

MEMORANDUM

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DATE: September 9, 2017

TO: Raymond Hayhurst, City of Alexandria

CC: Maha Gilini, MSCE, CPM

FROM: Suresh Karre, P.E., PTOE

SUBJECT: King Street Road Diet Traffic Analysis – After Complete Street

Introduction

As part of the City of Alexandria's Complete Streets Initiative, VA-7 (King Street) has been converted to a two-lane, undivided arterial roadway with curb side bike lanes in both directions between its intersections with Braddock Road to the northwest and Janney's Lane to the southeast. Under this road diet, one through travel lane was removed in each direction, with left-turn bays provided at all intersections along the corridor. A previous study was conducted in December 2015 to analyze the proposed road diet and its impacts on traffic operations along King Street. The city of Alexandria has requested an updated traffic analysis to verify current operations after the road diet was implemented.

This memorandum has been prepared to summarize the updated traffic analysis conducted along King Street between Braddock Road and Highland Place under both Existing (after Complete Street) conditions and No Build conditions (prior to the implementation of the road diet).

Data Collection

The City of Alexandria provided STV with the intersection turning movement counts collected in October 2016 and in May 2017. In addition, queuing observations for each intersection along King Street collected in May 2017 were also provided by the City. Turning movement counts at the intersections of Braddock Road at Quaker Lane, King Street at Braddock Road and King Street at Quaker Road were collected in October 2016. Tube counts along King Street were collected in May 2017, in addition to turning movement counts at the intersections of King Street with Braddock Road and Janney's Lane. All data provided by The City are included as part of **Attachment A**.

These counts along King Street were reviewed and balanced to account for any inconsistencies between different count dates. It should be noted that the new (2016/2017) traffic volumes were generally lower than the previous analysis, which included traffic count data from June 2014. As directed by the City, the through volumes along King Street was increased in both the east- and westbound direction during the AM peak hour to reflect a more conservative analysis. The pedestrian volumes from previous study were maintained at locations without new data.

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Traffic Analysis

To compare the impacts of the road diet on traffic operations along King Street, the Existing (after Complete Street) and No Build (before Complete Street) conditions were modeled in Synchro 9.0. The City provided updated signal timing data and adjusted parameters under Existing AM and PM peak hour conditions. Both scenarios reflected an updated speed limit of 25 mph along King Street.

Queue observations provided by the City were compared to the queue lengths derived from the Existing scenario Synchro files to validate the models. The queue lengths derived from the Synchro models were generally consistent with the field-collected queue measurements. Based on an initial review of the models, the City has recommended several adjustments to the models, as identified below:

- Volume increases along both east- and westbound King Street (additional 125 vehicles in each direction in the AM peak hour)
- Lost time adjustments (adjusted to zero)
- Number of pedestrian calls (pedestrian call during every cycle)
- Conflicting bicycles (five in each direction per hour)

The above adjustments resulted in much longer queue lengths compared to the field-collected measurements and reflects a more conservative analysis. A summary table comparing the field-collected and Synchro queue lengths along with all the queue outputs are included as part of **Attachment B**.

Multiple Measures of Effectiveness (MOE) were considered on a comparative basis; the first of these MOE were the intersection approach and overall Level of Service (LOS) and delay at each intersection along the corridor. A summary of the Synchro outputs for intersection LOS and delay is shown in **Table 1**. All intersection LOS and delay outputs are included as part of **Attachment C**.

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Table 1: Synchro Intersection LOS and Delay

Intersection	Approach	No Build (Before Complete Street)				Existing (After Complete Street)			
		AM Peak		PM Peak		AM Peak		PM Peak	
		Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS
King Street at Braddock Road	Eastbound	13.3	B	3.8	A	13.3	B	3.8	A
	Westbound	18.3	B	16.2	B	18.3	B	16.2	B
	Northbound	228.5	F	202.4	F	228.5	F	202.4	F
	Southbound	18.4	B	40.9	D	18.4	B	40.9	D
	Overall	64.4	E	67.3	E	64.4	E	67.3	E
King Street at Kenwood Avenue	Eastbound	17.0	B	15.2	B	16.3	B	17.2	B
	Westbound	26.6	C	16.2	B	38.2	D	37.4	D
	Northbound	22.0	C	19.2	B	42.9	D	31.0	C
	Southbound	33.5	C	38.2	D	41.5	D	53.0	D
	Overall	23.7	C	19.7	B	30.5	C	32.2	C
King Street at Chinquapin Drive	Eastbound	51.6	D	3.2	A	20.3	C	16.2	B
	Westbound	17.2	B	2.9	A	20.0	C	9.1	A
	Northbound	42.8	D	35.6	D	55.1	E	47.3	D
	Overall	35.7	D	4.6	A	25.0	C	14.6	B
King Street at Janney's Lane	Eastbound	32.4	C	19.0	B	32.4	C	19.1	B
	Westbound	18.2	B	10.5	B	18.2	B	10.7	B
	Northbound	53.6	D	30.3	C	53.6	D	30.0	C
	Overall	34.7	C	17.8	B	34.7	C	17.9	B
King Street at Highland Place	Eastbound	7.2	A	6.2	A	4.0	A	12.1	B
	Westbound	7.0	A	7.4	A	7.7	A	13.7	B
	Northbound	24.0	C	22.9	C	27.2	C	14.3	B
	Overall	7.8	A	7.1	A	6.7	A	13.0	B

As shown in **Table 1**, intersection approach delays generally increase at the intersections impacted by the road diet. All the changes resulting in a LOS change are highlighted in yellow (for increased delay) and green (for reduced delay). For example, the northbound approach delay at the intersection of King Street at Chinquapin Drive during the AM peak hour increased from 42.8 seconds (LOS D) to 55.1 seconds (LOS E). This is highlighted in yellow. However, the overall

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intersection delay improves from 35.7 seconds (LOS D) to 25.0 seconds (LOS C) because the exclusive pedestrian phase has been removed under the Existing conditions. This is highlighted in green.

While there are some increases in the individual approach delays, overall intersections appear to operate at a reasonable LOS and delay under Existing conditions (after Complete Street) compared to the No Build conditions (before Complete Street).

Arterial LOS was also considered to measure the corridor-wide impacts of the road diet. Summaries of the Synchro outputs for this MOE for both the AM and PM peak hours are shown in **Table 2** and **Table 3**, respectively. All arterial LOS outputs are included as part of **Attachment D**.

Table 2: Synchro Arterial LOS and Delay - AM Peak Hour

Signal	No Build AM (Before Complete Street)				Existing AM (After Complete Street)			
	Signal Delay (s)	Travel Time (s)	Distance (mi)	Arterial LOS	Signal Delay (s)	Travel Time (s)	Distance (mi)	Arterial LOS
Eastbound King Street								
Kenwood Avenue	20.1	50.0	0.17	D	19.5	49.4	0.17	D
Chinquapin Drive	50.6	73.4	0.13	F	27.9	50.7	0.13	D
Janney’s Lane	38.7	174.6	0.94	B	38.7	174.6	0.94	B
Highland	7.4	38.2	0.19	C	4.4	35.2	0.19	B
Overall	116.8	336.2	1.43	C	90.5	309.9	1.43	C
Westbound King Street								
Janney’s Lane	16.5	47.3	0.19	C	16.5	47.3	0.19	C
Chinquapin Drive	14.8	150.7	0.94	B	21.1	157.0	0.94	B
Kenwood Avenue	27.4	50.2	0.13	D	43.9	66.7	0.13	F
Braddock Road	209.0	238.9	0.17	F	209.0	238.9	0.17	F
Overall	267.7	487.1	1.43	D	290.5	509.9	1.43	D

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Table 3: Synchro Arterial LOS and Delay - PM Peak Hour

Signal	No Build PM (Before Complete Street)				Existing PM (After Complete Street)			
	Signal Delay (s)	Travel Time (s)	Distance (mi)	Arterial LOS	Signal Delay (s)	Travel Time (s)	Distance (mi)	Arterial LOS
Eastbound King Street								
Kenwood Avenue	17.2	47.1	0.17	D	18.8	48.7	0.17	D
Chinquapin Drive	3.4	26.2	0.13	C	19.4	42.2	0.13	D
Janney’s Lane	23.7	159.6	0.94	B	24.2	160.1	0.94	B
Highland	6.4	37.2	0.19	C	12.6	43.4	0.19	C
Overall	50.7	270.1	1.43	C	75.0	294.4	1.43	C
Westbound King Street								
Janney’s Lane	10.1	40.9	0.19	C	10.4	41.2	0.19	C
Chinquapin Drive	3.5	139.4	0.94	B	10.5	146.4	0.94	B
Kenwood Avenue	16.6	39.4	0.13	D	40.0	62.8	0.13	E
Braddock Road	186.1	216.0	0.17	F	186.1	216.0	0.17	F
Overall	216.3	435.7	1.43	D	247.0	466.4	1.43	D

As shown in **Table 2** and **Table 3**, the Existing corridor operations along King Street are relatively similar to No Build conditions. For example, the overall signal delay and travel time increase by approximately 23 seconds in the westbound direction during the AM peak hour. However, the same decrease by approximately 27 seconds in the eastbound direction.

The overall signal delay and travel time under Existing Conditions in comparison to No Build differs no more than 30.0 seconds under both AM and PM peak hours. Therefore, no traffic signal timing improvements are recommended at this time. It is also recommended that the traffic operations along this corridor be monitored in the future to address any potential operational issues.

Conclusions

Based on the updated traffic analysis of the King Street corridor, the overall corridor operations under Existing conditions (after complete street) are similar to No Build conditions (before complete street). While there are some increases in the individual approach delays, overall intersections appear to operate at a reasonable LOS and delay under Existing Conditions. In addition, the overall signal delay and travel time under Existing Conditions in comparison to No Build differs no more than 30.0 seconds under both AM and PM peak hours. As such, no traffic signal timing improvements were identified at this time.