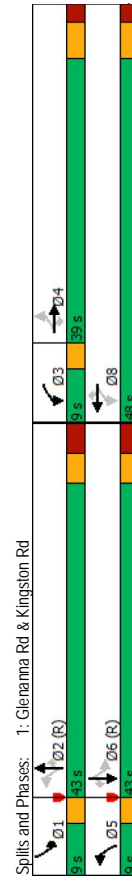
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	24	1215	141	156	611	132	120	177	194	178	199	36
Traffic Volume (vph)	24	1215	141	156	611	132	120	177	194	178	199	36
Future Volume (vph)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Ideal Flow (vphpl)	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2
Lane Width	6.4	6.4	6.4	3.0	6.4	6.4	3.0	7.0	3.0	7.0	3.0	7.0
Total Lost Time (s)	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00	0.90	1.00	1.00	0.91	1.00	1.00	0.84
Frbp. ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	0.96	1.00	1.00	0.97	1.00	1.00
Frt	0.95	1.00	1.00	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	1668	3500	1220	1658	3500	1373	1649	1879	1385	1673	1824	1295
Satd. Flow (prot)	0.40	1.00	1.00	0.08	1.00	1.00	0.47	1.00	1.00	0.53	1.00	1.00
Flt Permitted	701	3500	1220	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	1321	153	170	664	143	130	192	211	193	216	39
RTOR Reduction (vph)	0	0	60	0	0	39	0	0	171	0	0	32
Lane Group Flow (vph)	26	1321	93	170	664	104	130	192	40	193	216	7
Conf. Peds. (#/hr)	30	55	55	55	30	91	0%	1%	0%	50	50	0%
Heavy Vehicles (%)	0%	2%	5%	4%	2%	1%	0%	0%	0%	1%	0%	3%
Turn Type	Perm	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm
Permitted Phases	4	4	4	8	8	8	5	2	2	1	6	6
Actuated Green, G (s)	44.5	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	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	0.44	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	6.4	3.0	6.4	6.4	3.0	7.0	3.0	7.0	3.0	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	3.0
Lane Grp Cap (vph)	311	1557	542	282	2110	827	239	325	239	262	315	224
v/s Ratio Prot	c0.38	c0.08	0.19	0.08	0.19	0.08	0.03	0.10	0.03	c0.04	0.12	0.12
v/s Ratio Perm	0.04	0.08	0.29	0.08	0.29	0.08	0.09	0.03	0.03	c0.13	0.03	0.01
Uniform Delay, d1	16.0	24.7	16.7	19.6	9.7	8.5	32.4	38.1	35.2	34.7	38.8	34.4
Progression Factor	0.48	0.54	0.19	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.05	1.06
Incremental Delay, d2	0.1	2.2	0.1	3.6	0.1	0.1	2.5	7.7	1.5	10.3	11.5	0.2
Delay (s)	7.7	15.5	3.3	23.3	9.8	8.6	34.9	45.8	36.7	46.9	52.7	34.6
Level of Service	A	B	A	C	A	A	C	D	D	D	D	C
Approach Delay (s)	14.1			12.0			39.5				48.6	
Approach LOS	B			B			D				D	
Intersection Summary												
HCM 2000 Control Delay	21.9	HCM 2000 Level of Service										
HCM 2000 Volume to Capacity ratio	0.78	C										
Actuated Cycle Length (s)	100.0	Sum of lost time (s)										
Intersection Capacity Utilization	84.9%	ICU Level of Service										
Analysis Period (min)	15											
Critical Lane Group												

Queues  
 1: Glenanna Rd & Kingston Rd

19225 | 1294 Kingston Rd  
 2028 FT PM: Option 2 (Optimized)



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	24	1215	141	156	611	132	120	177	194	178	199	36
Traffic Volume (vph)	24	1215	141	156	611	132	120	177	194	178	199	36
Future Volume (vph)	26	1321	153	170	664	143	130	192	211	193	216	39
Lane Group Flow (vph)	Perm	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm
Projected Phases	4	4	4	8	8	8	5	2	2	1	6	6
Permitted Phases	4	4	4	8	8	8	5	2	2	1	6	6
Detector Phase	4	4	4	8	8	8	5	2	2	1	6	6
Switch Phase	4	4	4	8	8	8	5	2	2	1	6	6
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)	24.4	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	39.0	9.0	48.0	48.0	9.0	43.0	43.0	9.0	43.0	43.0
Total Spill (%)	39.0%	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	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	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	0.0
Total Lost Time (s)	6.4	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	Lag	Lead	Lead	Lead	Lag	Lag	Lag	Lead	Lag	Lag
Lead/Lag Optimize?	None	None	None	None	None	None	None	None	None	None	None	None
Recall Mode	0.08	0.85	0.25	0.59	0.31	0.16	0.49	0.59	0.51	0.65	0.69	0.13
v/s Ratio	9.6	18.8	1.9	25.0	10.9	4.3	32.3	44.9	9.8	40.7	51.8	1.5
Control 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
Queue Delay	9.6	18.8	1.9	25.0	10.9	4.3	32.3	44.9	9.8	40.7	51.8	1.5
Total Delay	0.9	143.0	0.0	15.7	32.2	3.4	19.9	36.5	0.7	33.9	44.0	0.0
Queue Length 50th (m)	m2.8m#180.1	m6.5	39.7	50.6	13.4	32.0	55.0	19.2	41.3	67.0	0.5	416.6
Queue Length 95th (m)	393.2			523.9			174.6					
Internal Link Dist (m)	42.6	60.4	33.0	23.2	25.4	25.4	25.0	27.3	25.0	27.3	16.5	16.5
Turn Bay Length (m)	311	1557	603	287	2110	867	265	676	631	296	656	532
Base Capacity (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Stallion 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	0.08	0.85	0.25	0.59	0.31	0.16	0.49	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:NBL and 6:SBTL, Start of Green												
Natural Cycle: 80												
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.												



HCM Signalized Intersection Capacity Analysis  
 2: Liverpool Rd & Kingston Rd

19225 | 1294 Kingston Rd  
 2028 FT PM: Option 2 (Optimized)

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	248	1069	330	226	525	82	302	919	278	116	367
Future Volume (vph)	248	1069	330	226	525	82	302	919	278	116	367
Ideal Flow (vphpl)	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	3.5	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
Frbp, ped/bikes	1.00	1.00	0.94	1.00	1.00	0.95	1.00	1.00	0.91	1.00	0.99
Frbp, 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	1363	1671	4895
Flt Permitted	0.34	1.00	1.00	0.12	1.00	1.00	0.37	1.00	1.00	0.19	1.00
Satd. Flow (perm)	603	3500	1416	221	3500	1431	651	3535	1363	335	4895
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
Adj. Flow (vph)	270	1162	359	246	571	89	328	999	302	126	399
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	155	0
Lane Group Flow (vph)	270	1162	359	246	571	89	328	999	147	126	453
Conf. Peds. (#/hr)	26	32	32	32	26	34	26	34	48	48	34
Heavy Vehicles (%)	1%	2%	2%	1%	2%	2%	2%	1%	3%	3%	0%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA
Permitted Phases	7	4		3	8		5	2		1	6
Actuated Green, G (s)	46.5	34.2	34.2	43.1	32.5	32.5	37.9	29.9	29.9	26.0	21.0
Effective Green, g (s)	46.5	34.2	34.2	43.1	32.5	32.5	37.9	29.9	29.9	26.0	21.0
Actuated g/C Ratio	0.46	0.34	0.34	0.43	0.32	0.32	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)	415	1197	484	252	1137	465	389	1056	407	153	1027
v/s Ratio Prot	c0.08	c0.33	c0.10	0.16	c0.12	c0.28	c0.04	0.09	0.11	0.17	0.09
v/s Ratio Perm	0.22	0.25	0.32	0.06	0.20	0.06	0.20	0.11	0.11	0.17	0.09
Uniform Delay, d1	0.65	0.97	0.74	0.98	0.50	0.19	0.84	0.95	0.36	0.82	0.44
Progression Factor	1.00	1.00	1.00	1.37	1.44	1.45	1.00	1.00	1.00	1.04	0.98
Incremental Delay, d2	3.6	19.9	9.8	48.7	1.5	0.9	15.2	16.2	0.5	28.3	0.3
Delay (s)	21.1	52.3	38.9	83.2	40.7	36.1	39.8	50.5	28.1	62.4	34.0
Level of Service	C	D	D	F	D	D	D	D	C	C	E
Approach Delay (s)	44.9			51.8			44.2			39.8	
Approach LOS	D			D			D			D	
Intersection Summary											
HCM 2000 Control Delay	45.3 HCM 2000 Level of Service										
HCM 2000 Volume to Capacity ratio	0.98										
Actuated Cycle Length (s)	100.0 Sum of lost time (s)										
Intersection Capacity Utilization	92.5% ICU Level of Service										
Analysis Period (min)	15										
Critical Lane Group	c Critical Lane Group										

Queues  
 2: Liverpool Rd & Kingston Rd

19225 | 1294 Kingston Rd  
 2028 FT PM: Option 2 (Optimized)

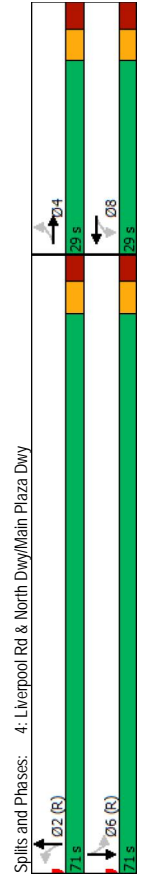
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	248	1069	330	226	525	82	302	919	278	116	367
Future Volume (vph)	248	1069	330	226	525	82	302	919	278	116	367
Lane Group Flow (vph)	270	1162	359	246	571	89	328	999	302	126	491
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA
Projected Phases	7	4		3	8		5	2		1	6
Permitted Phases	4	4		4	8		5	2		2	6
Switch Phase	7	4		4	3		8	5		2	1
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	41.6	41.6	13.4	39.0	39.0	17.0	37.0	37.0	8.0	28.0
Total Spill (%)	16.0%	41.6%	41.6%	13.4%	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?	None	C-Min	None	None	C-Min	None	None	C-Min	None	None	C-Min
Recall Mode	0.62	0.97	0.74	0.94	0.50	0.19	0.79	0.94	0.54	0.76	0.46
v/s Ratio	20.3	53.1	40.0	72.0	41.5	37.6	37.3	52.1	12.3	52.3	31.9
Control Delay	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Queue Delay	20.5	53.1	40.0	72.0	41.5	37.6	37.3	57.8	12.3	52.3	31.9
Total Delay	30.0	121.8	63.9	40.7	62.8	16.2	47.1	104.1	12.2	12.6	28.2
Queue Length 50th (m)	47.1	#168.4	#102.0	#83.5	78.3	30.6	#83.1	#145.5	38.3	#38.8	44.2
Queue Length 95th (m)											
Internal Link Dist (m)											
Turn Bay Length (m)	33.5	49.1	103.2	61.6	46.2	61.6	46.2	51.8	30.0	30.0	30.0
Base Capacity (vph)	452	1197	484	262	1138	465	415	1064	564	166	1070
Stallion Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	10	0	0	0	0	0	0	48	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.61	0.97	0.74	0.94	0.50	0.19	0.79	0.98	0.54	0.76	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.											
Spills and Phases: 2: Liverpool Rd & Kingston Rd											

Queues  
4: Liverpool Rd & North Dwy/Main Plaza Dwy

HCM Unsignalized Intersection Capacity Analysis  
3: Liverpool Rd & South Dwy

19225 | 1294 Kingston Rd  
2028 FT PM: Option 2 (Optimized)

Movement	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (veh/h)	34	0	123	0	83	919	76	389
Future Volume (veh/h)	34	0	123	0	83	919	76	389
Lane Group Flow (vph)	37	37	134	107	90	1267	83	478
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Projected Phases	4	4	8	8	2	2	6	6
Permitted Phases	4	4	8	8	2	2	6	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	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	0.0
Total Lost Time (s)	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9
LeadLag								
LeadLag Optimize?								
Recall Mode	None	None	None	None	C-Min	C-Min	C-Min	C-Min
v/c Ratio	0.19	0.06	0.66	0.31	0.15	0.52	0.34	0.20
Control Delay	37.1	0.2	54.6	6.2	2.4	3.9	10.7	4.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.7	0.0	0.0
Total Delay	37.1	0.2	54.6	6.2	2.4	4.6	10.7	4.3
Queue Length 50th (m)	6.7	0.0	26.0	0.0	1.4	9.2	5.3	10.6
Queue Length 95th (m)	15.0	0.0	43.0	9.5	m4.0	m12.1	15.3	16.6
Internal Link Dist (m)			19.8		34.1		56.6	192.1
Turn Bay Length (m)					30.0		30.0	
Base Capacity (vph)	275	703	293	446	611	2419	241	2442
Starvation Cap Reductn	0	0	0	0	0	720	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.13	0.05	0.46	0.24	0.15	0.75	0.34	0.20



Spills and Phases: 4: Liverpool Rd & North Dwy/Main Plaza Dwy

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔
Traffic Volume (veh/h)	0	22	0	1249	546	0
Future Volume (veh/h)	0	22	0	1249	546	0
Sign Control	Slop	Free	Free	Free	Free	Free
Grade	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	24	0	1358	593	0
Pedestrians	4					
Lane Width (m)	3.2					
Walking Speed (m/s)	1.2					
Percent Blockage	0					
Right turn flare (veh)				None	TWLT	2
Median storage (veh)						
Upstream signal (m)	0.72			59	80	
pX, platoon unblocked						
vC, conflicting volume	1276	202	597			
vC1, stage 1 conf vol	597					
vC2, stage 2 conf vol	679					
vCu, unblocked vol	613	202	597			
IC, single (s)	6.8	6.9	4.1			
IC, 2 stage (s)	5.8					
IF (s)	3.5	3.3	2.2			
p0 queue free %	100	97	100			
cM capacity (veh/h)	477	809	987			
Direction, Lane #	EB.1	NB.1	NB.2	SB.1	SB.2	SB.3
Volume Total	24	679	679	198	198	198
Volume Left	0	0	0	0	0	0
Volume Right	24	0	0	0	0	0
cSH	809	1700	1700	1700	1700	1700
Volume to Capacity	0.03	0.40	0.40	0.12	0.12	0.12
Queue Length 95th (m)	0.7	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	9.6	0.0	0.0	0.0	0.0	0.0
Lane LOS	A					
Approach Delay (s)	9.6	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					

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Queues  
6: Liverpool Rd & Glenanna Rd

HCM Signalized Intersection Capacity Analysis  
4: Liverpool Rd & North Dwy/Main Plaza Dwy

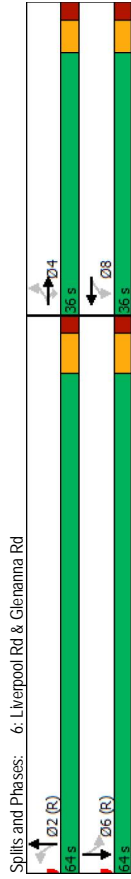
19225 | 1294 Kingston Rd  
2028 FT PM: Option 2 (Optimized)



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT	SBR
Lane Configurations	34	0	34	123	0	98	83	919	247	76	389
Traffic Volume (vph)	34	0	34	123	0	98	83	919	247	76	389
Future Volume (vph)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Ideal Flow (vphpl)	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5
Lane Width	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9
Total Lost Time (s)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95
Lane Util. Factor	1.00	0.99	1.00	0.99	1.00	0.99	1.00	0.99	1.00	0.99	1.00
Frbp, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00	0.99	1.00
Frbp, ped/bikes	1.00	0.85	1.00	0.85	1.00	0.97	1.00	0.95	1.00	0.98	1.00
Flt	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95
Flt Protected	1722	1575	1722	1560	1722	1560	1710	3385	1716	3433	1716
Satd. Flow (prot)	0.69	1.00	0.73	1.00	0.73	1.00	0.48	1.00	0.19	1.00	0.19
Flt Permitted	1247	1575	1329	1560	1247	1575	862	3385	339	3433	339
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
Adj. Flow (vph)	37	0	37	134	0	107	90	999	268	83	423
RTOR Reduction (vph)	0	31	0	0	91	0	0	19	0	0	8
Lane Group Flow (vph)	37	6	0	134	16	0	90	1248	0	83	470
Conf. Peds. (#/hr)	1	0	1	1	1	1	6	15	15	15	6
Heavy Vehicles (%)	0%	0%	0%	0%	0%	1%	0%	1%	0%	0%	2%
Turn Type	Perm	NA	NA	Perm	NA	NA	Perm	NA	NA	Perm	NA
Protected Phases	4	4	4	8	8	8	2	2	6	6	6
Permitted Phases	4	4	4	8	8	8	2	2	6	6	6
Actuated Green, G (s)	15.3	15.3	15.3	15.3	15.3	15.3	70.9	70.9	70.9	70.9	70.9
Effective Green, g (s)	15.3	15.3	15.3	15.3	15.3	15.3	70.9	70.9	70.9	70.9	70.9
Actuated g/C Ratio	0.15	0.15	0.15	0.15	0.15	0.15	0.71	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	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	3.0	3.0	3.0	3.0
Lane Grip Cap (vph)	190	240	203	238	611	2399	240	2433	240	2433	240
v/s Ratio Prot	0.03	0.00	0.01	0.01	0.01	0.01	0.37	0.14	0.24	0.14	0.14
v/s Ratio Perm	0.19	0.02	0.66	0.07	0.15	0.52	0.35	0.19	0.35	0.19	0.19
Uniform Delay, d1	37.0	36.0	39.9	36.3	4.7	6.7	5.6	4.9	5.6	4.9	4.9
Progression Factor	1.00	1.00	1.00	1.00	1.00	0.35	0.49	0.86	0.86	0.81	0.81
Incremental Delay, d2	0.5	0.0	7.8	0.1	0.3	0.4	3.9	0.2	3.9	0.2	0.2
Delay (s)	37.5	36.0	47.7	36.4	1.9	3.7	8.7	4.1	8.7	4.1	4.1
Level of Service	D	D	D	D	D	A	A	A	A	A	A
Approach Delay (s)	36.8	D	42.7	36.6	D	3.6	A	4.8	A	4.8	A
Approach LOS	D	D	D	D	D	A	A	A	A	A	A

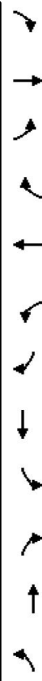
Intersection Summary

HCM 2000 Control Delay	9.2	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	13.8
Intersection Capacity Utilization	68.6%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			



HCM Signalized Intersection Capacity Analysis  
 6: Liverpool Rd & Glenanna Rd

19225 | 1294 Kingston Rd  
 2028 FT PM: Option 2 (Optimized)



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	632	72	67	354	30
Future Volume (vph)	45	72	110	52	145	44	347	632	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	5.9	6.7	6.7	6.7	6.7	6.7	6.7
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frbp, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00	0.99	1.00
Frbp, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.98	1.00	1.00	0.99	1.00
Flt	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Flt Protected	1725	1824	1543	1725	1791	1708	3449	1708	3449	1707	3528	3528
Satd. Flow (prot)	0.43	1.00	1.00	0.71	1.00	0.51	1.00	0.51	1.00	0.35	1.00	1.00
Flt Permitted	788	1824	1543	1282	1791	912	3449	912	3449	636	3528	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	687	78	73	385	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	759	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	Perm	NA	NA
Protected Phases	4		4	8		8		2		6		6
Permitted Phases	4		4	8		8		2		6		6
Actuated Green, G (s)	16.0	16.0	16.0	16.0	16.0	16.0	71.4	71.4	71.4	71.4	71.4	71.4
Effective Green, g (s)	16.0	16.0	16.0	16.0	16.0	16.0	71.4	71.4	71.4	71.4	71.4	71.4
Actuated g/C Ratio	0.16	0.16	0.16	0.16	0.16	0.16	0.71	0.71	0.71	0.71	0.71	0.71
Clearance Time (s)	5.9	5.9	5.9	5.9	5.9	5.9	6.7	6.7	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	3.0	3.0	3.0
Lane Grp Cap (vph)	126	291	246	205	286	651	2462	454	2518	454	2518	2518
w/s Ratio Prot	0.04		0.01	0.04		c0.11		0.22		0.11		0.12
w/s Ratio Perm	0.06		0.01	0.04		c0.41		0.11		0.11		0.12
w/c Ratio	0.39	0.27	0.08	0.28	0.67	0.58	0.31	0.16	0.16	0.16	0.16	0.16
Uniform Delay, d1	37.6	36.9	35.7	36.9	39.5	7.0	5.2	4.6	4.6	4.6	4.6	4.6
Progression Factor	1.00	1.00	1.00	0.70	0.77	0.49	0.43	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.0	0.5	0.1	0.7	6.0	3.3	0.3	0.8	0.1	0.8	0.1	0.1
Delay (s)	39.6	37.4	35.9	26.5	36.5	6.8	2.6	5.4	4.8	5.4	4.8	4.8
Level of Service	D	D	D	C	D	A	A	A	A	A	A	A
Approach Delay (s)			37.1		34.3		3.9		4.9			
Approach LOS			D		C		A		A			A

Intersection Summary		
HCM 2000 Control Delay	11.7	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	67.9%	ICU Level of Service C
Analysis Period (min)	15	
c Critical Lane Group		



**Year 2033**



**AM Peak Hour**



HCM Signalized Intersection Capacity Analysis  
 1: Glenanna Road & Kingston Road

Queues  
 1: Glenanna Road & Kingston Road

2033 FT AM: Option 2

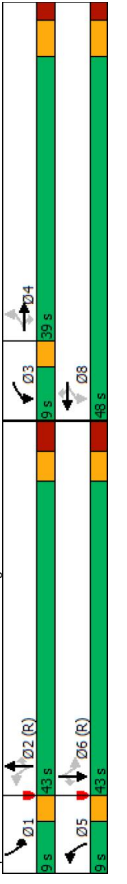
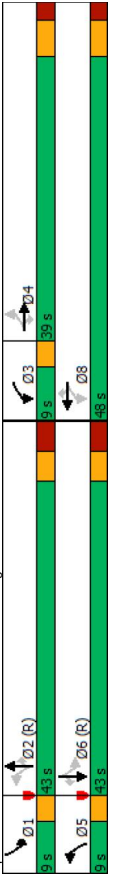


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	10	423	92	96	605	122	52	73	64	190	102	26
Traffic Volume (Vph)	10	423	92	96	605	122	52	73	64	190	102	26
Future Volume (vph)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Ideal Flow (vphpl)	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2
Lane Width	6.4	6.4	6.4	3.0	6.4	6.4	3.0	7.0	3.0	7.0	3.0	7.0
Total Lost Time (s)	1.00	1.00	0.91	1.00	1.00	0.96	1.00	1.00	0.93	1.00	1.00	0.93
Lane Util. Factor	0.99	1.00	1.00	0.99	1.00	1.00	0.97	1.00	1.00	0.97	1.00	0.97
Frbp, ped/bikes	0.95	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	0.95
Satd. Flow (prot)	1568	3305	1303	1646	3400	1464	1667	1860	1397	1641	1773	1436
Flt Permitted	0.40	1.00	1.00	0.30	1.00	1.00	0.69	1.00	1.00	0.66	1.00	1.00
Satd. Flow (perm)	663	3305	1303	521	3400	1464	1203	1860	1397	1133	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	460	100	104	658	133	57	79	70	207	111	28
RTOR Reduction (vph)	0	0	80	0	0	63	0	0	42	0	0	15
Lane Group Flow (vph)	11	460	20	104	658	70	57	79	28	207	111	13
Conf. Peds. (#/hr)	8	25	25	25	8	35	34	34	34	34	34	35
Heavy Vehicles (%)	9%	8%	8%	4%	5%	1%	0%	1%	3%	2%	6%	0%
Turn Type	Perm	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm
Permitted Phases	4	4	4	8	8	8	5	2	2	1	6	6
Actuated Green, G (s)	20.4	20.4	20.4	32.0	32.0	32.0	45.9	39.9	39.9	54.6	45.6	45.6
Effective Green, g (s)	20.4	20.4	20.4	32.0	32.0	32.0	45.9	39.9	39.9	54.6	45.6	45.6
Actuated g/C Ratio	0.20	0.20	0.20	0.32	0.32	0.32	0.46	0.40	0.40	0.55	0.46	0.46
Clearance Time (s)	6.4	6.4	6.4	3.0	6.4	6.4	3.0	7.0	3.0	7.0	3.0	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	3.0
Lane Grp Cap (vph)	135	674	265	263	1088	468	580	742	557	678	808	654
v/s Ratio Prot	c0.14	0.02	0.09	0.03	c0.19	0.05	0.04	0.01	0.04	c0.04	0.06	0.06
v/s Ratio Perm	0.08	0.68	0.08	0.40	0.60	0.15	0.10	0.11	0.05	0.31	0.14	0.02
Uniform Delay, d1	32.2	36.8	32.2	25.1	28.7	24.3	15.2	18.9	18.4	11.8	15.8	14.9
Progression Factor	0.61	0.80	0.16	1.00	1.00	1.00	1.00	1.00	1.00	0.71	0.81	1.00
Incremental Delay, d2	0.2	2.7	0.1	1.0	1.0	1.0	0.1	0.3	0.2	0.3	0.4	0.1
Delay (s)	20.0	32.3	5.3	26.1	29.6	24.4	15.2	19.2	18.6	8.6	13.1	15.0
Level of Service	B	C	A	C	C	C	B	B	B	A	B	B
Approach Delay (s)	27.3			28.4			17.9			10.6		
Approach LOS	C			C			B			B		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	10	423	92	96	605	122	52	73	64	190	102	26
Traffic Volume (Vph)	10	423	92	96	605	122	52	73	64	190	102	26
Future Volume (vph)	10	423	92	96	605	122	52	73	64	190	102	26
Lane Group Flow (vph)	11	460	100	104	658	133	57	79	70	207	111	28
Turn Type	Perm	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm
Permitted Phases	4	4	4	8	8	8	5	2	2	1	6	6
Detector Phase	4	4	4	4	4	4	5	2	2	1	6	6
Switch Phase	4	4	4	4	4	4	5	2	2	1	6	6
Minimum Initial (s)	5.0	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	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	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%	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	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	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	0.0
Total Lost Time (s)	6.4	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	Lag	Lead	Lead	Lead	Lag	Lag	Lag	Lead	Lag	Lag
Lead/Lag Optimize?	None	None	None	None	None	None	None	None	None	None	None	None
Recall Mode	0.08	0.68	0.28	0.36	0.62	0.25	0.09	0.10	0.11	0.29	0.13	0.04
v/c Ratio	20.1	34.7	2.8	24.0	31.0	9.1	11.8	23.6	2.9	9.0	15.7	1.4
Control 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
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	20.1	34.7	2.8	24.0	31.0	9.1	11.8	23.6	2.9	9.0	15.7	1.4
Queue Length 50th (m)	1.0	23.7	0.2	14.4	58.8	5.8	4.7	9.9	0.0	10.7	17.2	0.2
Queue Length 95th (m)	m2.3	24.8	0.0	23.0	67.1	16.8	12.6	24.8	5.5	20.3	32.0	2.1
Internal Link Dist (m)		393.2			523.9		174.6				416.6	
Turn Bay Length (m)	42.6	60.4	33.0	23.2	25.4	25.4	25.0	27.3	25.0	27.3	25.0	27.3
Base Capacity (vph)	216	1077	498	291	1414	662	649	797	657	724	838	733
Stallion Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillover 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	0.05	0.43	0.20	0.36	0.47	0.20	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:NBL and 6:SBTL, Start of Green  
 Natural Cycle: 70  
 Control Type: Actuated-Coordinated  
 m Volume for 95th percentile queue is measured by upstream signal.



HCM Signalized Intersection Capacity Analysis  
 2: Liverpool Road & Kingston Road

Queues  
 2: Liverpool Road & Kingston Road

19225 | 1294 Kingston Rd  
 2033 FT AM: Option 2

19225 | 1294 Kingston Rd  
 2033 FT AM: Option 2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR
Lane Configurations	→	→	→	←	←	←	←	←	←	←	←
Traffic Volume (vph)	101	404	254	178	505	49	215	473	122	85	892
Future Volume (vph)	101	404	254	178	505	49	215	473	122	85	892
Ideal Flow (vphpl)	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	3.5	3.2	3.2	3.5	3.2
Total Lost time (s)	3.0	7.0	3.0	3.0	7.0	3.0	6.9	6.9	3.0	6.9	3.2
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
Frbp. ped/bikes	1.00	1.00	0.96	1.00	1.00	0.96	1.00	1.00	0.95	1.00	0.99
Frbp. ped/bikes	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98
Flt	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	1639	3400	1487	1690	3500	1329	1676	4913
Flt Permitted	0.33	1.00	1.00	0.38	1.00	1.00	0.15	1.00	1.00	0.46	1.00
Satd. Flow (perm)	579	3368	1462	661	3400	1487	267	3500	1329	816	4913
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
Adj. Flow (vph)	110	439	276	193	549	53	234	514	133	92	970
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	14
Lane Group Flow (vph)	110	439	276	193	549	53	234	514	133	92	1071
Conf. Peds. (#/hr)	15	19	9	15	22	15	22	25	10%	25	22
Heavy Vehicles (%)	4%	6%	1%	5%	5%	0%	2%	2%	10%	2%	4%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA
Permitted Phases	7	4	4	3	8	8	5	2	2	1	6
Actuated Green, G (s)	32.6	23.4	23.4	35.4	24.8	24.8	49.1	39.3	39.3	40.7	33.9
Effective Green, g (s)	32.6	23.4	23.4	35.4	24.8	24.8	49.1	39.3	39.3	40.7	33.9
Actuated g/C Ratio	0.33	0.23	0.23	0.35	0.25	0.25	0.49	0.39	0.39	0.41	0.34
Clearance Time (s)	3.0	7.0	3.0	3.0	7.0	3.0	6.9	6.9	3.0	6.9	3.0
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)	287	788	342	337	843	368	304	1375	522	390	1665
v/s Ratio Prot	0.04	0.13	0.06	0.16	0.16	0.09	0.15	0.02	0.02	0.22	0.08
v/s Ratio Perm	0.09	0.19	0.14	0.14	0.04	0.28	0.04	0.04	0.04	0.08	0.08
Uniform Delay, d1	0.38	0.56	0.81	0.57	0.65	0.14	0.77	0.37	0.10	0.24	0.64
Progression Factor	1.00	1.00	1.00	2.38	1.84	1.95	1.00	1.00	1.00	0.84	0.81
Incremental Delay, d2	0.9	2.8	18.2	2.2	3.6	0.8	11.2	0.8	0.4	0.3	1.8
Delay (s)	25.4	36.6	54.4	59.0	65.6	57.8	28.5	22.4	19.6	16.0	24.5
Level of Service	C	D	D	E	E	E	C	C	B	B	C
Approach Delay (s)	41.0			63.5			23.6				23.9
Approach LOS	D			E			C				C
<b>Intersection Summary</b>											
HCM 2000 Control Delay	36.2 HCM 2000 Level of Service										
HCM 2000 Volume to Capacity ratio	0.78										
Actuated Cycle Length (s)	100.0 Sum of lost time (s)										
Intersection Capacity Utilization	74.8% ICU Level of Service										
Analysis Period (min)	15										
c Critical Lane Group											

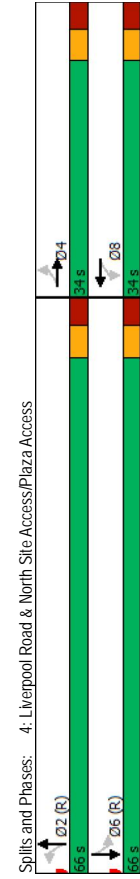
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR
Lane Configurations	→	→	→	←	←	←	←	←	←	←	←
Traffic Volume (vph)	101	404	254	178	505	49	215	473	122	85	892
Future Volume (vph)	101	404	254	178	505	49	215	473	122	85	892
Lane Group Flow (vph)	110	439	276	193	549	53	234	514	133	92	1085
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA
Projected Phases	7	4	4	3	8	8	5	2	2	1	6
Permitted Phases	4	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	None	None	C-Min	None	None	C-Min	None	None	Max
v/c Ratio	0.35	0.54	0.79	0.53	0.64	0.14	0.75	0.37	0.22	0.21	0.66
Control Delay	20.3	35.2	51.5	49.3	63.6	54.4	35.3	24.7	5.6	12.8	25.3
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	20.3	35.2	51.5	49.3	63.6	54.4	35.3	24.7	5.6	12.8	25.3
Queue Length 50th (m)	13.4	40.8	52.4	39.3	62.6	0.0	25.9	40.8	0.0	6.6	69.5
Queue Length 95th (m)	22.8	53.4	78.5	60.3	80.2	24.0	76.0	60.3	13.3	15.4	60.9
Internal Link Dist (m)	667.5										
Turn Bay Length (m)	33.5	49.1	103.2	61.6	46.2	61.6	46.2	51.8	30.0	30.0	30.0
Base Capacity (vph)	343	976	423	372	986	431	310	1375	602	454	1650
Stallion Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillover 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	0.32	0.45	0.65	0.52	0.56	0.12	0.75	0.37	0.22	0.20	0.66
<b>Intersection Summary</b>											
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.											

Queues  
 4: Liverpool Road & North Site Access/Plaza Access

HCM Unsignalized Intersection Capacity Analysis  
 3: Liverpool Road & South Site Access

19225 | 1294 Kingston Rd  
 2033 FT AM: Option 2

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	50	0	106	0	33	427	94	887
Future Volume (vph)	50	0	106	0	33	427	94	887
Lane Group Flow (vph)	54	63	115	64	36	641	102	986
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Projected Phases	4	4	8	8	2	2	6	6
Permitted Phases	4	4	8	8	2	2	6	6
Detector Phase								
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	24.9	24.9
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	0.0
Total Lost Time (s)	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9
LeadLag								
LeadLag Optimize?								
Recall Mode	None	None	None	None	None	None	C-Min	C-Min
v/c Ratio	0.29	0.21	0.63	0.12	0.10	0.27	0.20	0.39
Control Delay	40.5	1.6	54.5	0.4	2.8	1.8	5.5	5.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	40.5	1.6	54.5	0.4	2.8	1.8	5.5	5.2
Queue Length 50th (m)	10.0	0.0	22.4	0.0	0.9	6.4	5.8	30.8
Queue Length 95th (m)	20.4	0.5	38.4	0.0	1.2	2.6	13.3	46.2
Internal Link Dist (m)	19.8		34.1		56.6		192.1	
Turn Bay Length (m)			30.0				30.0	
Base Capacity (vph)	351	464	348	698	354	2382	514	2507
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.15	0.14	0.33	0.09	0.10	0.27	0.20	0.39



	EBL	EBT	NBL	NBT	SBL	SBT
Lane Configurations	↔	↔	↔	↔	↔	↔
Traffic Volume (veh/h)	0	32	0	623	1051	0
Future Volume (Veh/h)	0	32	0	623	1051	0
Sign Control	Stop	Free	Free	Free	Free	Free
Grade	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	35	0	677	1142	0
Pedestrians	4					
Lane Width (m)	3.2					
Walking Speed (m/s)	1.2					
Percent Blockage	0					
Right turn flare (veh)						
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked	0.93	0.93				
vC, conflicting volume	1484	385	1146			
vC1, stage 1 conf vol	1146					
vC2, stage 2 conf vol	338					
vCu, unblocked vol	911	62	883			
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)	332	895	716			
Direction, Lane #	EB.1	NB.1	NB.2	SB.1	SB.2	SB.3
Volume Total	35	338	338	381	381	381
Volume Left	0	0	0	0	0	0
Volume Right	35	0	0	0	0	0
cSH	895	1700	1700	1700	1700	1700
Volume to Capacity	0.04	0.20	0.20	0.22	0.22	0.22
Queue Length 95th (m)	1.0	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
Lane LOS	A					
Approach Delay (s)	9.2	0.0		0.0		
Approach LOS	A					
Intersection Summary						
Average Delay	0.2					
Intersection Capacity Utilization	30.3%					
ICU Level of Service	A					
Analysis Period (min)	15					

Queues  
6: Liverpool Road & Glenanna Road

HCM Signalized Intersection Capacity Analysis  
4: Liverpool Road & North Site Access/Plaza Access

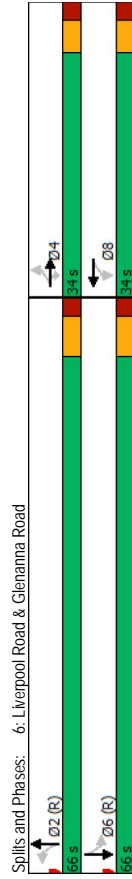
19225 | 1294 Kingston Rd  
2033 FT AM: Option 2



Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	←	←	←	←	←	←	←	←	←
Traffic Volume (vph)	47	138	251	71	87	115	388	73	679
Future Volume (vph)	47	138	251	71	87	115	388	73	679
Lane Group Flow (vph)	51	150	273	77	156	125	458	79	813
Turn Type	Perm	Perm	Perm	Perm	Perm	NA	Perm	NA	Perm
Projected Phases	4	4	4	8	8	2	2	6	6
Permitted Phases	4	4	4	8	8	2	2	6	6
Detector Phase									
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	0.54	0.58	0.29	0.19	0.13	0.32
Control Delay	44.9	49.3	21.3	50.6	37.3	5.2	2.8	5.5	5.5
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	21.3	50.6	37.3	5.2	2.8	5.5	5.5
Queue Length 50th (m)	9.6	29.2	12.9	15.5	25.3	3.7	6.5	4.0	24.7
Queue Length 95th (m)	19.9	46.0	37.5	25.4	37.4	11.5	15.6	11.2	43.6
Internal Link Dist (m)						416.6	192.1		478.0
Turn Bay Length (m)	22.0		24.3	24.3	24.4	24.4	46.2		250.2
Base Capacity (vph)	271	498	571	283	505	431	2460	616	2502
Stallion 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	0.27	0.31	0.29	0.19	0.13	0.32

**Intersection Summary**

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



HCM Signalized Intersection Capacity Analysis  
4: Liverpool Road & North Site Access/Plaza Access

19225 | 1294 Kingston Rd  
2033 FT AM: Option 2



Movement	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	←	←	←	←	←	←	←	←	←
Traffic Volume (vph)	50	0	58	106	0	59	33	427	163
Future Volume (vph)	50	0	58	106	0	59	33	427	163
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.5	3.2	3.2	3.5	3.2	3.5	3.2	3.5
Total Lost Time (s)	6.9	6.9	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	1.00	1.00	0.95	1.00	0.95
Frbp, ped/bikes	1.00	0.99	1.00	0.99	1.00	0.98	1.00	0.98	1.00
Frbp, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.98	1.00
Flt	0.95	1.00	0.85	1.00	0.85	1.00	0.95	1.00	1.00
Flt Protected	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1722	1382	1705	1575	1721	3272	1664	3483	1664
Flt Permitted	0.72	1.00	0.72	1.00	0.27	1.00	0.41	1.00	0.41
Satd. Flow (perm)	1297	1382	1285	1575	494	3272	715	3483	715
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	54	0	63	115	0	64	36	464	177
RTOR Reduction (vph)	0	54	0	0	55	0	27	0	0
Lane Group Flow (vph)	54	9	0	115	9	0	36	614	0
Conf. Peds. (#/hr)	1	1	1	1	1	1	4	14	14
Heavy Vehicles (%)	0%	0%	14%	1%	0%	0%	4%	0%	2%
Turn Type	Perm	NA	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases	4			8		2		6	
Permitted Phases	4			8		2		6	
Actuated Green, G (s)	14.3	14.3	14.3	14.3	14.3	71.9	71.9	71.9	71.9
Effective Green, g (s)	14.3	14.3	14.3	14.3	14.3	71.9	71.9	71.9	71.9
Actuated g/C Ratio	0.14	0.14	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	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
Lane Grip Cap (vph)	185	197	183	225	355	2352	514	2504	514
v/s Ratio Prot	0.04	0.01	0.01	0.01	0.07	0.19	0.14	0.28	0.14
v/s Ratio Perm	0.29	0.05	0.63	0.04	0.10	0.26	0.20	0.39	0.20
Uniform Delay, d1	38.3	37.0	40.3	36.9	4.3	4.9	4.6	5.5	4.6
Progression Factor	1.00	1.00	1.00	1.00	0.39	0.33	0.80	0.78	0.80
Incremental Delay, d2	0.9	0.1	6.6	0.1	0.5	0.3	0.8	0.4	0.8
Delay (s)	39.2	37.1	46.9	37.0	2.2	1.9	4.5	4.7	4.7
Level of Service	D	D	D	D	A	A	A	A	A
Approach Delay (s)									
Approach LOS	D	D	D	D	A	A	A	A	A

**Intersection Summary**

HCM 2000 Control Delay: 9.0  
 HCM 2000 Level of Service: A  
 HCM 2000 Volume to Capacity ratio: 0.43  
 Actuated Cycle Length (s): 100.0  
 Sum of lost time (s): 13.8  
 Intersection Capacity Utilization: 59.2%  
 ICU Level of Service: B  
 Analysis Period (min): 15  
 Critical Lane Group: C

HCM Signalized Intersection Capacity Analysis  
 6: Liverpool Road & Glenanna Road

19225 | 1294 Kingston Rd  
 2033 FT AM: Option 2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	47	138	251	71	87	56	115	388	33	73	679	69
Future Volume (vph)	47	138	251	71	87	56	115	388	33	73	679	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	5.9	6.7	6.7	6.7	6.7	6.7	6.7
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frbp. ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00	0.99	1.00	1.00
Frbp. ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00	0.99	1.00	1.00
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)	1658	1773	1513	1675	1717	1659	3356	1639	3411	1639	3411	1639
Flt Permitted	0.55	1.00	1.00	0.57	1.00	0.34	1.00	0.49	1.00	0.49	1.00	0.49
Satd. Flow (perm)	967	1773	1513	1010	1717	589	3356	842	3411	842	3411	842
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	273	77	95	61	125	422	36	79	738	75
RTOR Reduction (vph)	0	0	175	0	27	0	0	4	0	0	5	0
Lane Group Flow (vph)	51	150	98	77	129	0	125	454	0	79	808	0
Confl. Peds. (#/hr)							11		8		8	
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	Perm	NA	Perm
Protected Phases	4		4	8	8		2		2		6	
Permitted Phases	4		4	8	8		2		2		6	
Actuated Green, G (s)	14.2	14.2	14.2	14.2	14.2	14.2	73.2	73.2	73.2	73.2	73.2	73.2
Effective Green, g (s)	14.2	14.2	14.2	14.2	14.2	14.2	73.2	73.2	73.2	73.2	73.2	73.2
Actuated g/C Ratio	0.14	0.14	0.14	0.14	0.14	0.14	0.73	0.73	0.73	0.73	0.73	0.73
Clearance Time (s)	5.9	5.9	5.9	5.9	5.9	5.9	6.7	6.7	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	3.0	3.0	3.0
Lane Grp Cap (vph)	137	251	214	143	243	431	2456	616	2496	616	2496	616
w/s Ratio Prot	c0.08			0.07			0.14			0.09		
w/s Ratio Perm	0.05		0.06	0.08		0.21				0.13		
w/c Ratio	0.37	0.60	0.46	0.54	0.53	0.29	0.18			0.40		
Uniform Delay, d1	38.9	40.2	39.4	39.9	39.8	4.6	4.2			4.0		
Progression Factor	1.00	1.00	1.00	0.95	0.94	0.60	0.60			1.00		
Incremental Delay, d2	1.7	3.8	1.6	3.8	2.1	1.7	0.2			0.4		
Delay (s)	40.6	44.0	40.9	41.8	39.3	4.4	2.6			4.4		
Level of Service	D	D	D	D	D	A	A			A		
Approach Delay (s)			41.9		40.1		3.0			5.0		
Approach LOS			D		D		A			A		
<b>Intersection Summary</b>												
HCM 2000 Control Delay	16.2 HCM 2000 Level of Service B											
HCM 2000 Volume to Capacity ratio	0.37											
Actuated Cycle Length (s)	100.0 Sum of lost time (s) 12.6											
Intersection Capacity Utilization	63.1% ICU Level of Service B											
Analysis Period (min)	15											
c Critical Lane Group												

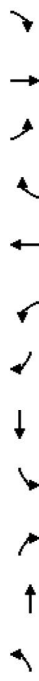


**PM Peak Hour**



HCM Signalized Intersection Capacity Analysis  
 1: Glenanna Rd & Kingston Rd

19225 | 1294 Kingston Rd  
 2033 FT PM: Option 2 (Optimized)



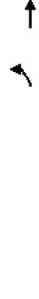
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	24	1249	141	156	629	132	120	177	194	178	199	36
Traffic Volume (vph)	24	1249	141	156	629	132	120	177	194	178	199	36
Future Volume (vph)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Ideal Flow (vphpl)	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2
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)	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00	0.90	1.00	1.00	0.91	1.00	1.00	0.84
Frbp. ped/bikes	0.95	1.00	0.85	1.00	1.00	0.85	1.00	0.85	1.00	0.97	1.00	0.85
Flt	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)	1669	3500	1220	1658	3500	1373	1649	1879	1385	1673	1824	1295
Flt Permitted	0.39	1.00	1.00	0.08	1.00	1.00	0.47	1.00	1.00	0.53	1.00	1.00
Satd. Flow (perm)	688	3500	1220	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	1388	153	170	684	143	130	192	211	193	216	39
RTOR Reduction (vph)	0	0	60	0	0	38	0	0	171	0	0	32
Lane Group Flow (vph)	26	1388	93	170	684	105	130	192	40	193	216	7
Conf. Peds. (#/hr)	30	55	55	30	91	30	91	50	50	50	50	91
Heavy Vehicles (%)	0%	2%	5%	4%	2%	1%	0%	0%	0%	1%	0%	3%
Turn Type	Perm	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm
Permitted Phases	4	4	4	8	8	8	5	2	2	1	6	6
Actuated Green, G (s)	44.5	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	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	0.44	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	6.4	3.0	6.4	3.0	7.0	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	3.0
Lane Grp Cap (vph)	306	1557	542	282	2110	827	239	325	239	262	315	224
v/s Ratio Prot	c0.39	c0.08	0.20	0.03	0.10	0.03	0.10	0.03	0.10	c0.04	0.12	0.12
v/s Ratio Perm	0.04	0.08	0.29	0.08	0.09	0.08	0.09	0.03	0.03	c0.13	0.13	0.01
Uniform Delay, d1	16.0	25.2	16.7	20.0	9.8	8.5	32.4	38.1	35.2	34.7	38.8	34.4
Progression Factor	0.48	0.54	0.19	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.05	1.06
Incremental Delay, d2	0.1	2.6	0.1	3.6	0.1	0.1	2.5	7.7	1.5	10.3	11.5	0.2
Delay (s)	7.8	16.2	3.3	23.6	9.9	8.6	34.9	45.8	36.7	46.7	52.5	34.6
Level of Service	A	B	A	C	A	A	C	D	D	D	D	C
Approach Delay (s)	14.7			12.0			39.5			48.5		
Approach LOS	B			B			D			D		

Intersection Summary	Value	Unit
HCM 2000 Control Delay	22.0	s
HCM 2000 Volume to Capacity ratio	0.79	
Actuated Cycle Length (s)	100.0	s
Intersection Capacity Utilization	88.9%	%
Analysis Period (min)	15	min
Critical Lane Group		

FTPM2 2033 Opt-Signal syn  
 Synchro 9 Report  
 Page 2

1: Glenanna Rd & Kingston Rd

19225 | 1294 Kingston Rd  
 2033 FT PM: Option 2 (Optimized)



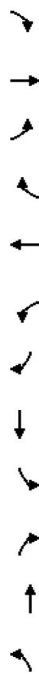
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	24	1249	141	156	629	132	120	177	194	178	199	36
Traffic Volume (vph)	24	1249	141	156	629	132	120	177	194	178	199	36
Future Volume (vph)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Ideal Flow (vphpl)	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2	3.2	3.5	3.2
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)	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00	0.90	1.00	1.00	0.91	1.00	1.00	0.84
Frbp. ped/bikes	0.95	1.00	0.85	1.00	1.00	0.85	1.00	0.85	1.00	0.97	1.00	0.85
Flt	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)	1669	3500	1220	1658	3500	1373	1649	1879	1385	1673	1824	1295
Flt Permitted	0.39	1.00	1.00	0.08	1.00	1.00	0.47	1.00	1.00	0.53	1.00	1.00
Satd. Flow (perm)	688	3500	1220	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	1388	153	170	684	143	130	192	211	193	216	39
RTOR Reduction (vph)	0	0	60	0	0	38	0	0	171	0	0	32
Lane Group Flow (vph)	26	1388	93	170	684	105	130	192	40	193	216	7
Conf. Peds. (#/hr)	30	55	55	30	91	30	91	50	50	50	50	91
Heavy Vehicles (%)	0%	2%	5%	4%	2%	1%	0%	0%	0%	1%	0%	3%
Turn Type	Perm	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm
Permitted Phases	4	4	4	8	8	8	5	2	2	1	6	6
Actuated Green, G (s)	44.5	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	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	0.44	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	6.4	3.0	6.4	3.0	7.0	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	3.0
Lane Grp Cap (vph)	306	1557	542	282	2110	827	239	325	239	262	315	224
v/s Ratio Prot	c0.39	c0.08	0.20	0.03	0.10	0.03	0.10	0.03	0.10	c0.04	0.12	0.12
v/s Ratio Perm	0.04	0.08	0.29	0.08	0.09	0.08	0.09	0.03	0.03	c0.13	0.13	0.01
Uniform Delay, d1	16.0	25.2	16.7	20.0	9.8	8.5	32.4	38.1	35.2	34.7	38.8	34.4
Progression Factor	0.48	0.54	0.19	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.05	1.06
Incremental Delay, d2	0.1	2.6	0.1	3.6	0.1	0.1	2.5	7.7	1.5	10.3	11.5	0.2
Delay (s)	7.8	16.2	3.3	23.6	9.9	8.6	34.9	45.8	36.7	46.7	52.5	34.6
Level of Service	A	B	A	C	A	A	C	D	D	D	D	C
Approach Delay (s)	14.7			12.0			39.5			48.5		
Approach LOS	B			B			D			D		

Intersection Summary	Value	Unit
HCM 2000 Control Delay	22.0	s
HCM 2000 Volume to Capacity ratio	0.79	
Actuated Cycle Length (s)	100.0	s
Intersection Capacity Utilization	88.9%	%
Analysis Period (min)	15	min
Critical Lane Group		

FTPM2 2033 Opt-Signal syn  
 Synchro 9 Report  
 Page 1

HCM Signalized Intersection Capacity Analysis  
 2: Liverpool Rd & Kingston Rd

19225 | 1294 Kingston Rd  
 2033 FT PM: Option 2 (Optimized)



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR
Lane Configurations	←	←	←	←	←	←	←	←	←	←	←
Traffic Volume (vph)	244	1096	330	226	538	85	302	957	278	119	387
Future Volume (vph)	244	1096	330	226	538	85	302	957	278	119	387
Ideal Flow (vphpl)	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	3.5	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
Frbp, ped/bikes	1.00	1.00	0.94	1.00	1.00	0.95	1.00	1.00	0.91	1.00	0.99
Frbp, ped/bikes	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97
Frbp	0.95	1.00	1.00	0.95	1.00	0.95	1.00	1.00	0.95	1.00	0.95
Satd. Flow (prot)	1700	3500	1416	1708	3500	1431	1678	3535	1363	1672	4899
Flt Permitted	0.33	1.00	1.00	0.12	1.00	1.00	0.35	1.00	1.00	0.19	1.00
Satd. Flow (perm)	584	3500	1416	222	3500	1431	621	3535	1363	332	4899
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
Adj. Flow (vph)	265	1191	359	246	585	92	328	1040	302	129	421
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	149	0	36
Lane Group Flow (vph)	265	1191	359	246	585	92	328	1040	153	129	480
Conf. Peds. (#/hr)	26	32	32	32	26	34	26	34	48	48	34
Heavy Vehicles (%)	1%	2%	2%	1%	2%	2%	2%	1%	3%	3%	0%
Turn Type	pm-pt	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm	pm-pt	NA
Permitted Phases	7	4	4	8	8	8	5	2	2	6	6
Actuated Green, G (s)	46.4	34.2	34.2	42.8	32.4	32.4	38.1	30.1	30.1	26.2	21.2
Effective Green, g (s)	46.4	34.2	34.2	42.8	32.4	32.4	38.1	30.1	30.1	26.2	21.2
Actuated g/C Ratio	0.46	0.34	0.34	0.43	0.32	0.32	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)	407	1197	484	249	1134	463	383	1064	410	153	1038
v/s Ratio Prot	c0.08	c0.34	c0.10	0.17	c0.12	c0.29	c0.29	c0.29	0.04	0.10	0.10
v/s Ratio Perm	0.22	0.25	0.32	0.06	0.21	0.06	0.21	0.11	0.11	0.18	0.18
Uniform Delay, d1	17.5	32.8	29.0	25.5	27.4	24.4	24.5	34.6	27.5	33.1	34.4
Progression Factor	1.00	1.00	1.00	1.39	1.45	1.46	1.00	1.00	1.00	1.08	0.97
Incremental Delay, d2	3.7	24.8	9.8	52.2	1.6	0.9	16.9	22.0	0.6	31.9	0.3
Delay (s)	21.3	57.7	38.9	87.6	41.3	36.5	41.4	56.6	28.1	67.6	33.9
Level of Service	C	E	D	F	D	D	D	E	C	E	C
Approach Delay (s)	48.6			53.2			48.5			40.6	
Approach LOS	D			D			D			D	

Intersection Summary	Value
HCM 2000 Control Delay	48.4
HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.01
Actuated Cycle Length (s)	100.0
Intersection Capacity Utilization	94.4%
Analysis Period (min)	15
Critical Lane Group	

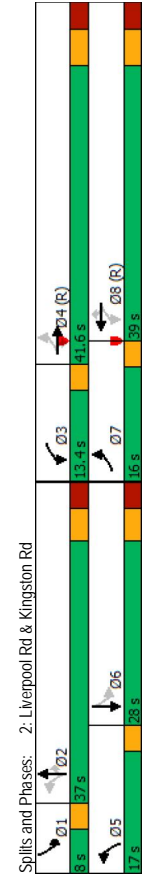
Queues  
 2: Liverpool Rd & Kingston Rd

19225 | 1294 Kingston Rd  
 2033 FT PM: Option 2 (Optimized)



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR
Lane Configurations	←	←	←	←	←	←	←	←	←	←	←
Traffic Volume (vph)	244	1096	330	226	538	85	302	957	278	119	387
Future Volume (vph)	244	1096	330	226	538	85	302	957	278	119	387
Lane Group Flow (vph)	265	1191	359	246	585	92	328	1040	302	129	480
Turn Type	pm-pt	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm	pm-pt	NA
Projected Phases	7	4	4	8	8	8	5	2	2	6	6
Permitted Phases	7	4	4	8	8	8	5	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	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	41.6	41.6	13.4	39.0	39.0	17.0	37.0	37.0	8.0	28.0
Total Split (%)	16.0%	41.6%	41.6%	13.4%	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	None	None	C-Min	None	None	C-Min	None	None	C-Min
v/c Ratio	0.61	0.99	0.74	0.95	0.52	0.20	0.81	0.98	0.54	0.78	0.48
Control Delay	20.4	58.5	40.0	75.1	42.1	37.9	38.7	58.2	13.0	55.1	32.3
Queue Delay	0.5	0.0	0.0	0.0	0.0	0.0	0.0	12.7	0.0	0.0	0.0
Total Delay	20.9	58.5	40.0	75.1	42.1	37.9	38.7	70.9	13.0	55.1	32.3
Queue Length 50th (m)	29.3	126.2	63.9	41.0	64.6	16.8	47.1	110.1	13.5	12.6	30.2
Queue Length 95th (m)	46.2	#175.3	#102.0	#82.8	80.4	32.0	#85.4	#155.0	40.1	#40.3	45.8
Internal Link Dist (m)								242.2			
Turn Bay Length (m)	33.5	49.1	103.2	61.6	46.2	61.6	46.2	51.8	30.0	30.0	30.0
Base Capacity (vph)	445	1197	484	259	1134	463	407	1064	559	166	1072
Stallion Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	29	0	0	0	0	0	0	53	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.64	0.99	0.74	0.95	0.52	0.20	0.81	1.03	0.54	0.78	0.48

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.





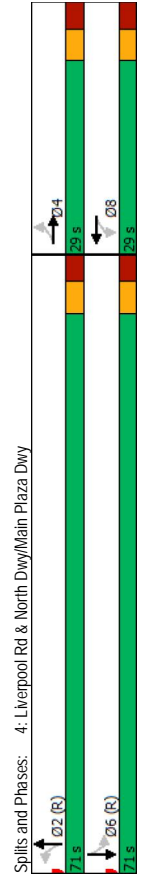
Queues  
4: Liverpool Rd & North Dwy/Main Plaza Dwy

HCM Unsignalized Intersection Capacity Analysis  
3: Liverpool Rd & South Dwy

19225 | 1294 Kingston Rd  
2033 FT PM: Option 2 (Optimized)

19225 | 1294 Kingston Rd  
2033 FT PM: Option 2 (Optimized)

Movement	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (veh/h)	40	0	123	0	100	939	76	397
Future Volume (veh/h)	40	0	123	0	100	939	76	397
Lane Group Flow (vph)	43	51	134	107	109	1289	83	491
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Projected Phases	4	4	8	8	2	2	6	6
Permitted Phases	4	4	8	8	2	2	6	6
Detector Phase								
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	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	0.0
Total Lost Time (s)	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9
LeadLag								
LeadLag Optimize?								
Recall Mode	None	None	None	None	C-Min	C-Min	C-Min	C-Min
v/c Ratio	0.22	0.08	0.66	0.31	0.18	0.53	0.36	0.20
Control Delay	37.6	0.3	54.8	6.9	3.2	4.6	11.3	4.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.8	0.0	0.0
Total Delay	37.6	0.3	54.8	6.9	3.2	5.4	11.3	4.4
Queue Length 50th (m)	7.8	0.0	26.1	0.0	1.7	8.6	5.4	10.9
Queue Length 95th (m)	16.8	0.0	43.0	10.5	m8.9	m19.6	13.4	18.8
Internal Link Dist (m)	19.8		34.1		56.6		192.1	
Turn Bay Length (m)			30.0		30.0		30.0	
Base Capacity (vph)	275	696	289	442	602	2418	232	2436
Starvation Cap Reductn	0	0	0	0	0	741	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.16	0.07	0.46	0.24	0.18	0.77	0.36	0.20



Spills and Phases: 4: Liverpool Rd & North Dwy/Main Plaza Dwy

FTPM2 2033 Opt-Signal.syn

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔
Traffic Volume (veh/h)	0	26	0	1286	567	0
Future Volume (veh/h)	0	26	0	1286	567	0
Sign Control	Slop	Free	Free	Free	Free	Free
Grade	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	28	0	1398	616	0
Pedestrians	4					
Lane Width (m)	3.2					
Walking Speed (m/s)	1.2					
Percent Blockage	0					
Right turn flare (veh)				None	TWLT	2
Median storage (veh)						
Upstream signal (m)	0.71			59	80	
pX, platoon unblocked						
vC, conflicting volume	1319	209	620			
vC1, stage 1 conf vol	620					
vC2, stage 2 conf vol	699					
vCu, unblocked vol	630	209	620			
IC, single (s)	6.8	6.9	4.1			
IC, 2 stage (s)	5.8					
IF (s)	3.5	3.3	2.2			
p0 queue free %	100	97	100			
cM capacity (veh/h)	464	800	967			
Direction, Lane #	EB.1	NB.1	NB.2	SB.1	SB.2	SB.3
Volume Total	28	699	699	205	205	205
Volume Left	0	0	0	0	0	0
Volume Right	28	0	0	0	0	0
cSH	800	1700	1700	1700	1700	1700
Volume to Capacity	0.03	0.41	0.41	0.12	0.12	0.12
Queue Length 95th (m)	0.9	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	9.7	0.0	0.0	0.0	0.0	0.0
Lane LOS	A					
Approach Delay (s)	9.7	0.0		0.0		
Approach LOS	A					
<b>Intersection Summary</b>						
Average Delay	0.1					
Intersection Capacity Utilization	38.9%					
ICU Level of Service	A					
Analysis Period (min)	15					

FTPM2 2033 Opt-Signal.syn

Queues  
6: Liverpool Rd & Glenanna Rd

HCM Signalized Intersection Capacity Analysis  
4: Liverpool Rd & North Dwy/Main Plaza Dwy

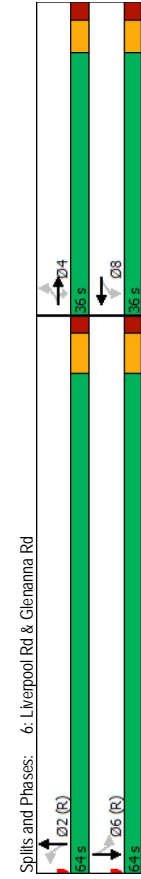
19225 | 1294 Kingston Rd  
2033 FT PM: Option 2 (Optimized)

19225 | 1294 Kingston Rd  
2033 FT PM: Option 2 (Optimized)



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Configurations	4	4	4	8	8	8	2	2	6	6
Traffic Volume (vph)	45	72	112	54	145	348	656	67	361	361
Future Volume (vph)	45	72	112	54	145	348	656	67	361	361
Ideal Flow (vphpl)	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	3.5
Total Lost Time (s)	6.9	6.9	6.9	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	1.00	1.00	1.00	1.00	1.00	1.00
Frbp, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frbp, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1722	1575	1722	1560	1722	1560	1710	3388	1716	3430
Flt Permitted	0.69	1.00	0.72	1.00	0.47	1.00	0.47	1.00	0.18	1.00
Satd. Flow (perm)	1247	1575	1312	1560	851	3388	329	3430	329	3430
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	43	0	51	134	0	107	109	1021	268	83
RTOR Reduction (vph)	0	43	0	0	91	0	0	19	0	0
Lane Group Flow (vph)	43	8	0	134	16	0	109	1270	0	83
Conf. Peds. (#/hr)	1	0	1	1	1	1	6	15	15	6
Heavy Vehicles (%)	0%	0%	0%	0%	0%	1%	0%	1%	0%	2%
Turn Type	Perm	NA	NA	Perm	NA	NA	Perm	NA	Perm	NA
Protected Phases	4	4	4	8	8	8	2	2	6	6
Permitted Phases	4	4	4	8	8	8	2	2	6	6
Actuated Green, G (s)	15.4	15.4	15.4	15.4	15.4	15.4	70.8	70.8	70.8	70.8
Effective Green, g (s)	15.4	15.4	15.4	15.4	15.4	15.4	70.8	70.8	70.8	70.8
Actuated g/C Ratio	0.15	0.15	0.15	0.15	0.15	0.15	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	6.9	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
Lane Grp Cap (vph)	192	242	202	240	602	2398	232	2428	232	2428
v/s Ratio Prot	0.03	0.00	0.01	0.01	0.01	0.01	c0.37	0.14	0.25	0.14
v/s Ratio Perm	0.22	0.03	0.66	0.07	0.18	0.53	0.13	0.36	0.20	0.20
Uniform Delay, d1	37.1	36.0	39.9	36.2	4.9	6.8	5.7	5.0	5.0	5.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.47	0.58	0.86	0.82
Incremental Delay, d2	0.6	0.1	7.9	0.1	0.3	0.4	4.2	0.2	4.2	0.2
Delay (s)	37.7	36.0	47.8	36.3	2.6	4.3	9.1	4.2	9.1	4.2
Level of Service	D	D	D	D	D	D	A	A	A	A
Approach Delay (s)	36.8	D	42.7	42.7	4.2	4.2	4.2	4.9	4.9	4.9
Approach LOS	D	D	D	D	D	D	A	A	A	A

Intersection Summary	
HCM 2000 Control Delay	9.7
HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.55
Actuated Cycle Length (s)	100.0
Sum of lost time (s)	13.8
Intersection Capacity Utilization	69.1%
ICU Level of Service	C
Analysis Period (min)	15
Critical Lane Group	C



FTPM2 2033 Opt+Signal.syn

FTPM2 2033 Opt+Signal.syn

HCM Signalized Intersection Capacity Analysis  
 6: Liverpool Rd & Glenanna Rd

19225 | 1294 Kingston Rd  
 2033 FT PM: Option 2 (Optimized)

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	45	72	112	54	145	44	348	656	73	67	361	30
Future Volume (vph)	45	72	112	54	145	44	348	656	73	67	361	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	5.9	6.7	6.7	6.7	6.7	6.7	6.7
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frbp. ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frbp. ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	0.97	1.00	0.99	1.00	0.99	1.00	0.99	1.00
Flt Protected	0.95	1.00	1.00	0.95	1.00	0.95	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1725	1824	1543	1725	1791	1708	3451	1708	3451	1708	3528	3528
Flt Permitted	0.43	1.00	1.00	0.71	1.00	0.50	1.00	0.34	1.00	0.34	1.00	1.00
Satd. Flow (perm)	788	1824	1543	1282	1791	906	3451	616	3528	616	3528	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	122	59	158	48	378	713	73	392	33	33
RTOR Reduction (vph)	0	0	102	0	13	0	0	6	0	0	4	4
Lane Group Flow (vph)	49	78	20	59	193	0	378	786	0	73	421	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	Perm	NA	NA
Protected Phases	4		4	8		8		2		6		6
Permitted Phases	4		4	8		8		2		6		6
Actuated Green, G (s)	16.0	16.0	16.0	16.0	16.0	16.0	71.4	71.4	71.4	71.4	71.4	71.4
Effective Green, g (s)	16.0	16.0	16.0	16.0	16.0	16.0	71.4	71.4	71.4	71.4	71.4	71.4
Actuated g/C Ratio	0.16	0.16	0.16	0.16	0.16	0.16	0.71	0.71	0.71	0.71	0.71	0.71
Clearance Time (s)	5.9	5.9	5.9	5.9	5.9	5.9	6.7	6.7	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	3.0	3.0	3.0
Lane Grp Cap (vph)	126	291	246	205	286	646	2464	439	2518	439	2518	2518
w/s Ratio Prot	0.04			c0.11		c0.11		0.23		0.12		0.12
w/s Ratio Perm	0.06		0.01	0.05		c0.42		0.12		0.12		0.12
w/c Ratio	0.39	0.27	0.08	0.29	0.67	0.59	0.32	0.17	0.17	0.17	0.17	0.17
Uniform Delay, d1	37.6	36.9	35.7	37.0	39.5	7.0	5.3	4.6	4.6	4.6	4.6	4.6
Progression Factor	1.00	1.00	1.00	0.71	0.78	0.42	0.43	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.0	0.5	0.1	0.8	6.0	3.4	0.3	0.8	0.1	0.8	0.1	0.1
Delay (s)	39.6	37.4	35.9	27.0	36.8	6.4	2.6	5.5	4.8	5.5	4.8	4.8
Level of Service	D	D	D	C	D	A	A	A	A	A	A	A
Approach Delay (s)			37.1		34.6		3.8		4.9		4.9	
Approach LOS			D		C		A		A		A	
<b>Intersection Summary</b>												
HCM 2000 Control Delay	11.6 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	68.2% ICU Level of Service C											
Analysis Period (min)	15											
c Critical Lane Group												



# APPENDIX H

Signal Warrant Analyses

The background of the page features several thick, overlapping, light grey curved lines that sweep across the frame from the top and right towards the bottom and left, creating a sense of motion and depth.

Existing Traffic

**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

Start Time	Liverpool Road Southbound					Private Access Westbound					Liverpool Road Northbound					1848-1852 Liverpool Rd. North Dwy. Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. 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

Start Time	Liverpool Road Southbound					Private Access Westbound					Liverpool Road Northbound					1848-1852 Liverpool Rd. North Dwy. Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. 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  
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File Name : 19225\_Liverpool\_1294Kingston NorthAll  
 Site Code : 19225130  
 Start Date : 2019-03-19  
 Page No : 3

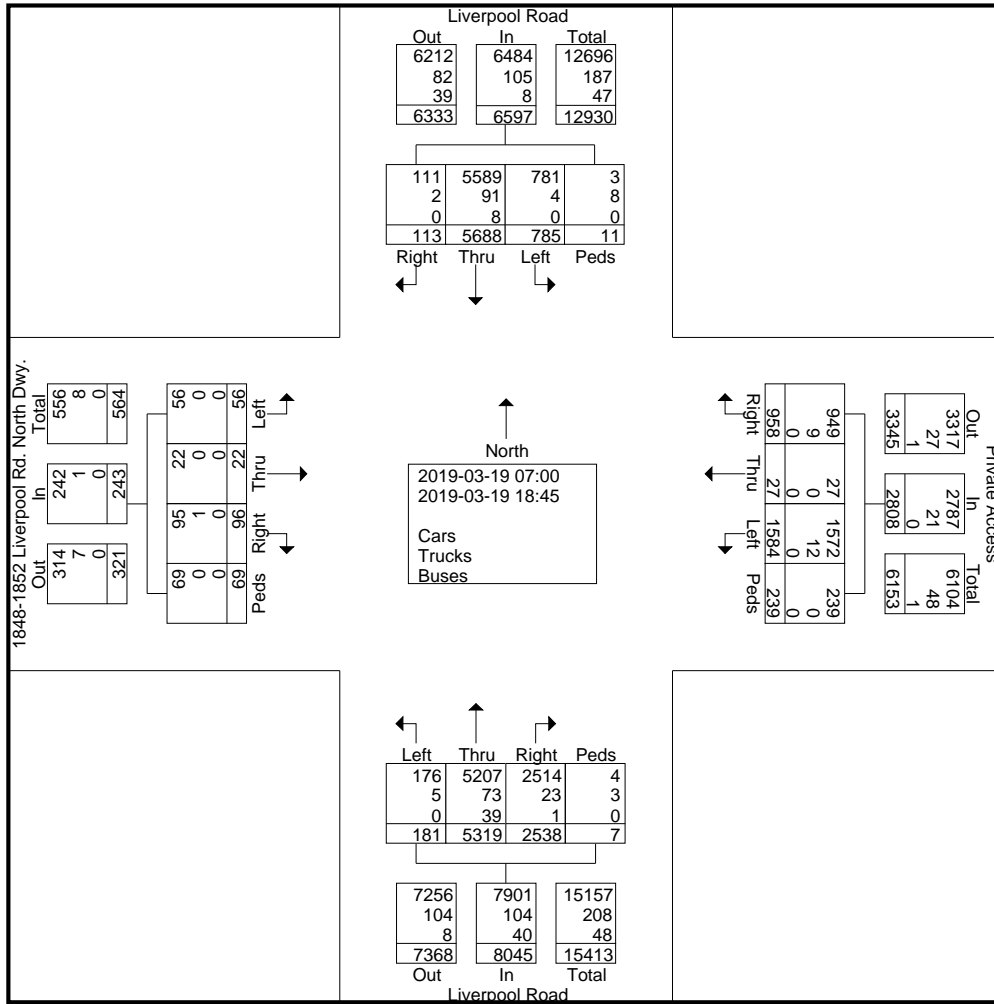




EXHIBIT H1

Liverpool Road at North Site Driveway/Private Access  
19225.200

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

Time Start	Liverpool Road								North Site Driveway			Private Driveway			Total All	Hourly	% of peak hour
	Northbound			Ped X	Southbound			Ped X	Eastbound			Westbound					
	Left	Through	Right		Left	Through	Right		Left	Through	Right	Left	Through	Right			
7:00	2	53	16	0	15	182	5	0	0	0	1	18	0	9	301		
7:15	6	68	22	0	15	221	2	0	0	0	3	23	0	12	372		
7:30	3	75	27	0	10	194	3	0	0	0	2	17	0	10	341		
7:45	2	101	24	0	21	202	4	0	1	0	0	28	0	15	398	1412	68%
8:00	6	67	28	0	32	234	2	0	1	0	3	35	2	12	422		
8:15	5	70	35	0	24	198	4	0	0	0	3	19	1	17	376		
8:30	6	68	46	0	18	168	2	0	0	2	3	28	0	16	357		
8:45	2	80	50	0	23	189	6	1	2	1	1	23	0	16	394	1549	75%
9:00	3	58	58	0	26	141	3	0	1	0	0	32	0	15	337		
9:15	1	57	54	1	21	131	0	0	0	0	1	23	1	18	308		
9:30	3	57	40	0	19	134	3	0	1	0	0	28	0	22	307		
9:45	0	41	42	0	18	98	1	0	0	1	2	33	0	17	253	1205	58%
10:00	3	55	35	0	13	86	2	0	0	1	2	34	0	6	237		
10:15	3	42	29	0	15	88	2	1	1	1	0	33	1	13	229		
10:30	4	54	43	0	19	87	1	0	0	2	1	23	0	18	252		
10:45	6	66	62	0	22	92	1	0	1	0	0	39	1	13	303	1021	49%
11:00	0	75	54	0	29	76	1	0	0	0	2	34	0	16	287		
11:15	4	80	45	0	9	94	0	0	0	0	2	35	1	18	288		
11:30	3	76	62	0	13	86	1	0	1	1	0	32	0	24	299		
11:45	3	89	81	0	11	104	0	0	0	0	1	41	0	16	346	1220	59%
12:00	3	99	56	0	18	85	1	0	1	1	0	52	4	18	338		
12:15	3	88	68	0	15	92	0	0	0	1	2	50	0	29	348		
12:30	3	88	59	0	15	87	2	0	2	1	3	45	1	19	325		
12:45	2	62	55	0	23	107	2	0	0	1	1	50	1	25	329	1340	65%
13:00	1	82	56	0	11	73	6	0	1	0	1	48	1	20	300		
13:15	2	72	58	0	12	72	6	0	0	0	2	40	0	22	286		
13:30	6	103	49	0	11	78	1	0	2	0	2	43	1	19	315		
13:45	3	84	69	0	15	97	1	0	2	1	0	33	0	13	318	1219	59%
14:00	1	96	49	0	13	95	1	0	2	0	0	40	0	21	318		
14:15	2	97	49	0	24	104	6	0	1	0	1	33	1	22	340		
14:30	5	95	51	0	15	97	0	0	1	1	4	39	1	23	332		
14:45	2	108	73	0	14	88	3	0	2	0	2	37	1	33	363	1353	65%
15:00	2	133	46	0	14	93	1	0	0	1	1	35	1	32	359		
15:15	5	141	67	0	15	67	1	0	2	0	3	31	0	20	352		
15:30	4	152	70	0	17	104	3	0	0	0	3	42	0	18	413		
15:45	5	138	52	0	13	121	3	0	4	2	1	34	1	23	397	1521	73%
16:00	3	145	53	0	15	104	0	0	3	0	0	31	1	27	382		
16:15	0	158	55	0	13	109	3	0	0	0	1	24	0	24	387		
16:30	7	226	76	1	13	93	5	0	1	1	3	29	0	23	478		
16:45	7	171	61	0	12	106	2	0	2	1	2	35	1	21	421	1668	80%
17:00	5	221	56	0	17	121	3	0	1	0	7	28	1	30	490		
17:15	9	252	74	1	10	122	7	1	1	0	6	31	1	38	553		
17:30	10	241	72	0	8	101	5	0	9	0	4	27	1	17	495		
17:45	12	234	62	0	15	149	1	0	3	0	9	28	1	23	537	2075	100%
18:00	6	203	74	1	24	148	3	0	2	0	6	31	0	25	523		
18:15	3	173	62	0	17	161	1	0	3	1	3	31	1	24	480		
18:30	2	162	66	0	10	99	1	0	2	0	1	24	0	22	389		
18:45	3	163	47	0	13	110	2	0	0	1	1	35	0	24	399	1791	86%
	181	5319	2538		785	5688	113		56	22	96	1584	27	958			

Hourly Summary

Hour Starting	Northbound			South Side Pedestrians	Southbound			North Side Pedestrians	Eastbound			West Side Pedestrians	Westbound			East Side Pedestrians	Total Volume	Ranking	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 Driveway (Existing)

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)			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	1	0	6	61	799	14	86	0	46	0
8:00	19	285	159	3	3	10	97	789	14	105	3	61	1
12:00	11	337	238	3	4	6	71	371	5	197	6	91	0
14:00	10	396	222	6	1	7	66	384	10	149	3	99	0
15:00	16	564	235	6	3	8	59	385	8	142	2	93	0
16:00	17	700	245	6	2	6	53	412	10	119	2	95	1
17:00	36	948	264	14	0	26	50	493	16	114	4	108	2
18:00	14	701	249	7	2	11	64	518	7	121	1	95	1
<b>Total</b>	<b>136</b>	<b>4,228</b>	<b>1,701</b>	<b>46</b>	<b>15</b>	<b>80</b>	<b>521</b>	<b>4,151</b>	<b>84</b>	<b>1,033</b>	<b>21</b>	<b>688</b>	<b>5</b>

## Justification 5: Collision Experience

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

\* Include only collisions that are susceptible 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	0	5	0	0	0	0	0	0	5
Factored 8 hour pedestrian volume	5		0		0		0		
% Assigned to crossing rate	100%		50%		0%		0%		
Net 8 Hour Pedestrian Volume at Crossing									5
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	0	5	0	0	0	0	0	0	5
Total 8 hour pedestrians delayed greater than 10 seconds	0	5	0	0	0	0	0	0	
Factored volume of total pedestrians	5		0		0		0		
Factored volume of delayed pedestrians	5		0		0		0		
% Assigned to Crossing Rate	100%		50%		0%		0%		
Net 8 Hour Volume of Total Pedestrians									5
Net 8 Hour Volume of Delayed Pedestrians									5

**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		
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>										
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	139	185	307	265	254	230	266	237		
	COMPLIANCE %				82	100	100	100	100	100	100	100	782	98
<b>Restricted Flow</b>					Both 1A and 1B 100% fulfilled each of 8 hours								Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
<b>Signal Justification 1:</b>					Lesser of 1A or 1B at least 80% fulfilled each of 8 hours								Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>

**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		
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>										
2A	480	720	600	900	1,273	1,363	1,033	1,088	1,267	1,437	1,807	1,553		
	COMPLIANCE %				100	100	100	100	100	100	100	100	800	100
2B	50	75	50	75	87	112	206	158	151	128	134	131		
	COMPLIANCE %				100	100	100	100	100	100	100	100	800	100
<b>Restricted Flow</b>					Both 2A and 2B 100% fulfilled each of 8 hours								Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
<b>Signal Justification 2:</b>					Lesser of 2A or 2B at least 80% fulfilled each of 8 hours								Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>

**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 <input checked="" type="checkbox"/>	NO <input type="checkbox"/>	YES <input checked="" type="checkbox"/>	NO <input type="checkbox"/>
Justification 2	Delay Cross Traffic	YES <input checked="" type="checkbox"/>	NO <input type="checkbox"/>	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	1,363	169	115	100 %	100 %
	16:00	1,437	216	115	100 %	
	17:00	1,807	226	115	100 %	
	18:00	1,553	217	115	100 %	

**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 I Count Date: 2019-03-19

## Summary Results

	Justification	Compliance	Signal Justified?	
			YES	NO
1. Minimum Vehicular Volume	A Total Volume	100 %	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	B Crossing Volume	98 %	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2. Delay to Cross Traffic	A Main Road	100 %	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	B Crossing Road	100 %	<input checked="" type="checkbox"/>	<input type="checkbox"/>
3. Combination	A Justificaton 1	98 %	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	B Justification 2	100 %	<input checked="" type="checkbox"/>	<input type="checkbox"/>
4. 4-Hr Volume		100 %	<input checked="" type="checkbox"/>	<input type="checkbox"/>

5. Collision Experience		0 %	<input type="checkbox"/>	<input checked="" type="checkbox"/>
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6. Pedestrians	A Volume	Justification not met	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	B Delay	Justification not met	<input type="checkbox"/>	<input checked="" type="checkbox"/>



Future Total 2028

EXHIBIT H1

Liverpool Road at North Site Driveway/Private Access  
19225.200

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

Time Start	Liverpool Road								North Site Driveway			Private Driveway			Total All	Hourly	% of peak hour
	Northbound			Ped X	Southbound			Ped X	Eastbound			Westbound					
	Left	Through	Right		SS	Left	Through		Right	NS	Left	Through	Right	Left			
7:00	2	53	16	0	15	182	5	0	0	0	1	18	0	9	301		
7:15	6	68	22	0	15	221	2	0	0	0	3	23	0	12	372		
7:30	3	75	27	0	10	194	3	0	0	0	2	17	0	10	341		
7:45	2	101	24	0	21	202	4	0	1	0	0	28	0	15	398	1412	68%
8:00	6	67	28	0	32	234	2	0	1	0	3	35	2	12	422		
8:15	5	70	35	0	24	198	4	0	0	0	3	19	1	17	376		
8:30	6	68	46	0	18	168	2	0	0	2	3	28	0	16	357		
8:45	2	80	50	0	23	189	6	1	2	1	1	23	0	16	394	1549	75%
9:00	3	58	58	0	26	141	3	0	1	0	0	32	0	15	337		
9:15	1	57	54	1	21	131	0	0	0	0	1	23	1	18	308		
9:30	3	57	40	0	19	134	3	0	1	0	0	28	0	22	307		
9:45	0	41	42	0	18	98	1	0	0	1	2	33	0	17	253	1205	58%
10:00	3	55	35	0	13	86	2	0	0	1	2	34	0	6	237		
10:15	3	42	29	0	15	88	2	1	1	1	0	33	1	13	229		
10:30	4	54	43	0	19	87	1	0	0	2	1	23	0	18	252		
10:45	6	66	62	0	22	92	1	0	1	0	0	39	1	13	303	1021	49%
11:00	0	75	54	0	29	76	1	0	0	0	2	34	0	16	287		
11:15	4	80	45	0	9	94	0	0	0	0	2	35	1	18	288		
11:30	3	76	62	0	13	86	1	0	1	1	0	32	0	24	299		
11:45	3	89	81	0	11	104	0	0	0	0	1	41	0	16	346	1220	59%
12:00	3	99	56	0	18	85	1	0	1	1	0	52	4	18	338		
12:15	3	88	68	0	15	92	0	0	0	1	2	50	0	29	348		
12:30	3	88	59	0	15	87	2	0	2	1	3	45	1	19	325		
12:45	2	62	55	0	23	107	2	0	0	1	1	50	1	25	329	1340	65%
13:00	1	82	56	0	11	73	6	0	1	0	1	48	1	20	300		
13:15	2	72	58	0	12	72	6	0	0	0	2	40	0	22	286		
13:30	6	103	49	0	11	78	1	0	2	0	2	43	1	19	315		
13:45	3	84	69	0	15	97	1	0	2	1	0	33	0	13	318	1219	59%
14:00	1	96	49	0	13	95	1	0	2	0	0	40	0	21	318		
14:15	2	97	49	0	24	104	6	0	1	0	1	33	1	22	340		
14:30	5	95	51	0	15	97	0	0	1	1	4	39	1	23	332		
14:45	2	108	73	0	14	88	3	0	2	0	2	37	1	33	363	1353	65%
15:00	2	133	46	0	14	93	1	0	0	1	1	35	1	32	359		
15:15	5	141	67	0	15	67	1	0	2	0	3	31	0	20	352		
15:30	4	152	70	0	17	104	3	0	0	0	3	42	0	18	413		
15:45	5	138	52	0	13	121	3	0	4	2	1	34	1	23	397	1521	73%
16:00	3	145	53	0	15	104	0	0	3	0	0	31	1	27	382		
16:15	0	158	55	0	13	109	3	0	0	0	1	24	0	24	387		
16:30	7	226	76	1	13	93	5	0	1	1	3	29	0	23	478		
16:45	7	171	61	0	12	106	2	0	2	1	2	35	1	21	421	1668	80%
17:00	5	221	56	0	17	121	3	0	1	0	7	28	1	30	490		
17:15	9	252	74	1	10	122	7	1	1	0	6	31	1	38	553		
17:30	10	241	72	0	8	101	5	0	9	0	4	27	1	17	495		
17:45	12	234	62	0	15	149	1	0	3	0	9	28	1	23	537	2075	100%
18:00	6	203	74	1	24	148	3	0	2	0	6	31	0	25	523		
18:15	3	173	62	0	17	161	1	0	3	1	3	31	1	24	480		
18:30	2	162	66	0	10	99	1	0	2	0	1	24	0	22	389		
18:45	3	163	47	0	13	110	2	0	0	1	1	35	0	24	399	1791	86%
	181	5319	2538		785	5688	113		56	22	96	1584	27	958			

Hourly Summary

Hour Starting	Northbound			South Side Pedestrians	Southbound			North Side Pedestrians	Eastbound			West Side Pedestrians	Westbound			East Side Pedestrians	Total Volume	Ranking	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					



EXHIBIT H2  
RESIDENTIAL PROXY SITE SURVEY  
19225.200

Survey Date: Tuesday March 19, 2019  
Location: 1000-1200 The Esplanade North

Municipality: City of Pickering

Time Start	Residential Driveways								Gated Driveways								Total			
	Inbound		Outbound		Total				Inbound		Outbound		Total				In	Out	All	Hourly
	Left	Right	Left	Right	In	Out	Two-way	Hourly	Left	Right	Left	Right	In	Out	Two-way	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
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
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
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	

<-- Peak Hour

<-- Peak Hour

<-- Peak Hour

Hourly Summary

Hour Start	Residential Driveways								Gated Driveways								Total				% of peak hour	Ranking
	Inbound		Outbound		Total				Inbound		Outbound		Total				In	Out	All	Hourly		
	Left	Right	Left	Right	In	Out	Two-way	Hourly	Left	Right	Left	Right	In	Out	Two-way	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







# Input Data Sheet

Analysis Sheet

Results Sheet

Proposed Collision

GO TO Justification:

What are the intersecting roadways?

Liverpool Rd. at Subject Site North Driveway (Future Total 2028)

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	64	320	89	26	0	24	61	808	35	86	0	46	1
8:00	91	309	159	36	0	35	97	798	49	105	0	61	4
12:00	71	358	238	28	0	27	71	379	38	197	0	91	8
14:00	95	415	222	38	0	36	66	391	52	149	0	99	7
15:00	100	586	235	40	0	38	59	394	54	142	0	93	13
16:00	76	727	245	31	0	29	53	423	41	119	0	95	7
17:00	91	982	264	36	0	35	50	506	49	114	0	108	7
18:00	76	730	249	31	0	28	64	530	41	121	0	95	8
<b>Total</b>	<b>664</b>	<b>4,427</b>	<b>1,701</b>	<b>266</b>	<b>0</b>	<b>252</b>	<b>521</b>	<b>4,229</b>	<b>359</b>	<b>1,033</b>	<b>0</b>	<b>688</b>	<b>55</b>

## Justification 5: Collision Experience

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

\* Include only collisions that are susceptible 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	0	5	0	0	0	0	0	0	
Factored 8 hour pedestrian volume	5		0		0		0		
% Assigned to crossing rate	100%		50%		0%		0%		
Net 8 Hour Pedestrian Volume at Crossing									5
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	0	5	0	0	0	0	0	0	
Total 8 hour pedestrians delayed greater than 10 seconds	0	5	0	0	0	0	0	0	
Factored volume of total pedestrians	5		0		0		0		
Factored volume of delayed pedestrians	5		0		0		0		
% Assigned to Crossing Rate	100%		50%		0%		0%		
Net 8 Hour Volume of Total Pedestrians									5
Net 8 Hour Volume of Delayed Pedestrians									5

**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		
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>										
1A	480	720	600	900	1,559	1,740	1,498	1,563	1,741	1,839	2,235	1,965		
	COMPLIANCE %				100	100	100	100	100	100	100	100	800	100
1B	120	170	120	170	182	237	343	322	313	274	293	275		
	COMPLIANCE %				100	100	100	100	100	100	100	100	800	100
<b>Restricted Flow</b>					Both 1A and 1B 100% fulfilled each of 8 hours								Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
<b>Signal Justification 1:</b>					Lesser of 1A or 1B at least 80% fulfilled each of 8 hours								Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>

**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		
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>										
2A	480	720	600	900	1,377	1,503	1,155	1,241	1,428	1,565	1,942	1,690		
	COMPLIANCE %				100	100	100	100	100	100	100	100	800	100
2B	50	75	50	75	113	145	233	194	195	157	157	160		
	COMPLIANCE %				100	100	100	100	100	100	100	100	800	100
<b>Restricted Flow</b>					Both 2A and 2B 100% fulfilled each of 8 hours								Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
<b>Signal Justification 2:</b>					Lesser of 2A or 2B at least 80% fulfilled each of 8 hours								Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>

**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 <input checked="" type="checkbox"/>	NO <input type="checkbox"/>	YES <input checked="" type="checkbox"/>	NO <input type="checkbox"/>
Justification 2	Delay Cross Traffic	YES <input checked="" type="checkbox"/>	NO <input type="checkbox"/>	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	1,503	166	115	100 %	100 %
	16:00	1,565	214	115	100 %	
	17:00	1,942	222	115	100 %	
	18:00	1,690	216	115	100 %	

Intersection: Liverpool Rd. at Subject Site North Driveway (Future Total 202 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 (Future Count Date: 2019-03-19)

## Summary Results

Justification		Compliance		Signal Justified?	
				YES	NO
1. Minimum Vehicular Volume	A Total Volume	100	%	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	B Crossing Volume	100	%	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2. Delay to Cross Traffic	A Main Road	100	%	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	B Crossing Road	100	%	<input checked="" type="checkbox"/>	<input type="checkbox"/>
3. Combination	A Justificaton 1	100	%	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	B Justification 2	100	%	<input checked="" type="checkbox"/>	<input type="checkbox"/>
4. 4-Hr Volume		100	%	<input checked="" type="checkbox"/>	<input type="checkbox"/>

5. Collision Experience	0	%	<input type="checkbox"/>	<input checked="" type="checkbox"/>
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6. Pedestrians	A Volume	Justification not met		<input type="checkbox"/>	<input checked="" type="checkbox"/>
	B Delay	Justification not met		<input type="checkbox"/>	<input checked="" type="checkbox"/>

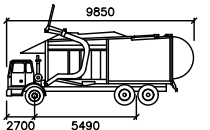


# APPENDIX I

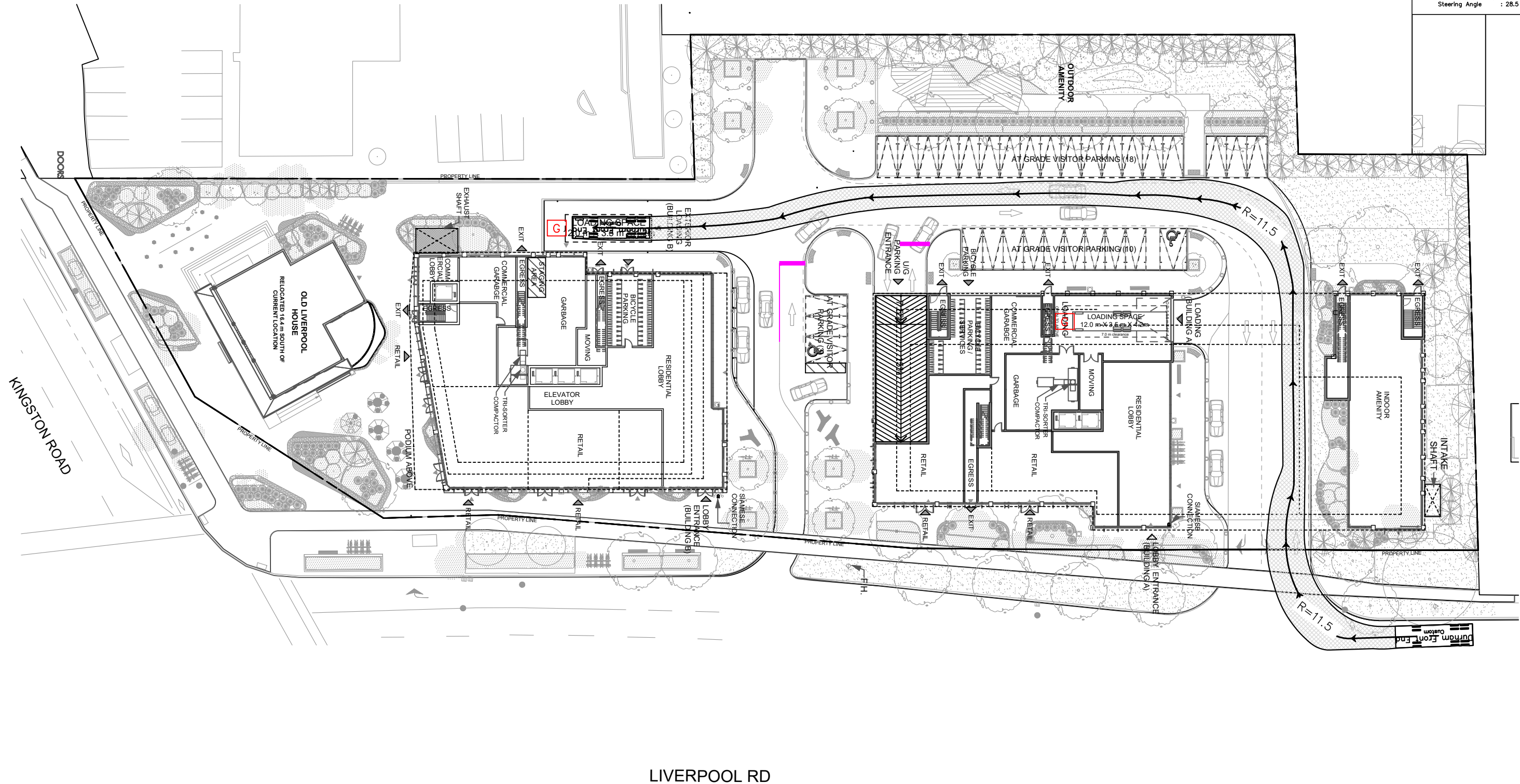
Loading and Site Circulation Review

**NOTES:**

1. COLLECTION VEHICLE SWEEP PATH SUBJECT TO APPROVAL BY THE REGION
2. WASTE BIN DIMENSIONS BASED ON 8 CUBIC YARD BIN FOOTPRINT ON REGION OF DURHAM BY LAW 46-2011, APPENDIX A

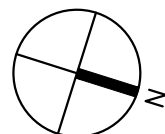


Durham Front End  
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 Track : 2770  
 Lock to Lock Time : 6.0  
 Steering Angle : 28.5



LIVERPOOL RD

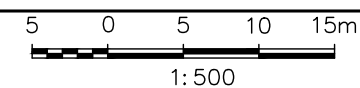
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**19225-200**  
 Date  
 JULY 08, 2020

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 NOT FOR CONSTRUCTION

**1294 KINGSTON ROAD**  
 PICKERING ONTARIO



**SITE PLAN – LOADING 1**  
**CITY GARBAGE TRUCK**  
**ENTRY PATH**

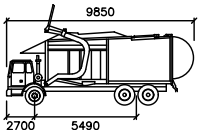
Drawing No.

**001**

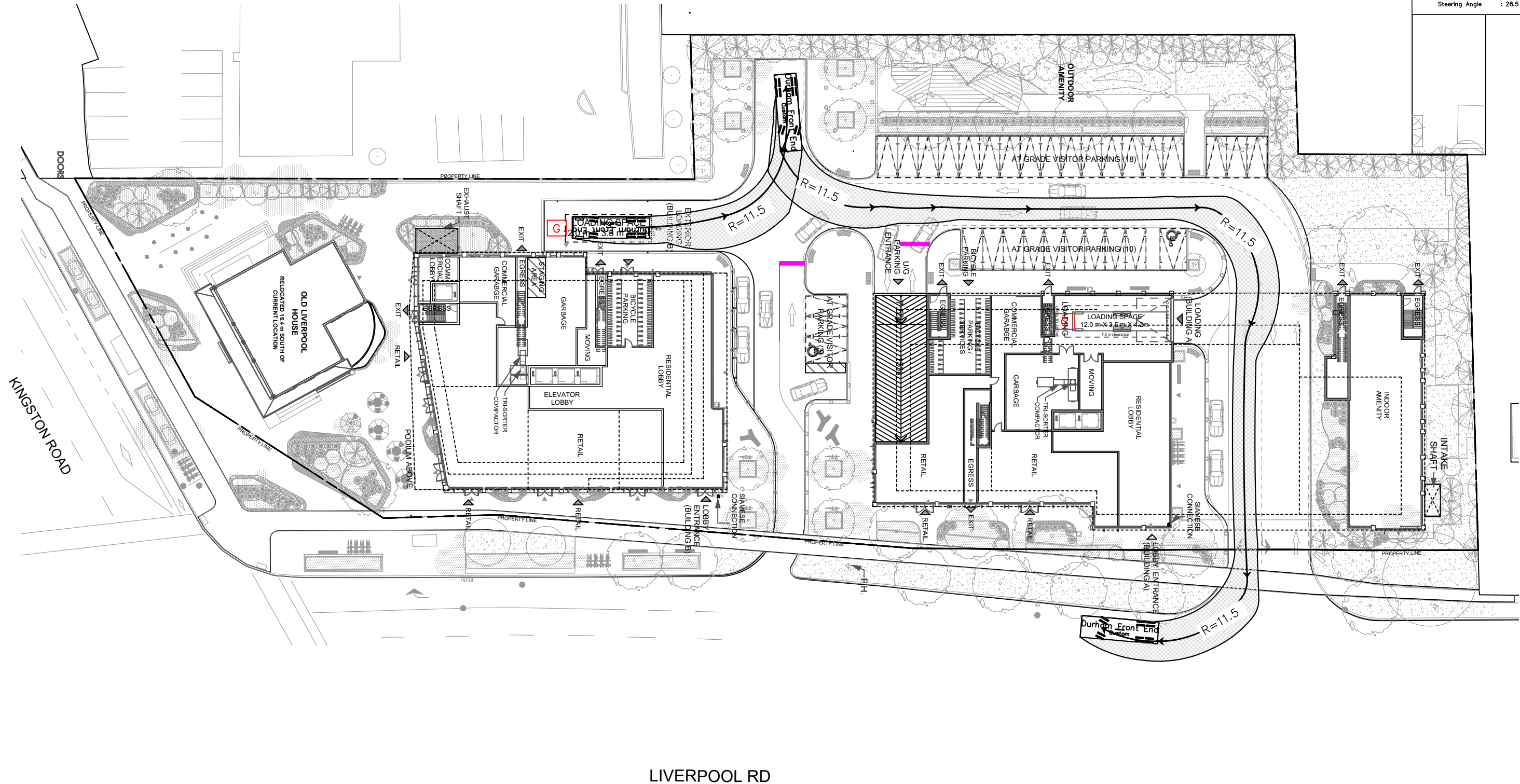


**NOTES:**

1. COLLECTION VEHICLE SWEEP PATH SUBJECT TO APPROVAL BY THE REGION
2. WASTE BIN DIMENSIONS BASED ON 8 CUBIC YARD BIN FOOTPRINT ON REGION OF DURHAM BY LAW 46-2011, APPENDIX A

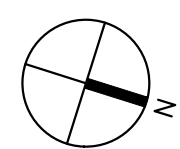


Durham Front End  
 Width : 2770  
 Track : 2770  
 Lock to Lock Time : 6.0  
 Steering Angle : 28.5



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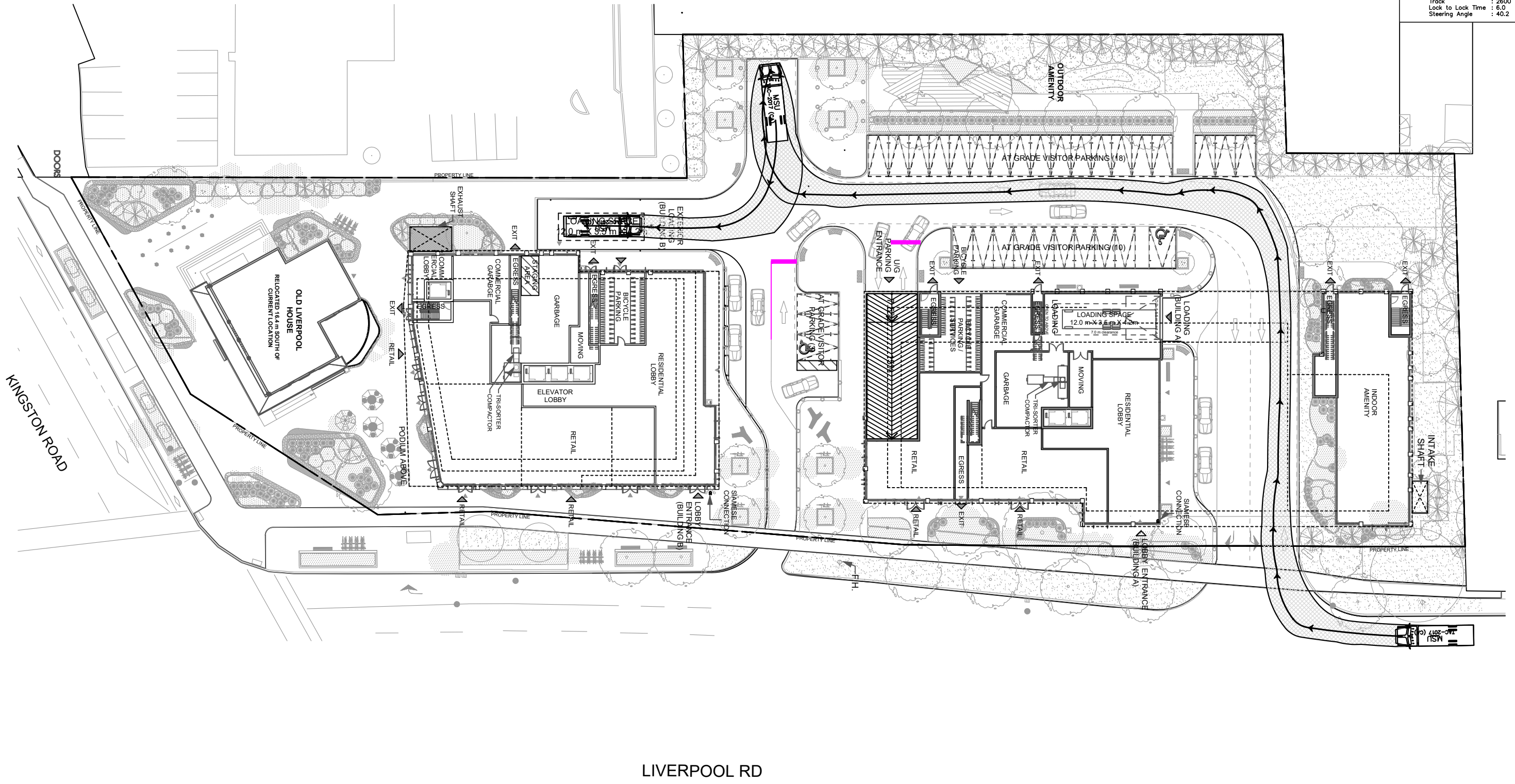
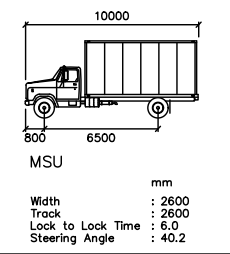
**1294 KINGSTON ROAD**  
 PICKERING ONTARIO

1:500

**SITE PLAN – LOADING 1  
 CITY GARBAGE TRUCK  
 EXIT PATH**

Drawing No.  
**002**





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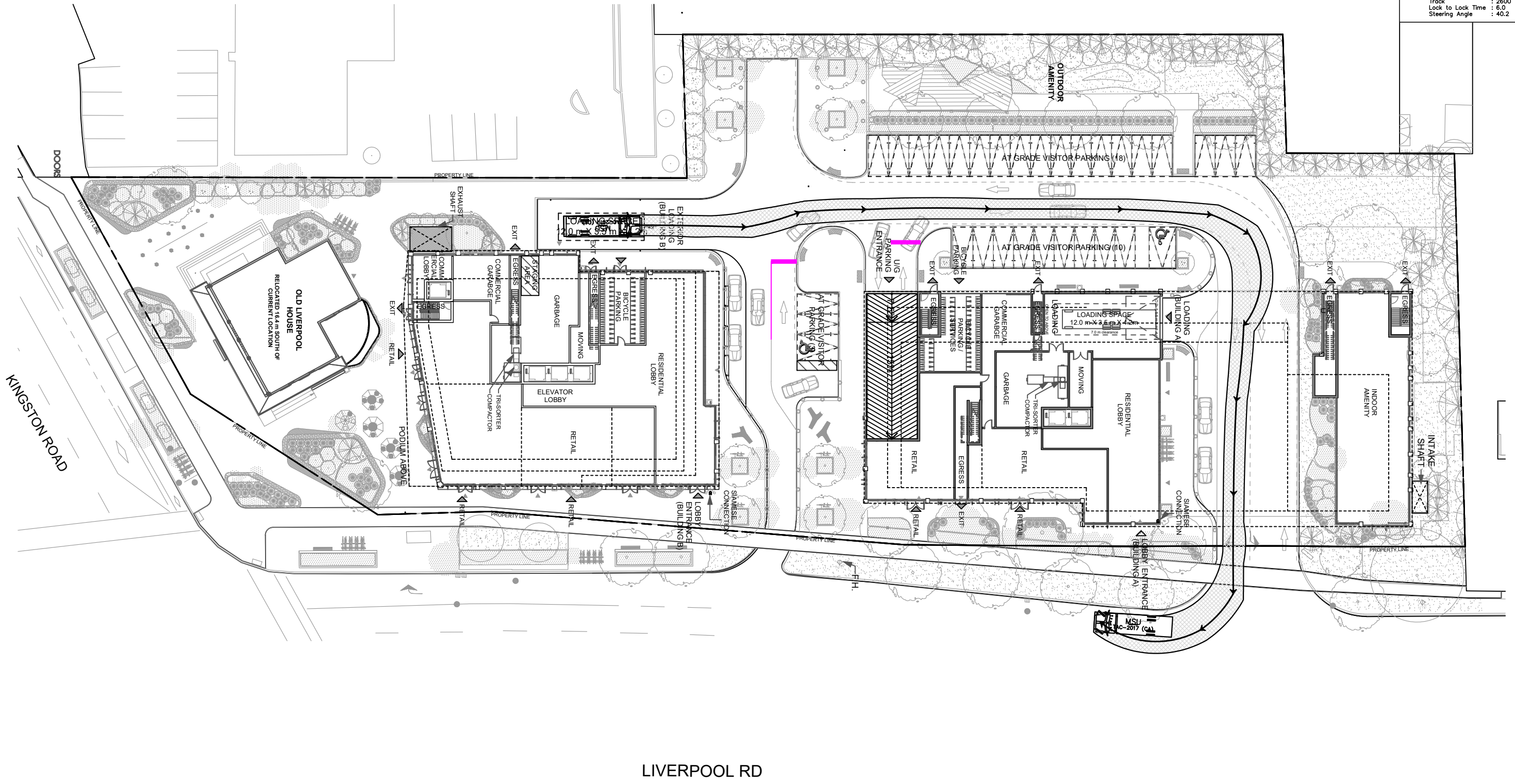
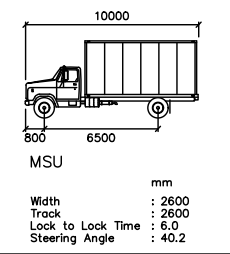
**1294 KINGSTON ROAD**  
PICKERING ONTARIO

5 0 5 10 15m  
1:500

**SITE PLAN – LOADING 1  
DELIVERY TRUCK  
ENTRY PATH**

Drawing No.  
**003**





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**1294 KINGSTON ROAD**  
 PICKERING ONTARIO

1:500

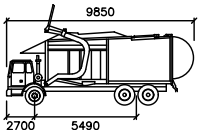
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 DELIVERY TRUCK  
 EXIT PATH**

Drawing No.  
004

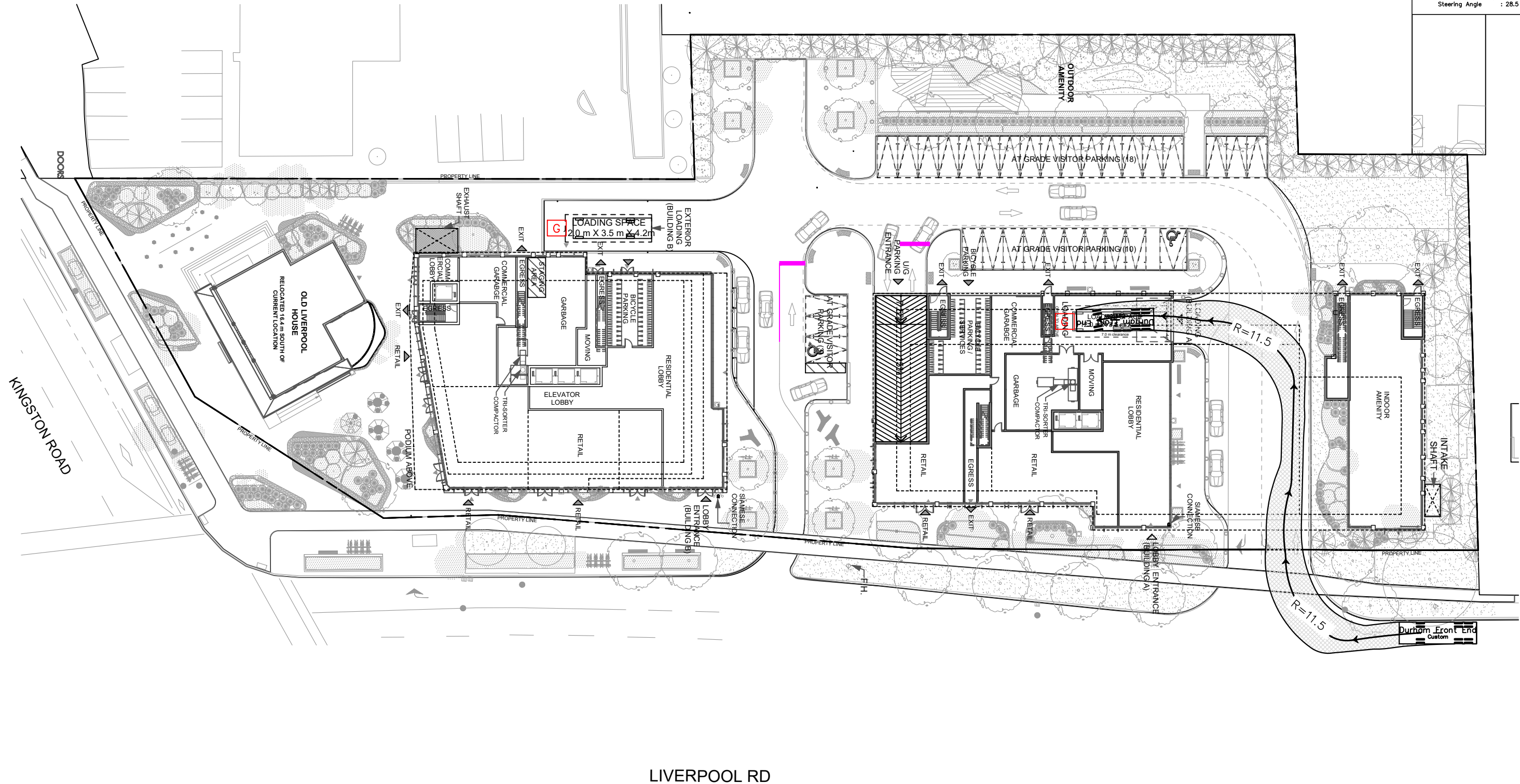


**NOTES:**

1. COLLECTION VEHICLE SWEEP PATH SUBJECT TO APPROVAL BY THE REGION
2. WASTE BIN DIMENSIONS BASED ON 8 CUBIC YARD BIN FOOTPRINT ON REGION OF DURHAM BY LAW 46-2011, APPENDIX A

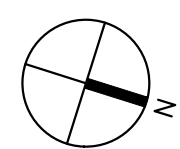


Durham Front End  
 Width : 2770  
 Track : 2770  
 Lock to Lock Time : 6.0  
 Steering Angle : 28.5



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**1294 KINGSTON ROAD**  
 PICKERING ONTARIO  
 5 0 5 10 15m  
 1:500

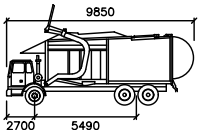
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**CITY GARBAGE TRUCK**  
**ENTRY PATH**

Drawing No.  
**005**

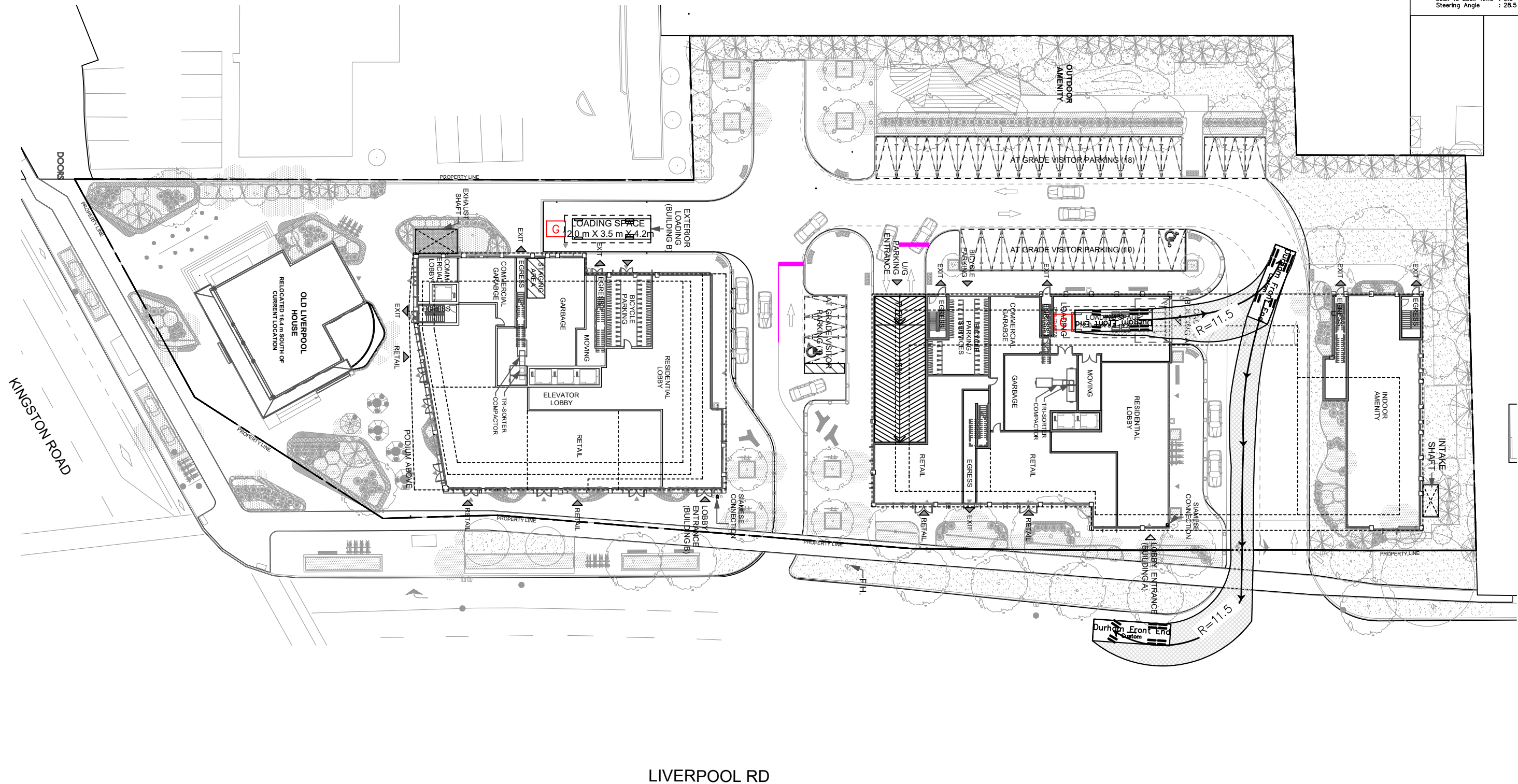


**NOTES:**

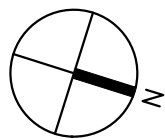
1. COLLECTION VEHICLE SWEEP PATH SUBJECT TO APPROVAL BY THE REGION
2. WASTE BIN DIMENSIONS BASED ON 8 CUBIC YARD BIN FOOTPRINT ON REGION OF DURHAM BY LAW 46-2011, APPENDIX A



Durham Front End  
 Width : 2770  
 Track : 2770  
 Lock to Lock Time : 6.0  
 Steering Angle : 28.5



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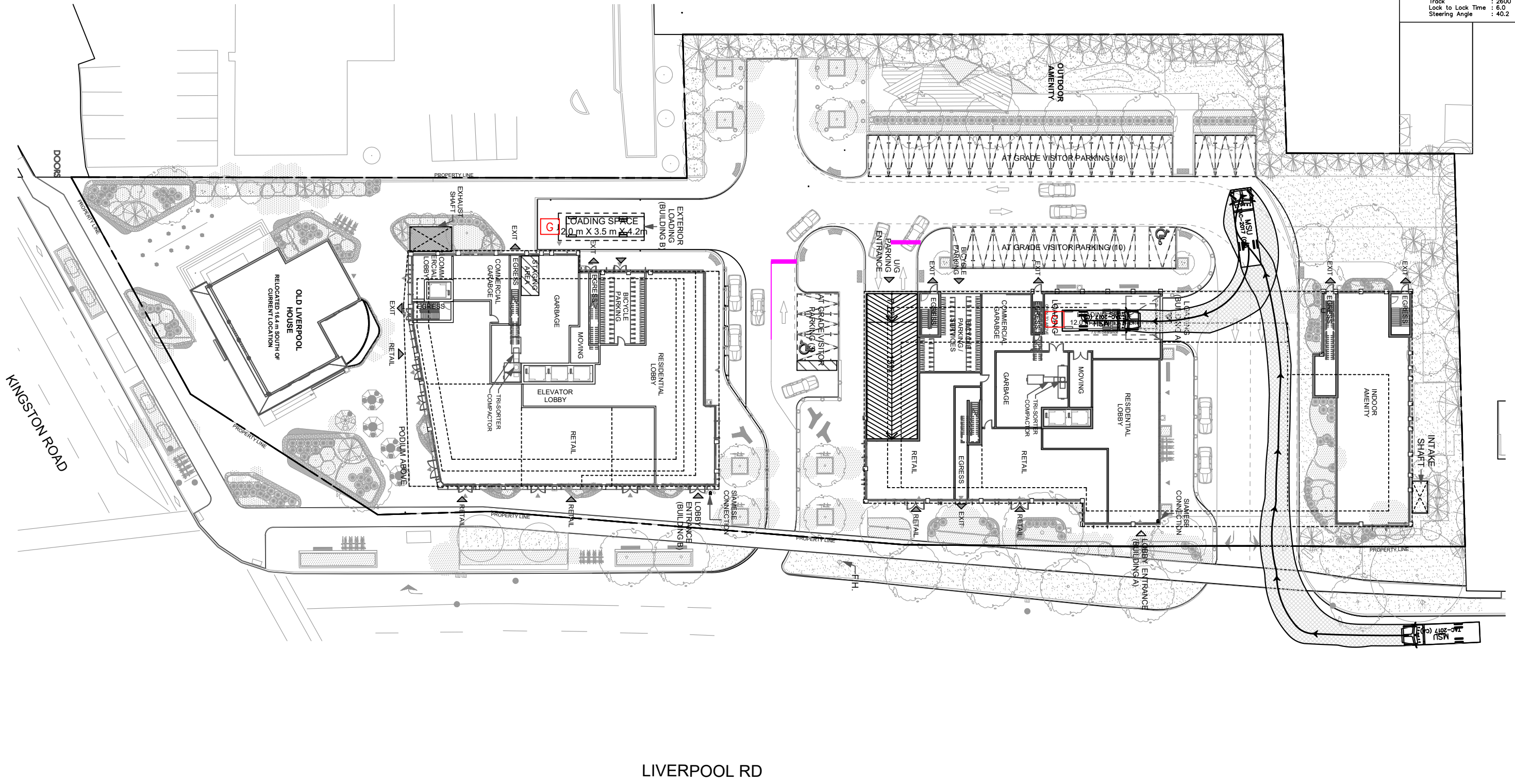
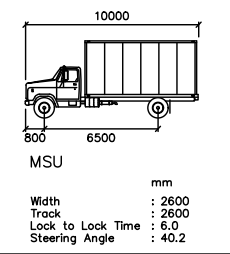
**1294 KINGSTON ROAD**  
 PICKERING ONTARIO

1:500

**SITE PLAN – LOADING 2  
 CITY GARBAGE TRUCK  
 EXIT PATH**

Drawing No.  
**006**





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**19225-200**

Date  
**JULY 08, 2020**

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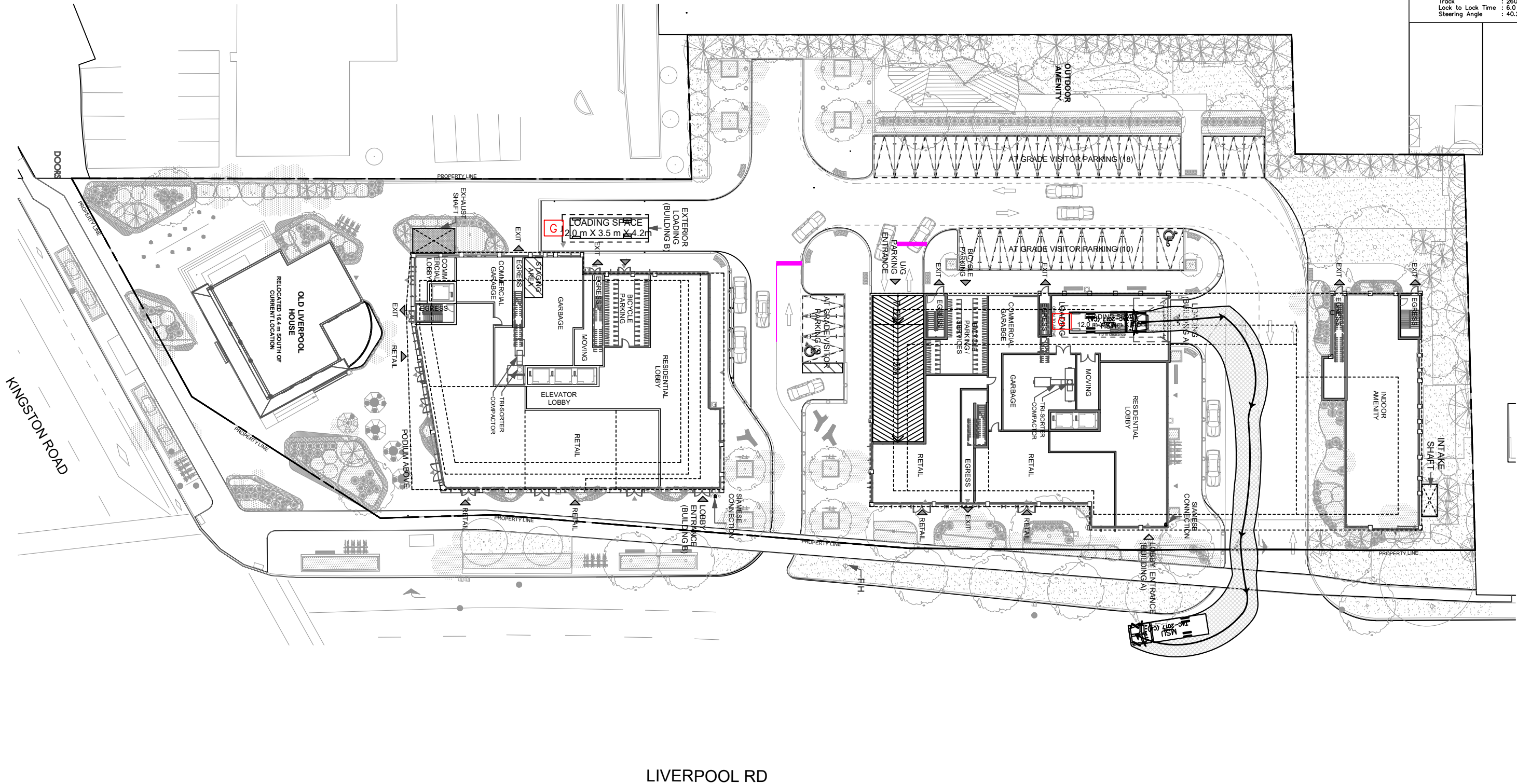
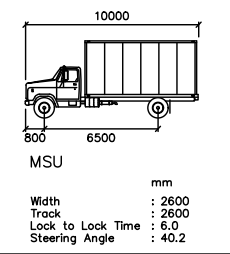
**1294 KINGSTON ROAD**  
**PICKERING ONTARIO**

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**SITE PLAN – LOADING 2  
 DELIVERY TRUCK  
 ENTRY PATH**

Drawing No.  
**007**





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Project No.  
**19225-200**

Date  
**JULY 08, 2020**

DRAFT

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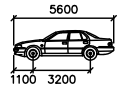
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**PICKERING ONTARIO**

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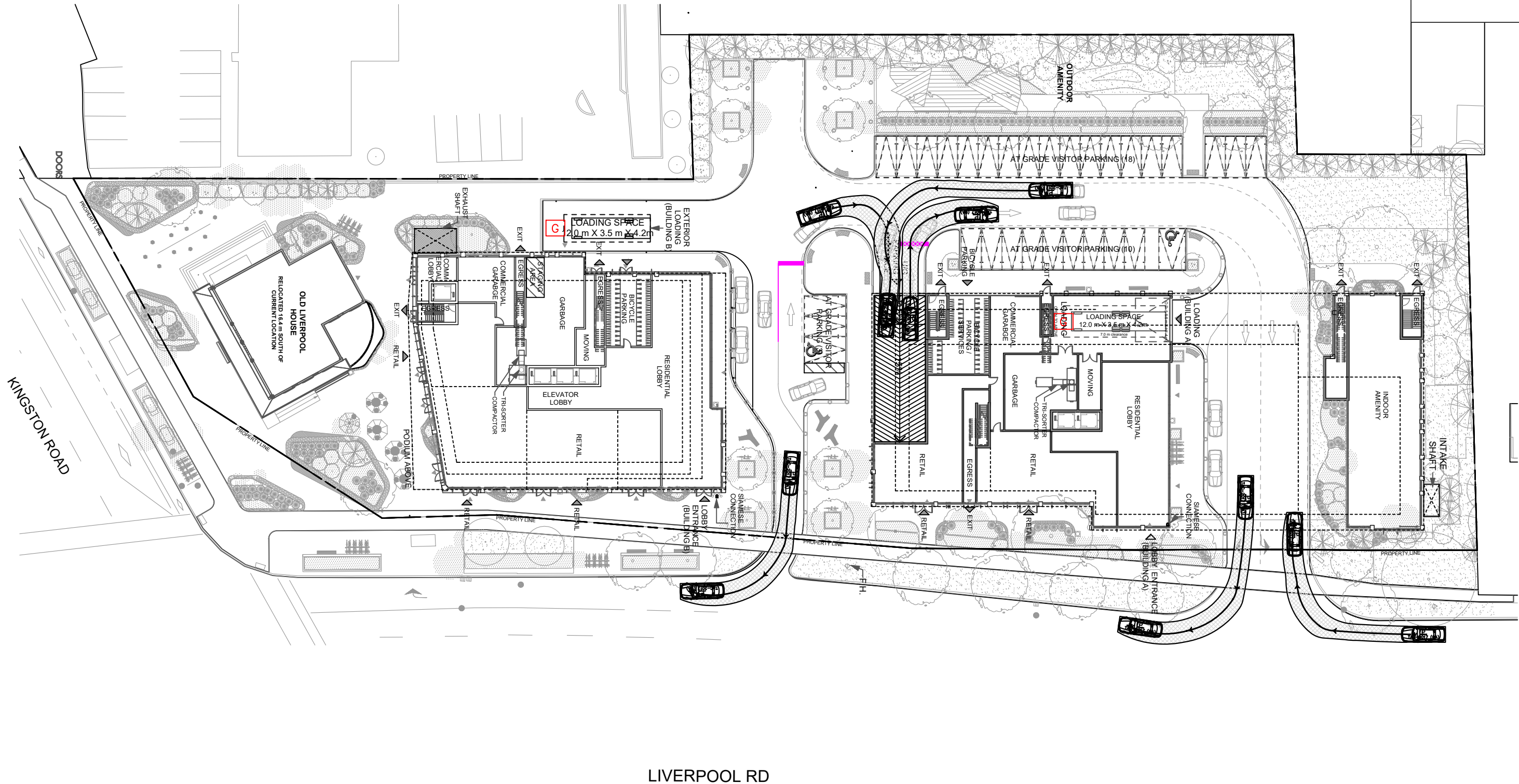
**SITE PLAN – LOADING 2  
 DELIVERY TRUCK  
 EXIT PATH**

Drawing No.  
**008**



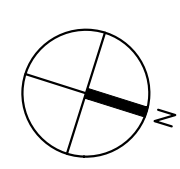


P  
 Width : 2000 mm  
 Track : 2000 mm  
 Lock to Lock Time : 6.0  
 Steering Angle : 35.9



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**1294 KINGSTON ROAD**  
 PICKERING ONTARIO

1:500

**SITE PLAN**  
**PASSENGER VEHICLE**  
**ENTRY/EXIT PATHS**

Drawing No.  
**009**



# APPENDIX J

City and Region Comments to May 2019  
Transportation Impact Assessment Report



To: Elizabeth Martelluzzi  
Planner II, Heritage

October 7, 2019

From: Richard Holborn  
Director, Engineering Services

Copy: Division Head, Water Resources & Development Services  
Manager, Capital Projects & Infrastructure  
Manager, Development Services  
Project Manager, Development Approvals

Subject: Zoning By-law Amendment Application A08/19 – Submission 1  
- Altona Group  
- 1294 Kingston Road, 1848 & 1852 Liverpool Road  
File: D-3300

The Engineering Services Department has reviewed the above-noted application and advise that we have no objection to the Zoning By-law Amendment Application.

Please ensure the first detailed design submission, in support of Site Plan Approval, includes a letter re-stating the City's comments below, followed by an appropriate response, immediately afterwards, outlining how the proponent addressed the comment.

### **Development Services Comments**

#### **Site Plan**

1. Extend the curb line on Liverpool Road through the proposed driveways.
2. Sidewalks on Liverpool Road are to be shown as continuous through the driveway entrance.
3. The proposed curb radii of 5.0m at the site entrances appears to be insufficient. Typically, a minimum of 7.5m is required. Confirm this requirement with the Region of Durham.
4. Provide a minimum 12.0m centreline radius for the internal road to provide for fire truck movements.
5. The proposed 2.0m wide sidewalks on Kingston Road and Liverpool Road should be increased to a minimum of 2.5m as per the City Centre Urban Design Guidelines.
6. Additional details will be required to be shown and labelled on the plan with the site plan application including, but not limited to, maintenance hole and catchbasin locations, fencing, signage, lighting, curbs, sidewalks, line painting, and existing infrastructure.
7. Confirm there is sufficient width for vehicles to enter and exit the underground parking ramp.

## **Functional Servicing and Stormwater Management Report**

8. As stated in the report, the site is relatively flat. Review the grading to eliminate the need for the toe wall on the west property line. If the wall is required, it should be relocated to provide a 0.6m undisturbed strip around the site. Alternatively, provide details of how the wall will be constructed at the property line without disturbing the adjacent property.
9. Construction Management & Erosion and Sediment Control Plans will be required for all phases of construction.
10. Based on the drawings, prepared by Aecom Canada Ltd., provided in Appendix A, the existing sewer on Kingston Road is a 675mm storm sewer. Please confirm and revise as required.
11. Typically, the control maintenance hole is located just inside the property line to meet this criteria. Revise the maintenance hole configuration at the southwest corner of the site.

### **Landscape Plans**

12. No comments.

### **Transportation Impact Assessment**

13. No comments.

### **Noise Feasibility Study**

14. Ensure all required noise attenuation measures are incorporated into the design.

### **Phase One Environmental Site Assessment**

15. No comments.

### **Phase Two Environmental Site Assessment**

16. No comments.

### **Geotechnical Report**

17. No comments.

### **Hydrogeological Report**

18. No comments.

## Capital Projects

### General Comments

1. Capital Projects has no comments at this time. Additional comments may be provided with the site plan application.

### Landscape Comments

2. The Tree Protection Plan and Details are acceptable.  
  
The number of trees proposed to be planted on the site exceeds the number of trees required for tree removal compensation. As such, no additional funds are required as cash-in-lieu for tree compensation.
3. The outdoor amenity area will be constructed over the underground parking garage. At detailed design, the proponent will be required to provide sufficient information to show that proper growing media will be provided for the proposed landscape features.
4. Consent will be required from the Region of Durham for any works within the boulevards of Kingston Road and Liverpool Road. Confirm who will be providing maintenance on the proposed planters, unit pavers, and site furniture within the right-of-way.
5. Provide additional seating and soft landscaping along the residential entry and drop-off area and within the retail forecourt. Plant material could be contained in raised planters.
6. Include public art at the corner of Kingston Road and Liverpool Road.

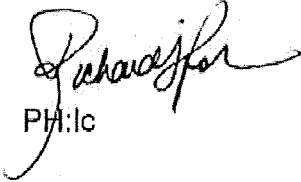
### Traffic Comments

7. Liverpool Road is an Arterial Road Type B from Bayly Street to Finch Avenue and is under the jurisdiction of the Region of Durham. Liverpool Road is a local road south of Bayly Street and is under the jurisdiction of the City of Pickering. Please revise Page 3 of the Transportation Impact Assessment accordingly.
8. The posted speed limit on Glenanna Road is 40 km/hour from Pickering Parkway to Kingston Road, 50 km/hour from Kingston Road to Listowell Crescent, and 40 km/hour from Listowell Crescent to Fairport Road. Please revise Page 3 of the Transportation Impact Assessment accordingly.
9. The traffic analysis has been completed for the years 2024 and 2029. Please confirm the assumed built out year of the site.
10. On Page 6 of the Transportation Impact Assessment, Table 2.2 (existing conditions) shows a Level of Service (LOS) "F" and a delay of 99 seconds for Westbound Left (WBL) movement for the Liverpool Road/Kingston Road intersection. On Page 34, Table 5.4 (future 2029 conditions) shows a LOS "F" and a lower delay of 85 seconds at this intersection for the same movement. Please confirm why the delay has gone down, while it should be increased with the addition of traffic.

## Water Resources Comments

1. The 100-year rainfall intensity was calculated incorrectly, resulting in an underestimated storage volume. Please revise the 100-year rainfall intensity parameter B to match the City's SWM Design Guidelines and update the storage volume accordingly.
2. Although the majority of the site is encompassed by a multi-level underground garage and the soils are of low permeability with relatively high groundwater levels, there appears to be an opportunity to incorporate surface type LID measures, such as enhanced swales and/or bio-retention for erosion control. Please consider adjusting your strategy to incorporate such measures.
3. Rainwater re-use for building mechanical systems and irrigation have been proposed for erosion control. Please provide complete details and specifications, including water demand calculations.
4. The Hydrogeological Review specifies the need for permanent dewatering should a secant-pile wall not be installed. The City has concerns with the long-term effect of dewatering on surrounding lands over the building's lifespan. Please elaborate on Section 6.2 to comment on the long-term effect of dewatering.
5. Foundation drainage is proposed to be treated for high TSS levels and pumped into the Regional storm sewer system. The City requests written confirmation from the Region that this is acceptable.
6. Provide supporting calculations demonstrating that there is sufficient inlet capacity to capture the 100-year flows assuming 50% blockage.
7. Provide calculations demonstrating that the storm drains designed by the Mechanical Engineer are sized to convey the 100-year flows. Provide the corresponding mechanical drawings for our review.
8. Please provide cross-sections and details of all volume and flow control infrastructure i.e., storage tank, irrigation cistern, orifice tube, control and diversion maintenance holes and storm service connection.
9. Confirm the type of foundation shoring system, i.e., secant-pile wall or soldier-pile with timber lagging, which shall be used for excavation as recommended in the Geotechnical Investigation Report.
10. Add the following notes to the Servicing Plan:
  - a. This Plan has been approved for the installation of a (insert oil-grit separator manufacturer name and model number) stormwater treatment unit as per the Engineer of Record's design. The oil grit separator specified by the Engineer of Record in the stormwater management report and on the approved site plan drawings cannot be substituted for a different model.

- b. The Owner shall provide the City of Pickering certification of the (insert oil-grit separator manufacturer name and model number) from the manufacturer upon installation.
- c. The Manufacturer shall provide an operation and maintenance manual to the Owner and to City of Pickering. The Owner is to maintain the unit as per the manual and shall provide the City of Pickering with annual cleaning certificates.



PH:lc



The Regional  
Municipality  
of Durham

Planning and Economic  
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Brian Bridgeman, MCIP, RPP  
Commissioner of Planning  
and Economic Development

November 22, 2019

Ms. Elizabeth Martelluzzi  
Planner II, Heritage  
City of Pickering  
Pickering Civic Complex  
One The Esplanade  
Pickering, ON L1V 6K7

Dear Ms. Martelluzzi,

Re: **Zoning Amendment Application A 08/19**  
Applicant: **Altona Group**  
Location: 1294 Kingston Road  
1848 & 1852 Liverpool Road  
Municipality: City of Pickering

The Region recently provided comments on the rezoning application, dated October 10, 2019. Our comments advised that the Region needed more time to review the Transportation Impact Assessment (TIS) by LEA Consulting, dated May 2019. Attached are our detailed comments on the TIS and further to our initial letter, the proposed zoning by-law amendment conforms with the Region's Official Plan.

Please contact me at (905) 668-4113, ext. 2577 if you have any questions.

Sincerely,

Valerie Hendry, MCIP, RPP  
Project Planner

Attachments: Comment from Peter Castellan

cc: Peter Castellan, Works Department  
Sandra McEleney, Regional Planning  
Christopher Norris, DRT

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If this information is required in an accessible format, please contact Planning Reception at 1-800-372-1102, extension 2577.



## INTEROFFICE MEMORANDUM

To: Valerie Hendry, MCIP, RPP  
Project Planner

From: Peter Castellan  
Development Approvals Division

Date: November 18, 2019

Re: **Review of Transportation Impact Assessment – LEA Consulting Ltd.**  
Zoning By-law Amendment Application A08/19  
Applicant: Altona Group  
1294 Kingston Road, 1848 & 1852 Liverpool Road  
City of Pickering  
**Our File: 2019-P-013**

The Regional  
Municipality  
of Durham

Works Department

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Susan Siopis, P. Eng.  
Commissioner of Works

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The above-noted report has been reviewed by staff from the Transportation Infrastructure, Planning and Traffic Engineering and Operations Divisions with assistance from Paradigm Transportation Solutions Ltd.

Our major findings can be summarized as follows:

- It is agreed that the proposed development can be accommodated by the Regional road network with no additional improvements to the major study area intersections;
- It is agreed that with redevelopment of the subject site, the proximity of the southerly site access on Liverpool Road to the Liverpool Road/Kingston Road intersection is a concern. The location of the existing access is also within the southbound right turn lane area which could create additional conflicts between vehicles trying to turn right into the site and vehicles turning right onto Kingston Road. The Region will require this access to be closed.
- The Region does not agree with the consultant's conclusion that further study of the potential to signalize the Liverpool Road intersection with the northerly site access (and the existing plaza access opposite) should be undertaken. This intersection is simply too close to the adjacent signalized intersection of Kingston Rd./Liverpool Rd.
- To be able to accommodate a signalized intersection on Liverpool Rd. north of Kingston Rd., the Region requires that the signal location be as far north of the intersection of Kingston Rd./Liverpool Rd. as possible. The Region would accept a future signal on Liverpool Rd located at the northern access of the plaza on the east side of Liverpool Rd. This would place the location of a future signal approximately 191 m from the intersection (measured from the centre of the intersection of Kingston Rd./Liverpool Rd to the centre of the northerly plaza access).

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For the subject property to be able to utilize a signal in this location, the Developer is required to provide an easement at the north limit of the property, which in future would connect with an easement through the properties to the north, when these properties redevelop. If the Developer provides the easement, full access can be provided, as an interim condition, onto Liverpool Rd. at the proposed entrance location. Once a connection to signals is acquired, this access will be restricted to right in/right out. If an easement for access to the north of the site is not provided, the proposed access to the site will need to be restricted to right in/right out.

- Although the Region is supportive of the TDM measures outlined, commitments to specific measures are expected to be established in the TIS.
- The 22% oversupply of parking relative to the City's ZBL requirements contradicts the TDM initiatives.

In general, the report is thorough, but there are some relatively minor deficiencies and/or incomplete technical rationale as summarized below:

1. Existing Conditions:

- There are no reported observations of existing operations that can be related to the operational assessment. Traffic observations during the peak periods are a requirement of the Region's TIS Guidelines;
- In Figure 2.1 "Existing Transportation Elements in the Study Area", the consultant omits the eastbound right turn lane that is available at the Kingston Road/Glenanna Road intersection. While the curb lane is part of the BRT, access to the lane is permitted for right turn movements. This right turn lane is absent from both existing and future intersection analyses, which means that the analysis results shown for this intersection are slightly worse than they should be; and
- The consultant identifies that they did counts at the Liverpool Road site accesses in November 2018, but the only data in Appendix A is their March 2019 count at Liverpool Road and the north site access, which is referred to later in Section 6 "Signal Warrant Analysis" of the report.

2. Future Background Traffic:

- The application of the agreed to background growth rate was only applied to the arterial road through movements at the study area intersections. There is no explanation provided for why turning movements would experience no growth.



### 3. Site Traffic Forecast:

- The consultant calculates site trip generation using residential and shopping centre land use categories from the ITE Trip Generation Manual and makes a 10% reduction for transit use (reasonable) and a modest reduction for internal capture trips (less than 10 trips, also reasonable);
- As part of the trip generation, the consultant includes the Old Liverpool House gross floor area with the new retail gross floor area and applies the ITE Shopping Centre average rates. Since the Old Liverpool House has historically operated as a restaurant, clarification should be provided regarding it now being considered akin to a shopping centre;
- The consultant notes that the trip distribution was derived from TTS data for residential and existing traffic patterns for retail. Table 4.3 only shows the trip distribution for residential and it is virtually all to/from the north or south with only 4% total assigned east (1%) and west (3%). The consultant directs the reader to Appendix E for further detail and specifically for the retail trip distribution. In reviewing Appendix E, the TTS data is provided, and it appears that the consultant has rigidly used this information to derive a trip distribution with a heavy north/south orientation. The retail trip distribution is shown to be based on existing traffic patterns and that results in 25% to 35% of the trips being to/from the combination of east and west on Kingston Road, which is reasonable. Since the overall trip generation is relatively low, relatively minor changes in the trip distribution are not expected to make any significant differences to the forecasts and analysis. For future reference, however, the consultant could consider the TTS data as a first step and follow that by checking to see if the resultant trip distribution makes sense for the site context.
- The consultant prepares two forecast scenarios for site access – one with the existing two accesses, and at the request of the Region, one with a single access at the location of the existing northerly access. The consultant assumes that the south access will be restricted to right turns in and right turns out.

### 4. Future Total Traffic:

- In doing the analysis of the two access scenarios, the consultant finds little difference in the operational performance of the site access intersections on Liverpool Road. With the limitation of the south access to right turns only, this result could be expected since in either scenario, the north site access accommodates either most or all the site traffic. In general, all turning movements are shown to operate at acceptable levels of service and within capacity;

- The consultant draws no conclusion as to whether the site should retain the existing two accesses or consolidate access at the northerly access location. The Region will allow one direct access to the site from Liverpool Rd. A second access is to be made available through an easement at the north limits of the property to access a potential signal on Liverpool.
- The consultant conducts a signal justification analysis for the Liverpool Road/North Site Access-Retail Plaza Access intersection and finds that the signal warrants are met under existing conditions. The consultant does acknowledge that signalized intersection spacing is an issue with existing signals 140 metres to the south and 217 metres to the north but concludes that additional analysis should be undertaken presumably to determine if a signal is feasible at this location. Despite the site accesses being an existing condition, the consultant conducts a sightline analysis for both the northerly and southerly site access. Based on that analysis, the consultant concludes that the southerly site access should be restricted to right turns in and out. While we agree that this is a reasonable recommendation given the proximity of the access to the functional area for the Liverpool Road/Kingston Road intersection, the consultant's conclusion is based on assuming that the sightline to/from the south from this access is limited by the presence of this intersection – i.e. the sightline may not extend into or beyond this intersection (despite the depiction of the sightline for the northerly access extending into the intersection as shown in Appendix I). Using this logic, the existing southerly site access should not have been permitted to operate with full movements as it has for many years.
- The consultant recommends that left turns to/from the southerly access be restricted by extending the existing raised centre median 45 metres to the north and across this access. The consultant does not acknowledge that this will require widening Liverpool Road to accommodate the median extension through what is not part of the tapered section north of Kingston Road. Considering that the southerly access is shown to have a relatively low volume of site traffic assigned to it, and given the extent of construction and the cost to extend the raised centre median, this suggests that closing this access and consolidating access at the northerly access has merit.

5. Travel Demand Management Measures:

- A standard list of TDM measures has been outlined, and the consultant suggests that, "The proposed strategies can be further detailed at the site plan stage". It is noted that TDM was not explicitly used to reduce the initial ITE trip generation.

Rather, a reduction of 10% was made for potential transit use, which could be reasoned to be a result of the locational advantages of the site relative to transit facilities (including the BRT and GO station). The consultant does note that bicycle parking will be provided on-site and will exceed the City's Zoning By-law requirement by 47 spaces.

- In contrast to the TDM measures that are discussed, the consultant also notes that 512 auto parking spaces are proposed, which is 93 spaces greater than the City's Zoning By-law requirement. This represents an over supply of 22% and no rationale is provided to support the proposed parking provision.

We do not require a re-submission of the TIS unless the scope of the proposed development significantly changes. The Region's access requirements are to be shown on the site plan submission.

Yours truly,



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Peter Castellan  
Development Approvals Division

