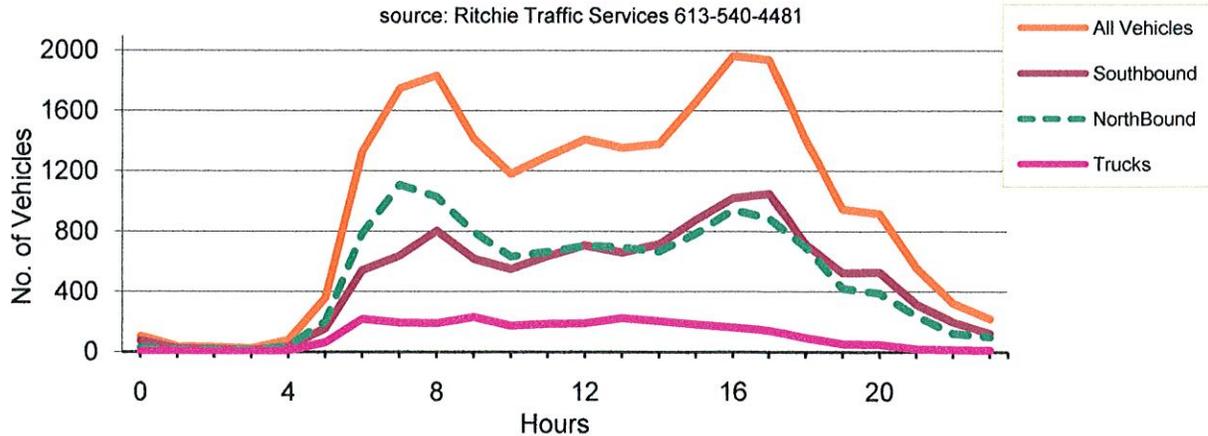


**Carp Road, south of Hwy 417 NB to EB On-ramp  
Thursday, June 2, 2011**

Direction		Southbound				NorthBound				SB/NB	SB/NB
Classification Categories		1-3 cars	4-7 short trucks	8-14 long trucks	SB Vehs Total	1-3 cars	4-7 short trucks	8-14 long trucks	NB Vehs Total	All Vehs Total	All Trucks Total
Start	End										
0	0100	51	3	0	54	42	3	0	45	99	6
0100	0200	30	4	0	34	14	1	0	15	49	5
0200	0300	14	2	0	16	5	0	0	5	21	2
0300	0400	12	1	0	13	8	2	0	10	23	3
0400	0500	29	4	2	35	27	5	1	33	68	12
0500	0600	106	23	2	131	173	30	3	206	337	58
0600	0700	413	102	4	519	643	102	3	748	1267	211
0700	0800	579	95	3	677	1013	80	3	1096	1773	181
0800	0900	617	72	4	693	872	86	6	964	1657	168
0900	1000	520	66	8	594	661	82	8	751	1345	164
1000	1100	453	74	4	531	559	59	10	628	1159	147
1100	1200	511	82	8	601	521	72	4	597	1198	166
1200	1300	569	91	11	671	632	74	5	711	1382	181
1300	1400	565	97	2	664	579	89	8	676	1340	196
1400	1500	632	105	9	746	589	79	7	675	1421	200
1500	1600	848	90	7	945	713	72	9	794	1739	178
1600	1700	981	63	3	1047	773	68	4	845	1892	138
1700	1800	987	65	4	1056	901	73	7	981	2037	149
1800	1900	742	55	2	799	684	33	1	718	1517	91
1900	2000	516	32	3	551	531	11	2	544	1095	48
2000	2100	466	21	1	488	365	13	1	379	867	36
2100	2200	410	15	1	426	246	5	0	251	677	21
2200	2300	251	10	1	262	147	1	0	148	410	12
2300	2400	129	7	0	136	59	4	0	63	199	11
AM total		3335	528	35	3898	4538	522	38	5098	8996	1123
PM total		7096	651	44	7791	6219	522	44	6785	14576	1261
24Hr Total		10431	1179	79	<b>11689</b>	10757	1044	82	<b>11883</b>	<b>23572</b>	<b>2384</b>
% of Total		89.2	10.1	0.7		90.5	8.8	0.7			<b>10.1</b>

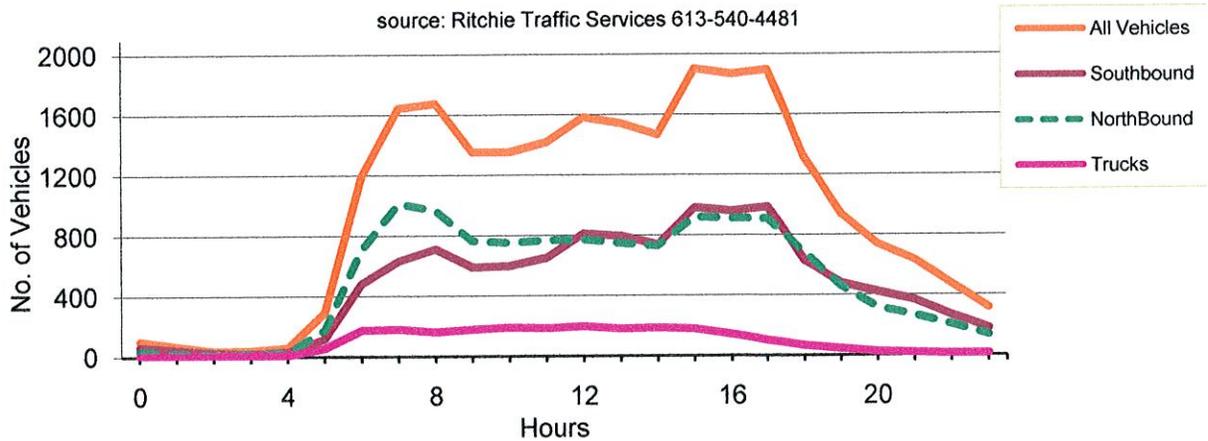
source: Ritchie Traffic Services 613-540-4481



**Carp Road, south of Hwy 417 NB to EB On-ramp  
Friday, June 3, 2011**

Direction		Southbound				NorthBound				SB/NB	SB/NB
Classification Categories		1-3 cars	4-7 short trucks	8-14 long trucks	SB Vehs Total	1-3 cars	4-7 short trucks	8-14 long trucks	NB Vehs Total	All Vehs Total	All Trucks Total
Start	End										
0	0100	61	3	0	64	35	1	1	37	101	5
0100	0200	42	3	0	45	22	0	0	22	67	3
0200	0300	24	2	0	26	8	2	0	10	36	4
0300	0400	16	4	0	20	16	4	0	20	40	8
0400	0500	30	1	3	34	21	4	1	26	60	9
0500	0600	94	16	6	116	142	28	6	176	292	56
0600	0700	402	76	3	481	612	92	2	706	1187	173
0700	0800	538	88	5	631	926	79	8	1013	1644	180
0800	0900	624	81	5	710	889	69	7	965	1675	162
0900	1000	496	84	10	590	680	75	8	763	1353	177
1000	1100	507	85	6	598	653	93	7	753	1351	191
1100	1200	544	97	10	651	688	67	11	766	1417	185
1200	1300	708	94	10	812	678	84	9	771	1583	197
1300	1400	699	85	10	794	662	76	9	747	1541	180
1400	1500	635	93	9	737	645	78	7	730	1467	187
1500	1600	879	98	5	982	847	70	5	922	1904	178
1600	1700	883	71	5	959	846	58	7	911	1870	141
1700	1800	923	60	4	987	871	35	3	909	1896	102
1800	1900	595	31	3	629	651	29	3	683	1312	66
1900	2000	450	28	1	479	443	15	1	459	938	45
2000	2100	406	14	0	420	309	8	1	318	738	23
2100	2200	353	12	0	365	262	4	1	267	632	17
2200	2300	258	7	2	267	204	2	0	206	473	11
2300	2400	170	9	0	179	132	3	1	136	315	13
AM total		3378	540	48	3966	4692	514	51	5257	9223	1153
PM total		6959	602	49	7610	6550	462	47	7059	14669	1160
24Hr Total		10337	1142	97	<b>11576</b>	11242	976	98	<b>12316</b>	<b>23892</b>	<b>2313</b>
% of Total		89.3	9.9	0.8		91.3	7.9	0.8			<b>9.7</b>

source: Ritchie Traffic Services 613-540-4481



Peak Hour Factors (PHF) - May-June, 2011

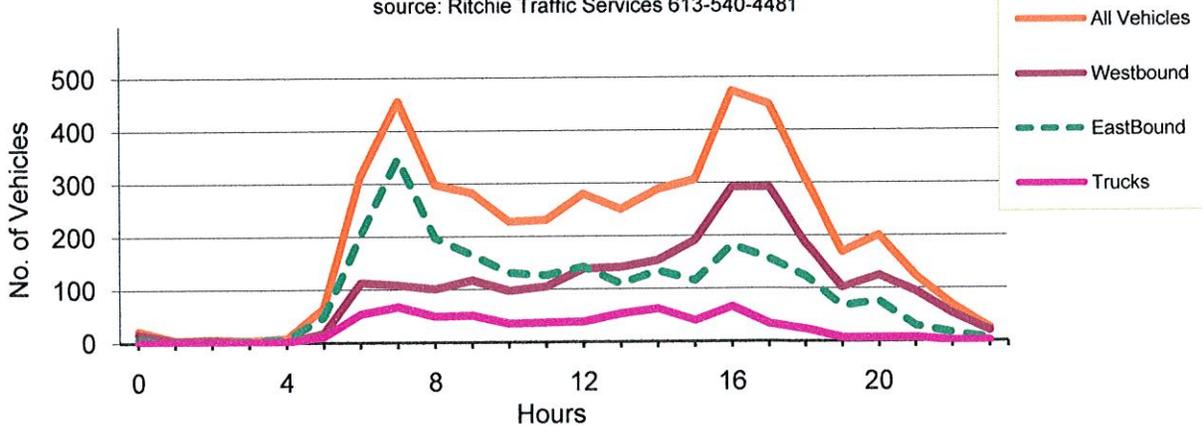
Richardson Road, 50 metres west of Carp Road

				WB+EB	WB+EB	WB+EB
				Total	PHF	% Trk
Monday, May 30, 2011	AM	7:00-8:00	All Veh.	456	0.96	14.7%
			Short Trk	65		14.3%
			Long Trk	2		0.4%
	PM	4:00-5:00	All Veh.	474	0.93	13.9%
			Short Trk	64		13.5%
			Long Trk	2		0.4%
Tuesday, May 31, 2011	AM	7:00-8:00	All Veh.	456	0.96	16.4%
			Short Trk	70		15.4%
			Long Trk	5		1.1%
	PM	4:15-5:15	All Veh.	541	0.90	12.9%
			Short Trk	65		12.0%
			Long Trk	5		0.9%
Wednesday, June 1, 2011	AM	7:00-8:00	All Veh.	449	0.91	16.5%
			Short Trk	73		16.3%
			Long Trk	1		0.2%
	PM	4:00-5:00	All Veh.	468	0.89	12.6%
			Short Trk	59		12.6%
			Long Trk	0		0.0%
Thursday, June 2, 2011	AM	7:00-8:00	All Veh.	439	0.83	15.0%
			Short Trk	66		15.0%
			Long Trk	0		0.0%
	PM	3:45-4:45	All Veh.	502	0.81	16.5%
			Short Trk	80		15.9%
			Long Trk	3		0.6%
Friday, June 3, 2011	AM	7:00-8:00	All Veh.	366	0.91	10.1%
			Short Trk	36		9.8%
			Long Trk	1		0.3%
	PM	4:30-5:30	All Veh.	429	0.95	7.2%
			Short Trk	31		7.2%
			Long Trk	0		0.0%

**Richardson Road, 50 metres west of Carp Road  
Monday, May 30, 2011**

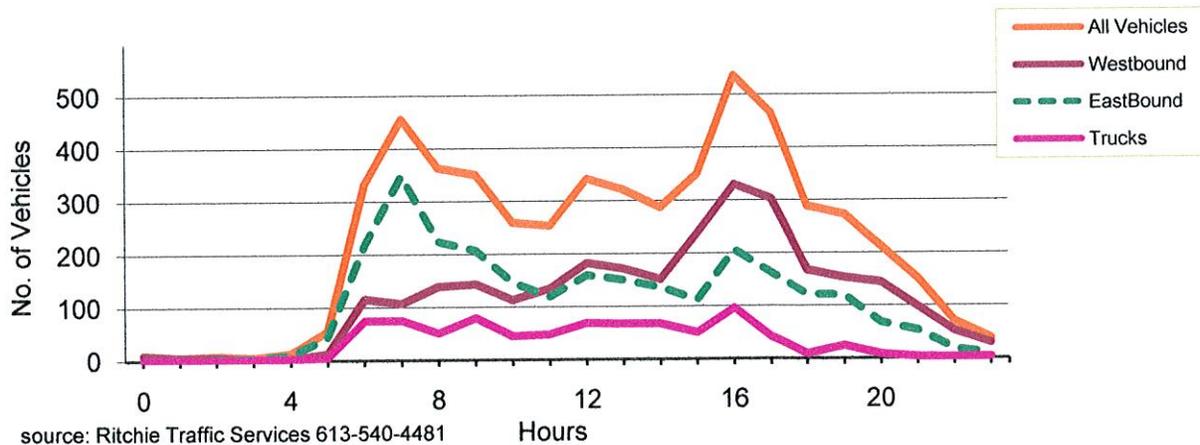
Direction		Westbound				EastBound				WB/EB	WB/EB
Classification Categories		1-3 cars	4-7 short trucks	8-14 long trucks	SB Vehs Total	1-3 cars	4-7 short trucks	8-14 long trucks	NB Vehs Total	All Vehs Total	All Trucks Total
Start	End										
0	0100	16	0	0	16	6	0	0	6	22	0
0100	0200	3	0	0	3	1	0	0	1	4	0
0200	0300	5	0	0	5	1	0	0	1	6	0
0300	0400	1	0	0	1	3	0	0	3	4	0
0400	0500	2	0	0	2	4	2	0	6	8	2
0500	0600	17	0	0	17	37	11	0	48	65	11
0600	0700	109	4	0	113	152	50	0	202	315	54
0700	0800	94	12	2	108	295	53	0	348	456	67
0800	0900	77	23	1	101	172	25	0	197	298	49
0900	1000	85	31	1	117	146	18	1	165	282	51
1000	1100	88	8	1	97	105	26	0	131	228	35
1100	1200	91	14	0	105	103	23	0	126	231	37
1200	1300	120	18	0	138	122	19	1	142	280	38
1300	1400	123	16	2	141	75	34	1	110	251	53
1400	1500	134	20	0	154	92	42	0	134	288	62
1500	1600	169	21	1	191	97	18	0	115	306	40
1600	1700	240	50	2	292	168	14	0	182	474	66
1700	1800	277	15	0	292	139	18	0	157	449	33
1800	1900	176	9	0	185	109	14	0	123	308	23
1900	2000	101	1	0	102	61	5	1	67	169	7
2000	2100	123	1	0	124	71	5	0	76	200	6
2100	2200	91	3	0	94	25	4	0	29	123	7
2200	2300	52	0	0	52	15	1	0	16	68	1
2300	2400	19	0	1	20	5	0	0	5	25	1
AM total		588	92	5	685	1025	208	1	1234	1919	306
PM total		1625	154	6	1785	979	174	3	1156	2941	337
24Hr Total		2213	246	11	<b>2470</b>	2004	382	4	<b>2390</b>	<b>4860</b>	<b>643</b>
% of Total		89.6	10.0	0.4		83.8	16.0	0.2			<b>13.2</b>

source: Ritchie Traffic Services 613-540-4481



**Richardson Road, 50 metres west of Carp Road  
Tuesday, May 31, 2011**

Direction		Westbound				EastBound				WB/EB	WB/EB
Classification Categories		1-3 cars	4-7 short trucks	8-14 long trucks	SB Vehs Total	1-3 cars	4-7 short trucks	8-14 long trucks	NB Vehs Total	All Vehs Total	All Trucks Total
Start	End										
0	0100	9	0	0	9	1	0	0	1	10	0
0100	0200	5	0	0	5	0	0	0	0	5	0
0200	0300	6	0	0	6	2	0	0	2	8	0
0300	0400	0	0	1	1	3	1	0	4	5	2
0400	0500	2	1	0	3	8	2	0	10	13	3
0500	0600	12	0	0	12	38	5	0	43	55	5
0600	0700	107	8	0	115	151	66	0	217	332	74
0700	0800	92	11	4	107	289	59	1	349	456	75
0800	0900	109	27	3	139	203	21	0	224	363	51
0900	1000	99	43	1	143	172	35	0	207	350	79
1000	1100	96	15	2	113	118	28	0	146	259	45
1100	1200	110	21	3	134	95	22	2	119	253	48
1200	1300	147	31	4	182	125	34	0	159	341	69
1300	1400	151	17	3	171	103	47	0	150	321	67
1400	1500	125	23	3	151	95	40	1	136	287	67
1500	1600	204	32	2	238	96	16	0	112	350	50
1600	1700	258	67	5	330	182	22	2	206	536	96
1700	1800	283	17	3	303	141	21	1	163	466	42
1800	1900	162	3	2	167	117	4	0	121	288	9
1900	2000	143	8	2	153	106	11	3	120	273	24
2000	2100	140	4	0	144	64	3	1	68	212	8
2100	2200	97	1	0	98	51	2	0	53	151	3
2200	2300	52	0	0	52	16	2	0	18	70	2
2300	2400	27	2	0	29	8	1	0	9	38	3
AM total		647	126	14	787	1080	239	3	1322	2109	382
PM total		1789	205	24	2018	1104	203	8	1315	3333	440
24Hr Total		2436	331	38	<b>2805</b>	2184	442	11	<b>2637</b>	<b>5442</b>	<b>822</b>
% of Total		86.8	11.8	1.4		82.8	16.8	0.4			<b>15.1</b>

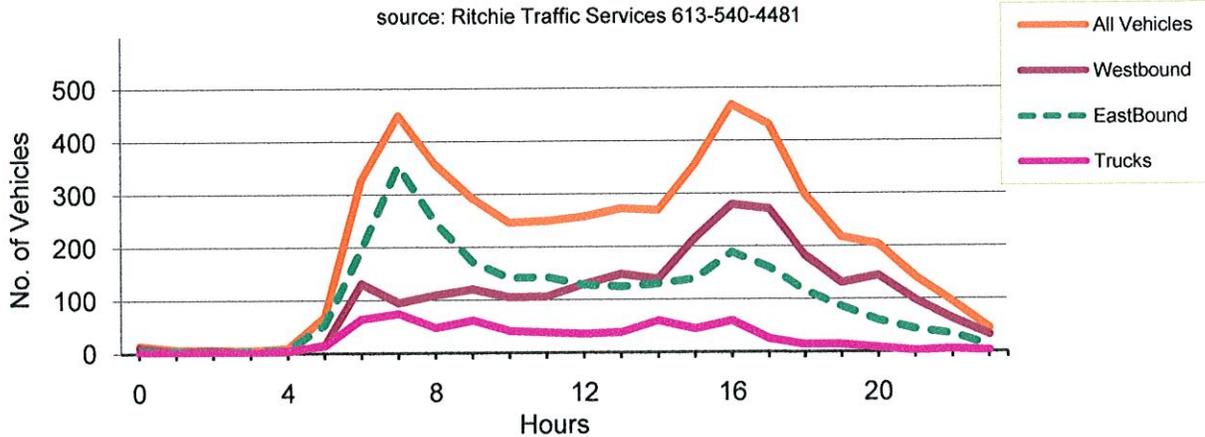


source: Ritchie Traffic Services 613-540-4481

**Richardson Road, 50 metres west of Carp Road**  
**Wednesday, June 1, 2011**

Direction		Westbound				EastBound				WB/EB	WB/EB
Classification Categories		1-3 cars	4-7 short trucks	8-14 long trucks	SB Vehs Total	1-3 cars	4-7 short trucks	8-14 long trucks	NB Vehs Total	All Vehs Total	All Trucks Total
Start	End										
0	0100	11	0	0	11	3	0	0	3	14	0
0100	0200	3	0	0	3	4	0	0	4	7	0
0200	0300	6	0	0	6	0	0	0	0	6	0
0300	0400	1	0	0	1	4	0	0	4	5	0
0400	0500	1	0	2	3	3	3	0	6	9	5
0500	0600	15	0	0	15	39	14	0	53	68	14
0600	0700	118	11	2	131	144	51	0	195	326	64
0700	0800	84	10	1	95	291	63	0	354	449	74
0800	0900	90	19	0	109	218	29	0	247	356	48
0900	1000	90	30	0	120	141	30	1	172	292	61
1000	1100	90	15	0	105	115	25	1	141	246	41
1100	1200	92	14	0	106	119	24	0	143	249	38
1200	1300	117	11	1	129	105	23	0	128	257	35
1300	1400	141	7	0	148	93	31	0	124	272	38
1400	1500	123	16	0	139	86	42	2	130	269	60
1500	1600	189	26	1	216	122	16	1	139	355	44
1600	1700	233	46	0	279	176	13	0	189	468	59
1700	1800	260	11	0	271	146	13	1	160	431	25
1800	1900	175	7	0	182	109	7	0	116	298	14
1900	2000	126	5	0	131	77	8	1	86	217	14
2000	2100	141	3	0	144	55	5	0	60	204	8
2100	2200	98	0	0	98	41	2	0	43	141	2
2200	2300	60	2	0	62	30	3	0	33	95	5
2300	2400	32	0	0	32	10	2	0	12	44	2
AM total		601	99	5	705	1081	239	2	1322	2027	345
PM total		1695	134	2	1831	1050	165	5	1220	3051	306
24Hr Total		2296	233	7	<b>2536</b>	2131	404	7	<b>2542</b>	<b>5078</b>	<b>651</b>
% of Total		90.5	9.2	0.3		83.8	15.9	0.3			<b>12.8</b>

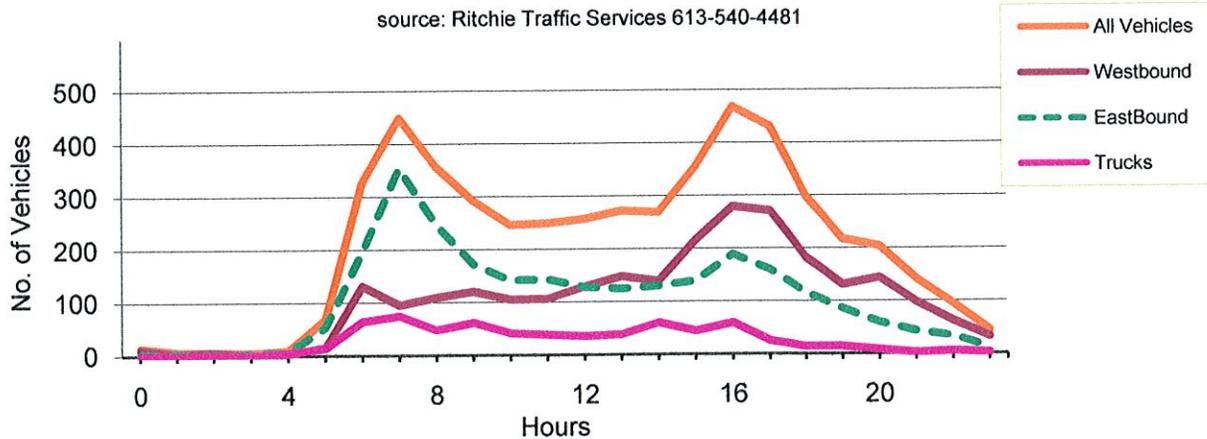
source: Ritchie Traffic Services 613-540-4481



**Richardson Road, 50 metres west of Carp Road**  
**Thursday, June 2, 2011**

Direction		Westbound				EastBound				WB/EB	WB/EB
Classification Categories		1-3 cars	4-7 short trucks	8-14 long trucks	SB Vehs Total	1-3 cars	4-7 short trucks	8-14 long trucks	NB Vehs Total	All Vehs Total	All Trucks Total
Start	End										
0	0100	9	0	0	9	2	0	0	2	11	0
0100	0200	1	0	0	1	1	0	0	1	2	0
0200	0300	2	0	0	2	2	0	0	2	4	0
0300	0400	1	0	0	1	2	0	0	2	3	0
0400	0500	1	0	2	3	3	2	1	6	9	5
0500	0600	16	1	0	17	33	9	0	42	59	10
0600	0700	104	9	1	114	160	56	0	216	330	66
0700	0800	87	8	0	95	286	58	0	344	439	66
0800	0900	95	14	2	111	202	26	0	228	339	42
0900	1000	74	30	0	104	160	18	1	179	283	49
1000	1100	76	9	0	85	98	14	1	113	198	24
1100	1200	104	13	0	117	100	14	0	114	231	27
1200	1300	118	9	0	127	130	24	1	155	282	34
1300	1400	114	24	0	138	95	34	0	129	267	58
1400	1500	151	19	1	171	103	37	0	140	311	57
1500	1600	201	28	1	230	116	22	1	139	369	52
1600	1700	256	52	0	308	166	25	1	192	500	78
1700	1800	267	16	1	284	165	14	0	179	463	31
1800	1900	184	12	1	197	120	15	0	135	332	28
1900	2000	114	4	0	118	86	5	1	92	210	10
2000	2100	131	4	0	135	41	2	0	43	178	6
2100	2200	91	2	1	94	57	5	1	63	157	9
2200	2300	61	2	0	63	18	0	0	18	81	2
2300	2400	39	1	0	40	13	2	0	15	55	3
AM total		570	84	5	659	1049	197	3	1249	1908	289
PM total		1727	173	5	1905	1110	185	5	1300	3205	368
24Hr Total		2297	257	10	<b>2564</b>	2159	382	8	<b>2549</b>	<b>5113</b>	<b>657</b>
% of Total		89.6	10.0	0.4		84.7	15.0	0.3			<b>12.8</b>

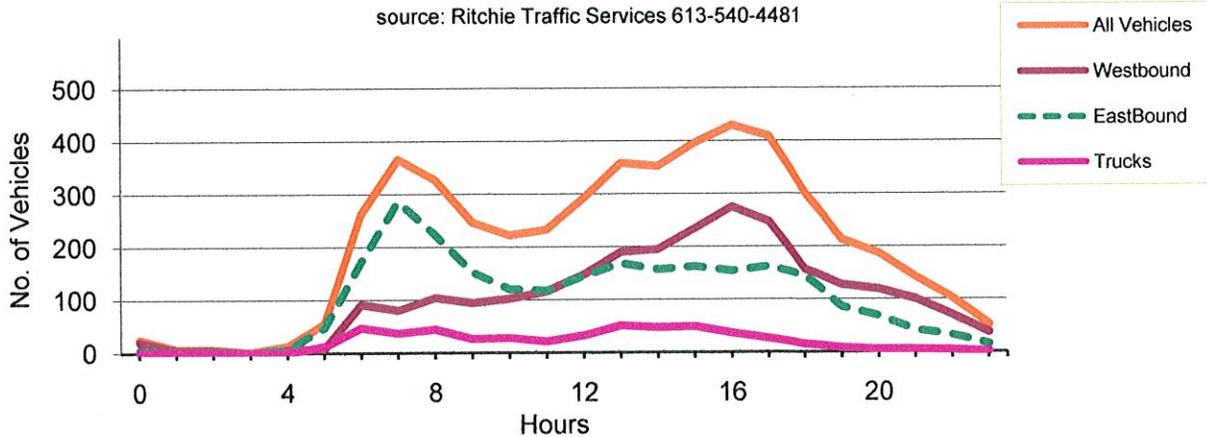
source: Ritchie Traffic Services 613-540-4481



**Richardson Road, 50 metres west of Carp Road**  
**Friday, June 3, 2011**

Direction		Westbound				EastBound				WB/EB	WB/EB
Classification Categories		1-3 cars	4-7 short trucks	8-14 long trucks	SB Vehs Total	1-3 cars	4-7 short trucks	8-14 long trucks	NB Vehs Total	All Vehs Total	All Trucks Total
Start	End										
0	0100	20	0	0	20	4	1	0	5	25	1
0100	0200	5	0	0	5	1	0	0	1	6	0
0200	0300	5	0	0	5	1	0	0	1	6	0
0300	0400	0	0	0	0	1	0	0	1	1	0
0400	0500	6	0	0	6	7	0	0	7	13	0
0500	0600	6	0	2	8	37	9	1	47	55	12
0600	0700	79	11	1	91	136	33	2	171	262	47
0700	0800	69	11	0	80	260	25	1	286	366	37
0800	0900	87	15	2	104	196	27	0	223	327	44
0900	1000	83	11	0	94	137	14	1	152	246	26
1000	1100	92	10	0	102	102	17	1	120	222	28
1100	1200	108	7	1	116	104	12	1	117	233	21
1200	1300	142	5	0	147	118	25	2	145	292	32
1300	1400	170	18	2	190	137	30	1	168	358	51
1400	1500	176	17	2	195	129	26	2	157	352	47
1500	1600	214	20	0	234	133	26	3	162	396	49
1600	1700	256	19	0	275	137	17	0	154	429	36
1700	1800	237	9	1	247	146	14	2	162	409	26
1800	1900	150	5	2	157	137	8	0	145	302	15
1900	2000	123	3	1	127	82	4	0	86	213	8
2000	2100	116	3	0	119	66	2	0	68	187	5
2100	2200	98	1	1	100	39	3	0	42	142	5
2200	2300	67	3	0	70	31	1	0	32	102	4
2300	2400	36	1	0	37	15	0	0	15	52	1
AM total		560	65	6	631	986	138	7	1131	1762	216
PM total		1785	104	9	1898	1170	156	10	1336	3234	279
24Hr Total		2345	169	15	<b>2529</b>	2156	294	17	<b>2467</b>	<b>4996</b>	<b>495</b>
% of Total		92.7	6.7	0.6		87.4	11.9	0.7			<b>9.9</b>

source: Ritchie Traffic Services 613-540-4481







## Appendix A-6

### 2011 Peak Period Turning Movement Counts





Traffic count at Carp - Highway 417 WB off-ramp April 21 AM and April 14 PM

Automobiles

	Carp SB			Carp NB			417 WB ramp		
	R	L	T	R	L	T	R	L	T
7:00		93	2	10	39	0	53	0	56
7:15		93	3	10	59	0	62	0	59
7:30		115	2	15	54	0	54	0	76
7:45		107	2	13	62	0	51	0	120
8:00		111	2	14	51	0	35	0	94
8:15		96	4	16	59	0	45	0	103
8:30		93	2	11	56	0	28	0	102

Peak 7:30		429	10	58	226		185		393
Total volume		497	20	64	259		207		428
Truck %			14%	50%	9%	13%	11%		8%

3:00		92	8	24	54	0	51	0	133
3:15		69	4	31	40	0	48	0	148
3:30		108	11	36	61	0	48	0	162
3:45		79	7	28	61	0	57	0	161
4:00		128	19	41	62	0	41	0	174
4:15		120	12	39	55	0	47	0	164
4:30		136	25	35	56	0	44	0	229
4:45		126	17	25	59	0	58	0	215
5:00		127	11	35	61	0	48	0	204
5:15		96	13	43	64	0	50	0	216
5:30		79	10	34	57	0	71	0	190

Peak 4:30		485	66	138	240		200		864
Total volume		513	70	140	273		224		887
Truck %			5%	6%	1%	12%	11%		3%

Heavy Trucks

	Carp SB			Carp NB			417 WB ramp		
	R	L	T	R	L	T	R	L	T
7:00		22	3	1	7	0	7	0	3
7:15		16	1	1	6	0	10	0	5
7:30		19	3	3	8	0	5	0	12
7:45		12	5	0	9	0	6	0	6
8:00		20	1	2	8	0	6	0	9
8:15		17	1	1	8	0	5	0	8
8:30		13	4	3	12	0	5	0	11

Peak 7:30		68	10	6	33		22		35
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3:00		19	2	0	7	0	11	0	7
3:15		17	3	4	11	0	10	0	8
3:30		10	4	0	2	0	19	0	12
3:45		8	2	1	16	0	13	0	11
4:00		12	1	1	11	0	10	0	11
4:15		8	3	1	11	0	10	0	6
4:30		9	2	0	11	0	5	0	8
4:45		11	2	0	6	0	8	0	5
5:00		7	0	0	5	0	8	0	4
5:15		1	0	2	11	0	3	0	6
5:30		6	0	0	2	0	7	0	4

Peak 4:30		28	4	2	33		24		23
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Traffic count at Carp and Highway 417 EB off-ramp on April 14 AM and April 18 PM

Automobiles

	Carp SB			Carp NB			417 EB ramp		
	R	T	L	R	T	L	R	T	L
7:00	71	76	0	184	44	0	25	0	12
7:15	71	89	0	204	41	0	33	0	15
7:30	70	113	0	210	54	0	34	0	17
7:45	60	164	0	203	68	0	42	0	15
8:00	58	138	0	194	65	0	27	0	10
8:15	69	125	0	193	60	0	31	0	8
8:30	50	128	0	153	40	0	24	0	4

Peak 7:30	257	540		800	247		134		50
Total volume	303	601		831	289		139		59
Truck %	15%	10%		4%	15%		4%		15%

3:30	54	219	0	80	64	0	14	0	1
3:45	40	237	0	90	96	0	21	0	2
4:00	71	231	0	94	99	0	13	0	4
4:15	60	272	0	104	79	0	9	0	2
4:30	65	261	0	115	104	0	11	0	1
4:45	61	237	0	121	81	0	13	0	6
5:00	68	256	0	142	101	0	16	0	2
5:15	58	301	0	108	91	0	13	0	3
5:30	42	246	0	139	62	0	11	0	2
5:45	0	0	0	0	0	0	0	0	0

Peak 4:30	252	1055		486	377		53		12
Total volume	271	1090		497	406		57		17
Truck %	7%	3%		2%	7%		7%		29%

Heavy Trucks

	Carp SB			Carp NB			417 EB ramp		
	R	T	L	R	T	L	R	T	L
7:00	14	19	0	10	10	0	0	0	1
7:15	12	10	0	8	4	0	1	0	2
7:30	15	15	0	8	6	0	1	0	3
7:45	10	18	0	6	14	0	1	0	3
8:00	8	14	0	7	9	0	2	0	2
8:15	13	14	0	10	13	0	1	0	1
8:30	15	14	0	8	9	0	0	0	3

Peak 7:30	46	61	0	31	42	0	5	0	9
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3:30	12	17	0	9	6	0	0	0	5
3:45	10	14	0	5	11	0	1	0	1
4:00	6	13	0	4	11	0	0	0	0
4:15	8	12	0	2	15	0	1	0	0
4:30	10	15	0	3	11	0	1	0	2
4:45	5	8	0	5	5	0	2	0	1
5:00	2	6	0	1	8	0	0	0	1
5:15	2	6	0	2	5	0	1	0	1
5:30	3	4	0	3	2	0	1	0	1
5:45	0	0	0	0	0	0	0	0	0

Peak 4:30	19	35	0	11	29	0	4	0	5
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Traffic count at Carp- Richardson Side Road intersection April 5 PM and April 6 AM

Automobiles

	Carp SB			Carp NB			Richardson EB			Richardson WB		
	R	T	L	R	T	L	R	T	L	R	T	L
6:30	2	49	9	15	47	16	34	9	1	6	8	3
7:00	1	51	11	5	57	25	48	15	0	9	7	3
7:15	2	61	8	3	62	13	49	23	2	5	6	4
7:30	2	62	17	9	78	8	54	23	5	10	3	2
7:45	0	54	12	12	67	14	52	23	2	3	3	10
8:00	2	63	12	14	95	21	46	26	8	11	3	7
8:15	3	66	10	17	58	19	49	20	1	3	8	9
8:30	0	62	11	20	54	25	35	17	0	8	7	7
8:45	2	45	9	15	55	13	23	13	4	9	4	8
Peak 7:30	6	238	50	51	291	62	195	89	16	27	16	28
Total volume	8	274	57	52	324	70	207	105	17	28	22	29
Truck %	25%	13%	12%	2%	10%	11%	6%	15%	6%	4%	27%	3%
3:00	2	51	8	7	64	28	23	6	0	9	17	4
3:15	4	50	13	3	74	36	26	7	2	9	13	8
3:30	4	101	10	3	72	26	17	5	1	14	11	11
3:45	5	62	2	11	74	33	24	6	3	11	25	4
4:00	2	103	8	10	72	36	23	17	4	15	16	6
4:15	3	84	6	8	57	36	24	18	6	21	29	9
4:30	2	66	21	15	70	38	18	14	1	16	24	20
4:45	3	82	13	5	52	39	26	13	3	12	24	12
5:00	6	93	19	12	56	41	20	14	2	17	28	20
5:15	4	54	16	13	60	38	19	9	1	28	26	16
5:30	3	64	6	7	45	36	29	9	4	19	20	15
5:45	0	26	7	4	47	38	18	6	1	12	21	16
Peak 4:15	10	327	48	35	245	147	91	60	14	63	91	47
Total volume	11	349	49	38	267	171	93	64	15	65	111	47
Truck %	9%	6%	2%	8%	8%	14%	2%	6%	7%	3%	18%	0%

Traffic count at Carp- Richardson Side Road intersection April 5 PM and April 6 AM

Heavy Trucks

	Carp SB			Carp NB			Richardson EB			Richardson WB		
	R	T	L	R	T	L	R	T	L	R	T	L
6:30	0	8	2	0	3	1	5	4	2	0	0	1
7:00	0	14	6	0	3	0	6	3	1	0	1	2
7:15	1	4	1	2	7	0	9	10	3	0	0	1
7:30	1	8	1	0	2	3	2	3	0	0	1	1
7:45	0	7	4	0	9	0	3	8	0	0	0	0
8:00	0	9	1	0	9	2	0	2	1	1	4	0
8:15	0	5	0	0	6	3	1	0	0	0	0	0
8:30	0	8	0	1	10	2	3	1	0	1	1	1
8:45	0	5	0	0	7	7	2	1	1	0	0	0
Peak 7:30	1	29	6	0	26	8	6	13	1	1	5	1
3:00	0	6	0	0	10	3	0	0	0	0	0	0
3:15	0	5	1	0	12	3	2	0	0	1	1	0
3:30	0	8	0	0	13	2	2	0	0	1	1	0
3:45	0	10	0	0	6	6	0	0	0	0	3	0
4:00	0	5	0	0	4	11	0	0	0	0	5	0
4:15	0	6	1	0	4	5	0	0	1	0	10	0
4:30	0	0	0	0	5	2	0	0	0	0	3	0
4:45	1	3	0	0	3	4	2	2	0	1	0	0
5:00	0	1	0	0	2	1	0	0	0	1	2	0
5:15	0	1	0	0	1	2	0	0	0	1	1	0
5:30	0	0	0	0	3	0	0	0	0	0	1	0
5:45	0	0	0	0	2	0	1	0	0	0	0	0
Peak 4:15	1	14	1	0	16	22	2	2	1	1	18	0



## Appendix A-7

### Spot Speed Surveys





### Speed Survey Summary



Survey ID: 3423	Location: RICHARDSON SIDE RD	WILLIAM MOONEY RD	DAVID MANCHESTER RD	WC
IMM. EAST OF DAVID MANCHESTER AT HWY-417 OVERPASS.				
Date: Tuesday, February 14, 2006	Road surface: Asphalt	Speed Limit:		
Time: 14:30 - 15:00	Road condition: Dry			
Surveyor: Mousseau, Jerry	Weather: Cloudy			
Comments:				

Legend: A/LT = Auto/Light Truck, HT = Heavy Truck, B = Bus, SB = School Bus

EASTBOUND						WESTBOUND						COMBINED
Speed	A/LT	HT	B	SB	Total	Speed	A/LT	HT	B	SB	Total	Total
120.5	0	0	0	0	0	120.5	1	0	0	0	1	1
118.5	0	0	0	0	0	118.5	0	0	0	0	0	0
116.5	0	0	0	0	0	116.5	0	0	0	0	0	0
114.5	0	0	0	0	0	114.5	0	0	0	0	0	0
112.5	0	0	0	0	0	112.5	0	0	0	0	0	0
110.5	0	0	0	0	0	110.5	1	0	0	0	1	1
108.5	0	0	0	0	0	108.5	0	0	0	0	0	0
106.5	0	0	0	0	0	106.5	0	0	0	0	0	0
104.5	0	0	0	0	0	104.5	1	0	0	0	1	1
102.5	1	0	0	0	1	102.5	0	0	0	0	0	1
100.5	1	0	0	0	1	100.5	0	0	0	0	0	1
98.5	0	0	0	0	0	98.5	0	0	0	0	0	0
96.5	1	0	0	0	1	96.5	2	0	0	0	2	3
94.5	0	0	0	0	0	94.5	2	0	0	0	2	2
92.5	2	0	0	0	2	92.5	1	0	0	0	1	3
90.5	1	0	0	0	1	90.5	2	0	0	0	2	3
88.5	0	0	0	0	0	88.5	1	0	0	0	1	1
86.5	1	0	0	0	1	86.5	2	0	0	0	2	3
84.5	1	0	0	0	1	84.5	4	0	0	0	4	5
82.5	2	0	0	0	2	82.5	7	1	0	0	8	10
<u>80.5</u>	4	1	0	0	5	<u>80.5</u>	5	0	0	0	5	10
78.5	0	0	0	0	0	78.5	2	0	0	0	2	2
76.5	1	0	0	0	1	76.5	2	0	0	0	2	3
74.5	1	0	0	0	1	74.5	2	0	0	1	3	4
72.5	0	0	0	0	0	72.5	0	0	0	0	0	0
70.5	0	0	0	0	0	70.5	2	0	0	1	3	3
68.5	1	0	0	0	1	68.5	1	0	0	1	2	3
66.5	1	0	0	0	1	66.5	0	0	0	0	0	1
64.5	1	0	0	0	1	64.5	1	0	0	0	1	2
<b>Total:</b>	<b>19</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>20</b>	<b>Total:</b>	<b>39</b>	<b>1</b>	<b>0</b>	<b>3</b>	<b>43</b>	<b>63</b>

#### ALL VEHICLES

	Eastbound	Westbound	Combined
Average:	83 km/h	84 km/h	84 km/h
Standard Deviation:	10 km/h	11 km/h	11 km/h
85th percentile:	94 ± 6 Km/h	95 ± 4 Km/h	95 ± 3 Km/h
95th percentile:	101 ± 6 Km/h	102 ± 4 Km/h	102 ± 3 Km/h
Upper 15K:	92 km/h	84 km/h	90 km/h
Compliance:	38 %	36 %	37 %

#### HEAVY VEHICLES

Combined	Total heavy vehicles: 5
75 Km/h	
6 Km/h	Note: Insufficient heavy vehicle volume data for valid statistical results.
82 ± 7 Km/h	
70%	

Speed Survey  
Summary



Survey ID: 4837	Location: RICHARDSON SIDE RD 2495 Richardson Sd Rd	WILLIAM MOONEY RD	DAVID MANCHESTER RD	WC
Date: Friday, June 05, 2009	Road surface: Asphalt	Speed Limit:		
Time: 08:30 - 09:30	Road condition: Dry			
Surveyor: Mohr, Kerry-Lynn	Weather: Clear			
Comments:				

Legend: A/LT = Auto/Light Truck, HT = Heavy Truck, B = Bus, SB = School Bus

EASTBOUND						WESTBOUND						COMBINED
Speed	A/LT	HT	B	SB	Total	Speed	A/LT	HT	B	SB	Total	Total
120.5	1	0	0	0	1	120.5	0	0	0	0	0	1
118.5	0	0	0	0	0	118.5	0	0	0	0	0	0
116.5	0	0	0	0	0	116.5	0	0	0	0	0	0
114.5	0	0	0	0	0	114.5	0	0	0	0	0	0
112.5	0	0	0	0	0	112.5	0	0	0	0	0	0
110.5	1	0	0	0	1	110.5	0	0	0	0	0	1
108.5	1	0	0	0	1	108.5	0	0	0	0	0	1
106.5	1	0	0	0	1	106.5	1	0	0	0	1	2
104.5	1	0	0	0	1	104.5	0	0	0	0	0	1
102.5	4	0	0	0	4	102.5	2	0	0	0	2	6
100.5	4	0	0	0	4	100.5	0	0	0	0	0	4
98.5	2	0	0	0	2	98.5	0	0	0	0	0	2
96.5	7	0	0	0	7	96.5	2	0	0	1	3	10
94.5	6	0	0	0	6	94.5	0	0	0	0	0	6
92.5	6	0	0	0	6	92.5	3	0	0	0	3	11
90.5	7	0	0	0	7	90.5	3	0	0	0	3	10
88.5	7	0	0	0	7	88.5	1	0	0	0	1	8
86.5	6	0	0	1	7	86.5	4	0	0	0	4	11
84.5	6	0	0	0	6	84.5	6	0	0	0	6	12
82.5	5	0	0	0	5	82.5	3	0	0	0	3	8
80.5	3	0	0	0	3	80.5	4	0	0	0	4	7
78.5	2	0	0	0	2	78.5	2	0	0	0	2	4
76.5	3	0	0	0	3	76.5	2	0	0	1	3	6
74.5	0	0	0	0	0	74.5	1	0	0	0	1	1
72.5	1	0	0	0	1	72.5	2	1	0	0	3	4
70.5	0	0	0	0	0	70.5	0	0	0	0	0	0
68.5	2	0	0	0	2	68.5	0	0	0	0	0	2
66.5	1	0	0	0	1	66.5	0	0	0	0	0	1
64.5	0	0	0	0	0	64.5	0	0	0	0	0	0
62.5	0	0	0	0	0	62.5	1	0	0	0	1	1
60.5	0	0	0	0	0	60.5	1	0	0	0	1	1
58.5	0	0	0	0	0	58.5	0	0	0	0	0	0
56.5	0	0	0	0	0	56.5	0	0	0	0	0	0
54.5	0	0	0	0	0	54.5	1	0	0	0	1	1
<b>Total:</b>	<b>79</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>80</b>	<b>Total:</b>	<b>39</b>	<b>1</b>	<b>0</b>	<b>2</b>	<b>42</b>	<b>122</b>

ALL VEHICLES

	Eastbound	Westbound	Combined
Average:	90 km/h	84 km/h	88 km/h
Standard Deviation:	10 km/h	11 km/h	10 km/h
85th percentile:	100 ± 3 Km/h	95 ± 4 Km/h	99 ± 2 Km/h
95th percentile:	106 ± 3 Km/h	102 ± 4 Km/h	105 ± 2 Km/h
Upper 15K:	96 km/h	92 km/h	96 km/h
Compliance:	13 %	33 %	20 %

HEAVY VEHICLES

Combined	Total heavy vehicles: 4
83 Km/h	
11 Km/h	Note: Insufficient heavy vehicle volume data for valid statistical results.
94 ± 13 Km/h	
50%	

Speed Survey  
Summary



Survey ID: 4648 Location: WILLIAM MOONEY RD At house # 1032. MCGEE SIDE RD COVEREDBRIDGE WAY WC

Date: Monday, March 02, 2009 Road surface: Asphalt Speed Limit: 80

Time: 07:00 - 09:00 Road condition: Dry

Surveyor: Mousseau, Jerry Weather: Clear

Comments: Insufficient volume for proper speed survey.

Legend: A/LT = Auto/Light Truck, HT = Heavy Truck, B = Bus, SB = School Bus

NORTHBOUND						SOUTHBOUND						COMBINED
Speed	A/LT	HT	B	SB	Total	Speed	A/LT	HT	B	SB	Total	Total
98.5	0	0	0	0	0	98.5	1	0	0	0	1	1
96.5	0	0	0	0	0	96.5	0	0	0	0	0	0
94.6	0	0	0	0	0	94.5	0	0	0	0	0	0
92.5	0	0	0	0	0	92.5	1	0	0	0	1	1
90.5	0	0	0	0	0	90.5	0	0	0	0	0	0
88.5	0	0	0	0	0	88.5	0	0	0	0	0	0
86.5	0	0	0	0	0	86.5	0	0	0	0	0	0
84.5	1	0	0	0	1	84.5	0	0	0	0	0	1
82.5	1	0	0	0	1	82.5	0	0	0	0	0	1
80.5	0	0	0	0	0	80.5	0	0	0	0	0	0
78.5	0	0	0	0	0	78.5	0	0	0	0	0	0
76.5	1	0	0	0	1	76.5	1	0	0	0	1	2
74.6	0	0	0	0	0	74.5	1	0	0	0	1	1
72.5	4	0	0	0	4	72.5	2	0	0	0	2	6
70.5	1	0	0	0	1	70.5	5	0	0	1	6	7
68.6	1	0	0	0	1	68.5	1	0	0	0	1	2
66.5	0	0	0	0	0	66.5	1	0	0	0	1	1
64.6	0	0	0	0	0	64.5	0	0	0	0	0	0
62.5	0	0	0	0	0	62.5	1	0	0	0	1	1
60.5	1	0	0	1	2	60.5	1	0	0	0	1	3
58.5	0	0	0	0	0	58.5	0	0	0	0	0	0
56.5	0	0	0	0	0	56.5	1	0	0	0	1	1
<b>Total:</b>	<b>10</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>11</b>	<b>Total:</b>	<b>16</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>17</b>	<b>28</b>

	ALL VEHICLES		
	NorthBound	SouthBound	Combined
Average:	72 km/h	72 km/h	72 km/h
Standard Deviation:	8 km/h	10 km/h	9 km/h
85th percentile:	80 ± 6 Km/h	83 ± 6 Km/h	82 ± 4 Km/h
95th percentile:	85 ± 6 Km/h	89 ± 6 Km/h	87 ± 4 Km/h
Upper 15K:	76 km/h	76 km/h	76 km/h
Compliance:	82 %	88 %	86 %

HEAVY VEHICLES	
Combined	Total heavy vehicles: 2
66 Km/h	
7 Km/h	Note: Insufficient heavy vehicle volume data for valid statistical results.
73 ± 13 Km/h	
100%	

Speed Survey  
Summary



Survey ID: 1999 Location: WILLIAM MOONEY RD WILBERT COX DR RICHARDSON SIDE RD WC  
 Date: Monday, August 26, 2002 Road surface: Asphalt Speed Limit: 80  
 Time: 06:15 - 08:00 Road condition: Dry  
 Surveyor: Mousseau, Jerry Weather: Clear  
 Comments: INSUFFICIENT VOLUME DURING SURVEY.

Legend: A/LT = Auto/Light Truck, HT = Heavy Truck, B = Bus, SB = School Bus

NORTHBOUND						SOUTHBOUND						COMBINED
Speed	A/LT	HT	B	SB	Total	Speed	A/LT	HT	B	SB	Total	Total
102.5	0	0	0	0	0	102.5	1	0	0	0	1	1
100.5	0	0	0	0	0	100.5	0	0	0	0	0	0
98.5	0	0	0	0	0	98.5	0	0	0	0	0	0
96.5	0	0	0	0	0	96.5	0	0	0	0	0	0
94.5	0	0	0	0	0	94.5	0	0	0	0	0	0
92.5	0	0	0	0	0	92.5	1	0	0	0	1	1
90.5	0	0	0	0	0	90.5	1	0	0	0	1	1
88.5	1	0	0	0	1	88.5	0	0	0	0	0	1
86.5	0	0	0	0	0	86.5	0	0	0	0	0	0
84.5	0	0	0	0	0	84.5	1	0	0	0	1	1
82.5	0	0	0	0	0	82.5	1	0	0	0	1	1
80.5	0	0	0	0	0	80.5	3	0	0	0	3	3
78.5	0	0	0	0	0	78.5	0	0	0	0	0	0
76.5	0	0	0	0	0	76.5	0	0	0	0	0	0
74.5	0	0	0	0	0	74.5	0	0	0	0	0	0
72.5	1	0	0	0	1	72.5	2	0	0	0	2	3
70.5	1	0	0	0	1	70.5	2	0	0	0	2	3
68.5	0	0	0	0	0	68.5	2	0	0	0	2	2
66.5	0	0	0	0	0	66.5	0	0	0	0	0	0
64.5	0	0	0	0	0	64.5	1	0	0	0	1	1
62.5	1	0	0	0	1	62.5	1	0	0	0	1	2
60.5	0	0	0	0	0	60.5	1	0	0	0	1	1
<b>Total:</b>	<b>4</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>Total:</b>	<b>17</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>17</b>	<b>21</b>

ALL VEHICLES

	NorthBound	SouthBound	Combined
Average:	74 km/h	77 km/h	76 km/h
Standard Deviation:	11 km/h	11 km/h	11 km/h
85th percentile:	85 ± 14 Km/h	89 ± 7 Km/h	88 ± 6 Km/h
95th percentile:	92 ± 14 Km/h	96 ± 7 Km/h	95 ± 6 Km/h
Upper 15K:	76 km/h	84 km/h	84 km/h
Compliance:	75 %	62 %	64 %

HEAVY VEHICLES

Combined	Total heavy vehicles: 0
0 Km/h	
0 Km/h	Note: Insufficient heavy vehicle volume data for valid statistical results.
0 ± 0 Km/h	
0%	



# Appendix B

## Traffic Operations Detailed Analysis Results





HCM Unsignalized Intersection Capacity Analysis  
 10: Highway 417 EB off-ramp & Carp Road

11/05/2011



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	¶¶			¶	¶	
Volume (veh/h)	55	140	0	270	630	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	60	152	0	293	685	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)					321	
pX, platoon unblocked	0.99	0.99	0.99			
vC, conflicting volume	978	685	685			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	973	677	677			
tC, single (s)	6.6	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.6	3.3	2.2			
p0 queue free %	77	66	100			
cM capacity (veh/h)	262	445	906			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	212	293	685
Volume Left	60	0	0
Volume Right	152	0	0
cSH	372	1700	1700
Volume to Capacity	0.57	0.17	0.40
Queue Length 95th (m)	27.2	0.0	0.0
Control Delay (s)	26.8	0.0	0.0
Lane LOS	D		
Approach Delay (s)	26.8	0.0	0.0
Approach LOS	D		

Intersection Summary			
Average Delay		4.8	
Intersection Capacity Utilization		55.1%	ICU Level of Service B
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis  
 16: Richardson Side Road & William Mooney

11/05/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		⇄			⇄			⇄			⇄	
Volume (veh/h)	10	280	5	20	150	30	0	0	10	45	0	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	304	5	22	163	33	0	0	11	49	0	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	196			310			552	568	307	562	554	179
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	196			310			552	568	307	562	554	179
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			98			100	100	99	88	100	100
cM capacity (veh/h)	1377			1251			436	422	733	423	429	863

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	321	217	11	49
Volume Left	11	22	0	49
Volume Right	5	33	11	0
cSH	1377	1251	733	423
Volume to Capacity	0.01	0.02	0.01	0.12
Queue Length 95th (m)	0.2	0.4	0.4	3.1
Control Delay (s)	0.3	0.9	10.0	14.6
Lane LOS	A	A	A	B
Approach Delay (s)	0.3	0.9	10.0	14.6
Approach LOS			A	B

Intersection Summary			
Average Delay		1.9	
Intersection Capacity Utilization	34.4%	ICU Level of Service	A
Analysis Period (min)		15	

HCM Signalized Intersection Capacity Analysis  
 3: Richardson Side Road & Carp Road

10/05/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔		↔	↔		↔	↔	
Volume (vph)	20	105	210	30	20	30	70	335	50	60	275	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.6			5.6		6.1	6.1		6.1	6.1	
Lane Util. Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Fr <sub>t</sub>		0.92			0.95		1.00	0.98		1.00	0.99	
Fl <sub>t</sub> Protected		1.00			0.98		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1594			1619		1626	1710		1612	1666	
Fl <sub>t</sub> Permitted		0.98			0.72		0.57	1.00		0.49	1.00	
Satd. Flow (perm)		1561			1182		979	1710		836	1666	
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)	22	114	228	33	22	33	76	364	54	65	299	11
RTOR Reduction (vph)	0	115	0	0	25	0	0	7	0	0	2	0
Lane Group Flow (vph)	0	249	0	0	63	0	76	411	0	65	308	0
Heavy Vehicles (%)	6%	15%	6%	3%	27%	4%	11%	10%	2%	12%	13%	25%
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		13.1			13.1		28.7	28.7		28.7	28.7	
Effective Green, g (s)		13.1			13.1		28.7	28.7		28.7	28.7	
Actuated g/C Ratio		0.24			0.24		0.54	0.54		0.54	0.54	
Clearance Time (s)		5.6			5.6		6.1	6.1		6.1	6.1	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		382			289		525	917		448	894	
v/s Ratio Prot								c0.24			0.18	
v/s Ratio Perm		c0.16			0.05		0.08			0.08		
v/c Ratio		0.65			0.22		0.14	0.45		0.15	0.34	
Uniform Delay, d <sub>1</sub>		18.2			16.1		6.2	7.6		6.2	7.1	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d <sub>2</sub>		4.0			0.4		0.6	1.6		0.7	1.1	
Delay (s)		22.1			16.5		6.8	9.2		6.9	8.1	
Level of Service		C			B		A	A		A	A	
Approach Delay (s)		22.1			16.5			8.8			7.9	
Approach LOS		C			B			A			A	

Intersection Summary

HCM Average Control Delay	12.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	53.5	Sum of lost time (s)	11.7
Intersection Capacity Utilization	58.7%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis  
 6: Highway 417 WB ramp & Carp Road

10/05/2011



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↰		↩		↰	↱
Volume (vph)	430	0	260	65	20	505
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5		6.6		6.6	6.6
Lane Util. Factor	1.00		1.00		1.00	1.00
Frt	1.00		0.97		1.00	1.00
Flt Protected	0.95		1.00		0.95	1.00
Satd. Flow (prot)	1671		1648		1203	1667
Flt Permitted	0.95		1.00		0.50	1.00
Satd. Flow (perm)	1671		1648		639	1667
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	467	0	283	71	22	549
RTOR Reduction (vph)	0	0	6	0	0	0
Lane Group Flow (vph)	467	0	348	0	22	549
Heavy Vehicles (%)	8%	2%	13%	9%	50%	14%
Turn Type					Perm	
Protected Phases	8		2			6
Permitted Phases					6	
Actuated Green, G (s)	27.2		40.3		40.3	40.3
Effective Green, g (s)	27.2		40.3		40.3	40.3
Actuated g/C Ratio	0.34		0.50		0.50	0.50
Clearance Time (s)	6.5		6.6		6.6	6.6
Vehicle Extension (s)	3.0		3.0		3.0	3.0
Lane Grp Cap (vph)	564		824		320	834
v/s Ratio Prot	c0.28		0.21			c0.33
v/s Ratio Perm					0.03	
v/c Ratio	0.83		0.42		0.07	0.66
Uniform Delay, d1	24.5		12.8		10.4	15.0
Progression Factor	1.00		1.00		1.00	1.00
Incremental Delay, d2	9.7		1.6		0.4	4.1
Delay (s)	34.3		14.4		10.8	19.1
Level of Service	C		B		B	B
Approach Delay (s)	34.3		14.4			18.8
Approach LOS	C		B			B

Intersection Summary			
HCM Average Control Delay	22.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	80.6	Sum of lost time (s)	13.1
Intersection Capacity Utilization	61.3%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

# HCM Signalized Intersection Capacity Analysis

## 3: Richardson Side Road & Carp

11/05/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		⇄			⇄		⇄	⇄		⇄	⇄	
Volume (vph)	15	65	95	50	110	65	170	270	40	50	350	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.6			5.6		6.1	6.1		6.1	6.1	
Lane Util. Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Frt		0.93			0.96		1.00	0.98		1.00	1.00	
Flt Protected		1.00			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1709			1711		1641	1732		1805	1835	
Flt Permitted		0.96			0.89		0.52	1.00		0.56	1.00	
Satd. Flow (perm)		1653			1541		898	1732		1061	1835	
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)	16	71	103	54	120	71	185	293	43	54	380	11
RTOR Reduction (vph)	0	79	0	0	28	0	0	6	0	0	1	0
Lane Group Flow (vph)	0	111	0	0	217	0	185	330	0	54	390	0
Heavy Vehicles (%)	0%	4%	2%	0%	9%	4%	10%	8%	5%	0%	3%	7%
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		12.4			12.4		29.1	29.1		29.1	29.1	
Effective Green, g (s)		12.4			12.4		29.1	29.1		29.1	29.1	
Actuated g/C Ratio		0.23			0.23		0.55	0.55		0.55	0.55	
Clearance Time (s)		5.6			5.6		6.1	6.1		6.1	6.1	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		385			359		491	947		580	1004	
v/s Ratio Prot								0.19			c0.21	
v/s Ratio Perm		0.07			c0.14		0.21			0.05		
v/c Ratio		0.29			0.60		0.38	0.35		0.09	0.39	
Uniform Delay, d1		16.8			18.2		6.9	6.7		5.8	6.9	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.4			2.9		2.2	1.0		0.3	1.1	
Delay (s)		17.2			21.1		9.1	7.8		6.1	8.1	
Level of Service		B			C		A	A		A	A	
Approach Delay (s)		17.2			21.1			8.2			7.8	
Approach LOS		B			C			A			A	

### Intersection Summary

HCM Average Control Delay	11.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	53.2	Sum of lost time (s)	11.7
Intersection Capacity Utilization	67.6%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

# HCM Signalized Intersection Capacity Analysis

## 6: Highway 417 WB off-ramp & Carp

11/05/2011



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	890	0	265	140	70	430
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5		6.6		6.6	6.6
Lane Util. Factor	1.00		1.00		1.00	1.00
Frt	1.00		0.95		1.00	1.00
Flt Protected	0.95		1.00		0.95	1.00
Satd. Flow (prot)	1752		1674		1703	1810
Flt Permitted	0.95		1.00		0.26	1.00
Satd. Flow (perm)	1752		1674		469	1810
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	967	0	288	152	76	467
RTOR Reduction (vph)	0	0	15	0	0	0
Lane Group Flow (vph)	967	0	425	0	76	467
Heavy Vehicles (%)	3%	2%	12%	1%	6%	5%
Turn Type					Perm	
Protected Phases	8		2			6
Permitted Phases					6	
Actuated Green, G (s)	69.3		41.4		41.4	41.4
Effective Green, g (s)	69.3		41.4		41.4	41.4
Actuated g/C Ratio	0.56		0.33		0.33	0.33
Clearance Time (s)	6.5		6.6		6.6	6.6
Vehicle Extension (s)	3.0		3.0		3.0	3.0
Lane Grp Cap (vph)	981		560		157	605
v/s Ratio Prot	c0.55		0.25			c0.26
v/s Ratio Perm					0.16	
v/c Ratio	0.99		0.76		0.48	0.77
Uniform Delay, d1	26.8		36.7		32.7	37.0
Progression Factor	1.00		1.00		1.00	1.00
Incremental Delay, d2	25.0		9.3		10.3	9.2
Delay (s)	51.8		46.0		43.0	46.2
Level of Service	D		D		D	D
Approach Delay (s)	51.8		46.0			45.8
Approach LOS	D		D			D

### Intersection Summary

HCM Average Control Delay	48.8	HCM Level of Service	D
HCM Volume to Capacity ratio	0.91		
Actuated Cycle Length (s)	123.8	Sum of lost time (s)	13.1
Intersection Capacity Utilization	92.1%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

# HCM Unsignalized Intersection Capacity Analysis

## 10: Highway 417 EB off-ramp & Carp

11/05/2011



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	⇐			⇑	⇑	
Volume (veh/h)	20	60	0	385	1050	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	22	65	0	418	1141	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type						
				None	None	
Median storage (veh)						
Upstream signal (m)						
					321	
pX, platoon unblocked	0.82	0.82	0.82			
vC, conflicting volume	1560	1141	1141			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1573	1061	1061			
tC, single (s)	6.7	6.3	4.1			
tC, 2 stage (s)						
tF (s)	3.8	3.4	2.2			
p0 queue free %	75	70	100			
cM capacity (veh/h)	86	217	537			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	87	418	1141
Volume Left	22	0	0
Volume Right	65	0	0
cSH	157	1700	1700
Volume to Capacity	0.55	0.25	0.67
Queue Length 95th (m)	22.5	0.0	0.0
Control Delay (s)	53.2	0.0	0.0
Lane LOS	F		
Approach Delay (s)	53.2	0.0	0.0
Approach LOS	F		

Intersection Summary			
Average Delay		2.8	
Intersection Capacity Utilization		75.0%	ICU Level of Service D
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis  
 16: Richardson Side Road & William Mooney

11/05/2011



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		⇄			⇄			⇄			⇄	
Volume (veh/h)	5	145	0	5	230	55	5	0	5	25	0	10
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	158	0	5	250	60	5	0	5	27	0	11
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	310			158			470	489	158	465	459	280
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	310			158			470	489	158	465	459	280
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			99	100	99	95	100	99
cM capacity (veh/h)	1251			1422			493	476	888	502	494	759

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	163	315	11	38
Volume Left	5	5	5	27
Volume Right	0	60	5	11
cSH	1251	1422	634	555
Volume to Capacity	0.00	0.00	0.02	0.07
Queue Length 95th (m)	0.1	0.1	0.4	1.8
Control Delay (s)	0.3	0.2	10.8	12.0
Lane LOS	A	A	B	B
Approach Delay (s)	0.3	0.2	10.8	12.0
Approach LOS			B	B

Intersection Summary			
Average Delay		1.3	
Intersection Capacity Utilization	27.5%	ICU Level of Service	A
Analysis Period (min)		15	