



MEMO

Date: September 25, 2008

Subject: **Micro-simulation of realignment alternatives for Parkside Drive and Wilstead Drive, Newmarket, ON.**

Background:

The section of Davis Drive between George Street and Longford Avenue will be developed to host a bus rapid transit right-of-way. The presence of this right-of-way will relocate left turning movements for vehicles travelling westbound (WB) on Davis Drive and accessing Southbound (SB) Wilstead and Parkside Drive. Left turn movement onto WB Davis Drive from Northbound (NB) Wilstead and Parkside Drives will also be relocated to U-turns at adjacent signalized intersections.

A potential realignment of Wilstead and Parkside Drives to form full 'four-leg' intersections with the George Street and Longford Avenue intersections respectively has been proposed to address operational issues along Davis Drive that currently exist due to close spacing of signalized intersections.

The objective of this analysis is to determine the travel time for the various sections of Davis Drive and the affected turning movements if the realignments are implemented vs. if they are not implemented. Computer micro-simulation of the traffic movements was determined as an appropriate technique to analyze the traffic conditions that will exist for the various alignment scenarios. The software used to perform this analysis was Aimsun.

Summary of model inputs and results:

The table below summarizes the micro-simulation model results for the future year (2015) scenarios with regards to the potential realignment of Parkside and Wilstead Drives. The model included the section of Davis Drive from west of George Street to east of Longford Avenue.

The following assumptions/considerations were a part of the modelling process:

- Average pedestrian walking speed was assumed to be 0.9 m/s (3.0 ft/s) and a two stage pedestrian crossing across Davis Drive was assumed. Signal timing phasing was modelled to ensure a protected phase for pedestrians crossing Davis Drive.
- The average headway of the buses in the transit right of way was assumed to be 2.4 minutes.
- The PM peak hour traffic volume was identified as the critical traffic movement and hence this was chosen as the worst case demand to be modelled. The source of demand data was

the 'York Region Davis Drive EA Study – Traffic Operations Review, Final Report', NCE, 2006.

Figure 1 shows the turning movement volumes that were used as model inputs for the future year to represent 2015 demand. The shaded values represent the PM peak hour demand.

George Street					Barbara Road					Longford Drive															
64	33	150	L	20	159				28	17	22	L	78	68				79	67						
41	13	22	←	919	1297	←	1019	1658	78	23	159	←	935	1508	←	1003	1546	153	128	L	32	47			
↓	↓	↓	Γ	45	54	Γ	25	40	↓	↓	↓	Γ	39	61	Γ	67	135	↓	↓	←	706	1189			
112	20	J	←	1	←	←	←	←	58	38	J	←	1	←	1568	1166	←	←	←	94	68	J			
1322	1048	←	44	7	32	1561	1092	←	25	20	←	1401	970	←	32	11	37	113	49	↓	70	62	989	817	←
57	15	↓	85	83	139	50	10	↓	25	50	51	56	↓	182	40	38	238	180							
Shopping Centre					Wilstead					Shopping Centre					Parkside Drive										

Figure 1: Peak Hour Turning Movement Forecasts to Year 2015

The following scenarios were modelled and they all included the median rapidway on Davis Drive:

- 1.) Future year 2015 PM with existing network (i.e. no realignment)
- 2.) Future year 2015 PM demand with both Parkside Drive and Wilstead Drive realignment implemented.
- 3.) Future year 2015 PM demand with only Parkside Drive realigned. Wilstead Drive realignment was not implemented in this scenario.

Model Results:

Average travel times in **Table 1** represent total times and are inclusive of delays experienced for the reported section of roadway. Delay time constitutes the time a vehicle stays waiting in queue both due to signal control and queue length.

The average travel times for the buses from east of Longford Avenue to west of George Street is 75 seconds for WB buses and 64 seconds for EB buses.

Table 1: Summary of average auto travel times and delays for sections of Davis Drive across the various scenarios modelled

Road Section	Parameter	2015 Analysis PM Peak		
		No Realignment	Both Realignment (Parkside & Wilstead)	Parkside Realignment Only
EB W of George	Travel Time (s)	44	45	45
	Delay (s)	34	35	34
EB W of Barbara	Travel Time (s)	106	64	53
	Delay (s)	87	45	34
EB W of Longford	Travel Time (s)	67	43	44
	Delay (s)	52	29	29
WB E of George	Travel Time (s)	80	60	61
	Delay (s)	48	41	42
WB E of Barbara	Travel Time (s)	66	37	36
	Delay (s)	50	22	22
WB E of Longford	Travel Time (s)	78	52	53
	Delay (s)	58	32	33
Wilstead NB Left turn onto WB Davis	Travel Time (s)	145	90	148
	Delay (s)	130	70	125
Davis WB Left turn onto SB Wilstead	Travel Time (s)	78	58	64
	Delay (s)	66	51	54
Parkside NB Left turn onto WB Davis	Travel Time (s)	84	57	57
	Delay (s)	65	42	42
Davis WB Left turn onto SB Parkside	Travel Time (s)	100	65	64
	Delay (s)	70	42	41

Discussion and Recommendations:

The results summarized above show that there is a significant improvement of travel time along Davis Drive when either of the realignment scenarios is implemented (i.e. realign Parkside Drive only or realign both Parkside and Wilstead Drive scenarios) vs the no realignment scenario.

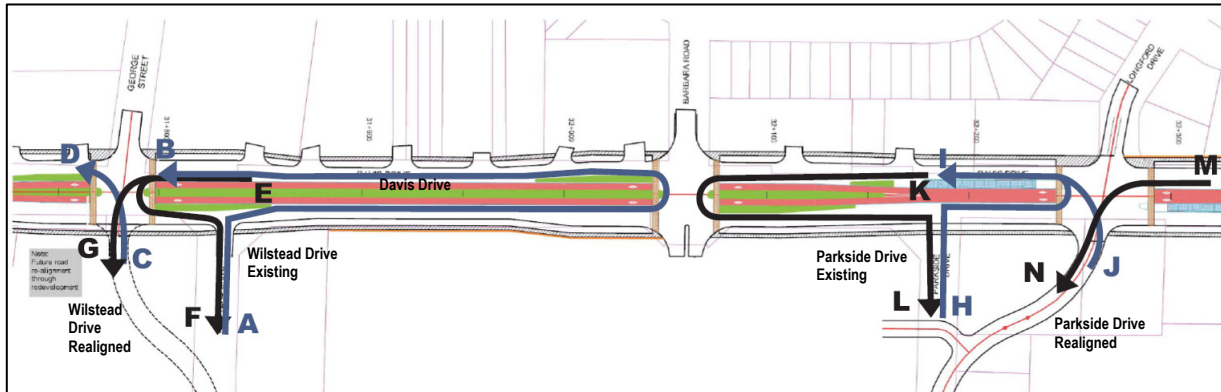


Figure 2: Critical Left Turn Movements for Parkside Drive and Wilstead Drive Intersections with Davis Drive.

Table 2: Summary of Critical Left Turn Movements

No Realignment		Both Parkside Dr. & Wilstead Dr. Realigned		Only Parkside Dr. Realigned	
From - To	Travel Time (s)	From - To	Travel Time (s)	From - To	Travel Time (s)
A-B	145	C-D	90	A-B	148
H-I	84	J-I	57	J-I	57
E-F	78	E-G	58	E-F	64
K-L	100	M-N	65	M-N	64

Figure 2 shows that without realignment vehicles traveling NB on Wilstead Drive and desirous of making a left turn onto WB Davis Drive would need to travel Eastbound (EB) on Davis Drive to Barbara Road and then make a U-turn onto WB Davis. The total time it will take to travel from A to B is 145 seconds. This time is significantly reduced if Wilstead is realigned to merge with the George Street/Davis Drive intersection. As shown above the average time it takes a vehicle to travel from C to D is 90 seconds. For vehicles desirous of making a left onto SB Wilstead from WB Davis Drive a U-turn is necessary at the George Street/Davis Drive intersection if Wilstead Drive is not realigned. The average time it takes to travel from E to F is 78 seconds vs. 58 seconds from E to G if the realignment of Wilstead Drive is implemented.

The same travel time pattern exists when the realignment of Parkside Drive is considered. For vehicles desirous of making a left turn onto Davis from NB Parkside a U-turn is required at Longford Avenue if the realignment is not implemented. The average travel time from H to I is 84 seconds compared to the average travel time of 57 seconds from J to I if realignment is implemented. For vehicles desirous of making a left onto SB Parkside from WB Davis Drive a U-turn at Barbara Road is necessary if realignment is not implemented. The average time it takes to travel from K to L is 100 seconds which is significantly higher than 65 seconds (i.e. the average travel time from M to N if realignment is implemented).

It should also be noted that the average travel time along all sections of Davis Drive between George Street and Longford Avenue is significantly improved if either of the realignment scenarios is implemented. These travel times are shown for each section of Davis Drive in

Table 2 and for each section the average travel time is less for the realigned scenarios vs. the no realignment scenario. This means that either realignment scenario will improve the level of service of the entire section modelled for future year 2015 forecast demand.

The scenario of implementing the realignment of Parkside Drive only and not implementing the realignment of Wilstead Drive showed that the average travel times were similar to the results obtained for the scenario where both realignments were modelled except for the left turn movements from NB Wilstead onto WB Davis Drive (A to B) and WB Davis Drive onto SB Wilstead Drive (E to F). It should be noted that the forecasted PM Peak Hour demand for vehicles making a left turn from Wilstead onto WB Davis Drive is 25 compared to 195 for vehicles making a left turn from Parkside Drive onto WB Davis Drive. The PM Peak Hour forecast demand for vehicles making a left onto Wilstead from WB Davis Drive is 40, compared to 135 for vehicles making a left from WB Davis onto Parkside Drive. This means that the realignment of Parkside Drive is most crucial when considering the future year demand forecasts since it impacts a significantly higher number of vehicles when compared to the volumes forecasted for Wilstead Drive.

In summary, the model results show that there are significant improvements in travel time when the realignment of Parkside and Wilstead Drives are implemented with the Parkside Drive realignment providing the greatest benefit. If only Parkside Drive is realigned the travel time improvements that are gained are mostly maintained except for the left turn movements related to Wilstead Drive.

It is important to note that there is a relatively low left turn demand forecasted for the 2015 PM peak for traffic moving from NB Wilstead Drive onto WB Davis Drive and from WB Davis Drive onto SB Wilstead Drive. Figure 1 above shows that the left turn demand from Wilstead Drive onto WB Davis Drive is 25, while the demand for left turn onto SB Wilstead from WB Davis Drive is 40 vehicles. Also it is reasonable to assume some of the modest left turn volume will redistribute to Parkside Drive and to Barbara Road in order to take advantage of reduced travel time.

The model results also show that the operational improvement to traffic along Davis Drive is similar for both realignment scenarios considered and as such the non-realignment of Wilstead Drive will have an insignificant impact to the movement of traffic along Davis Drive. Therefore the realignment of Wilstead Drive, even though ultimately desirable is not necessary as part of the rapidway implementation.