MEMORANDUM

To:

Sara Brandt-Vorel – City of Alexandria
Alex Carroll – City of Alexandria
Ryan Knight, PE – City of Alexandria
David Cook – VDOT Central Office Transportation and Mobility Planning Division
Brian Leckie - VDOT Northern VA District Transportation Planning

From: Daniel Scolese, PE
Ray Wright II, PE

Subject: Alexandria Roadway Safety Improvement: King Street

Date: 11/17/2025

Background & Purpose

Through the Virginia Department of Transportation (VDOT) Central Office Transportation and Mobility Planning Division (TMPD) technical assistance program for road reconfigurations, this study is focused on improving safety by addressing speeding, minimize crash risks, reducing crossing distances for pedestrians, and adding bike lanes in a very cost-effective manner. The program seeks to develop a striping and signage plan to resolve safety issues.

A study work group guided the study and shaped the development of improvement concepts along the study area. The group contributed local and institutional knowledge during meetings held throughout the study. The group reviewed the analysis methodologies, assumptions, and results, and reviewed and approved the recommendations. The study work group members included representatives from various agencies with expertise in traffic engineering, transit operations, state and local multimodal transportation planning, roadway design, local land use, and community development. The framework document that outlines roles and responsibilities can be found attached to this document.

The study work group members represented:

- City of Alexandria Transportation & Environmental Services (T&ES)
- DASH
- City of Alexandria Public Schools
- VDOT Northern VA District Transportation Planning
- VDOT Central Office Transportation and Mobility Planning Division (TMPD)

The consultant team of Michael Baker International led the study and facilitated the study work group meetings. The study area is shown in Figure 1.

Figure 1: Study Area



Corridor Characteristics and Needs

The King Street segment between Braddock Road and Quincy Street is a 25 MPH road with a 15 MPH speed limit during school hours, which is between 8AM and 830AM or 325 PM and 345 PM. It carries approximately 12,450 vehicles per day (vpd) as of 2024 per VDOT Traffic Monitoring Program data. Alexandria High School is located on the segment and residential properties about the northern side of the road. The road segment has been identified as a Safety improvement and access need for both pedestrians and cyclists in the Virginia Statewide Transportation Plan (VTrans). King Street is also identified on the National Highway System (NHS). It has been identified as a top statewide 1% segment within the Pedestrian and Bicyclist Safety Action Plan (PBSAP) 4.0.

The 2021 Alexandria Mobility Plan (AMP) also identified improvements of cycling facilities on King Street. The City performed Safe Routes to School (SRTS) audits in 2023 for the Alexandria City High School. A summary of the 2023 Alexandria City High School SRTS recommendations are below:

- Treatments to improve safety for pedestrian visibility and yielding.
- Better facilities for bus stops where overcrowding is occurring.
- Evaluation of a bike facility between Braddock Road and Chinquapin Drive
- Addressing the pick-up and drop issue near Alexandria City High School

Data Collection

The City collected 8-hour intersection turning movement counts and 48-hour tube counts between September 17 and 19, 2024. The team also collected additional counts in February 2025 at the intersection of Radford Street and King Street and another 48-hour tube count. Existing traffic signal timing plans and DASH transit usage were provided by the City. Historical traffic volume information and crash data were obtained from VDOT databases.

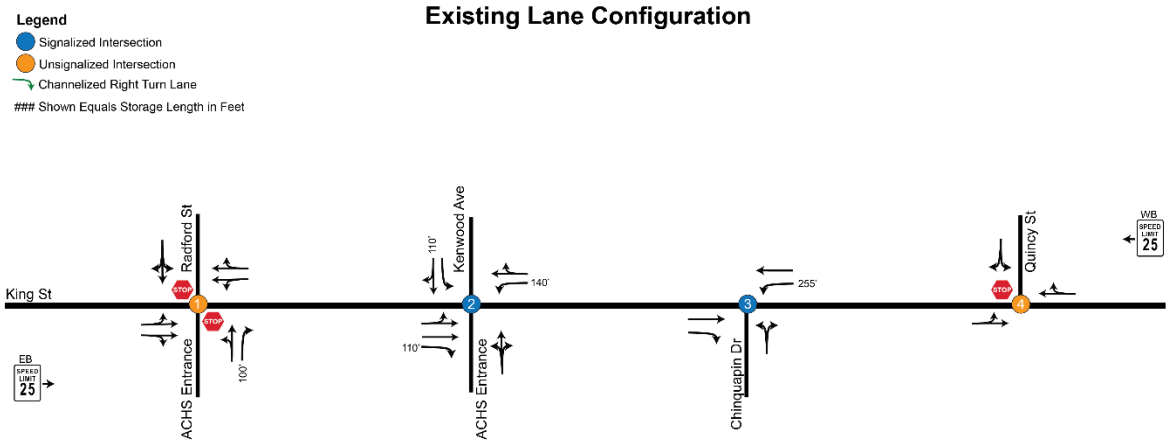
A field review during the school arrival, dismissal, and PM peak hours, were conducted on January 16, 2025, and February 19, 2025, to observe traffic patterns, gather queueing data to assist in the calibration of microsimulation models, review operational patterns, and identify areas with potential safety concerns.

The following sections summarize the collected data. Observations from the field review are presented with the discussion of safety deficiencies later. A separate memorandum documenting the microsimulation calibration is attached to this document.

Roadway Cross-section

King Street is a curb and gutter urban other principal arterial cross-section. Four lanes are provided between Braddock Road and Chinquapin Drive and transitions to a three-lane cross section, with the center lane being a turn lane, east of Chinquapin Drive. The lane widths are consistently 11-foot wide. A standard westbound bike lane is provided between Kenwood Avenue and Chinquapin Drive. Buffered Bike lanes are provided on both sides of King Street east of Chinquapin Drive.

Figure 2 shows the existing intersection configurations, storage lengths for left- and right-turn storage bays and posted speed limits for the study intersections.



Existing Volumes and Field Notes

The study team analyzed three peak hours within the King Street study area:

- 7:45 AM to 8:45 AM as the AM peak period, which also includes drop off traffic from the school.
- 3:30 PM to 4:30 PM as the School PM peak period
- 4:30 PM to 5:30 PM as the PM peak period

Figures 3 and 4 summarize the peak hour volumes and pedestrian volumes respectively. Note that the pedestrian volumes are underrepresented as during AM peak period and School PM peak period students were observed crossing the road midblock between Kenwood Avenue and Chinquapin Drive.

Transit Stop Data

The City provided transit stop data for between December 9, 2023, and December 7, 2024 for the DASH services on King Street. These lines include the 31 and 36 DASH services. The 31 DASH services King Street with stops in front of Alexandria High School and at the intersection of Quincy Street and King Street. The 36 DASH services Braddock Road, Kenwood Avenue, to King Street. There are stops located on King Street near Radford Street and near the intersection of Kenwood Avenue and Braddock Road. Figure 5 summarizes the average weekday boardings and alightings. In summary, and consistent with field findings, the transit stops are heavily used during pick-up and drop-off for Alexandria High School. There is overcrowding of bus stops along the northside of King Street for both the 31 and 36 stops. Although the data is only represented as the average daily weekday usage, the field visit confirmed frequent usage mid-day near Radford Street and during the PM peak hours near Quincy Street.



Overcrowding of bus stop at Kenwood Avenue (Westbound King Street)

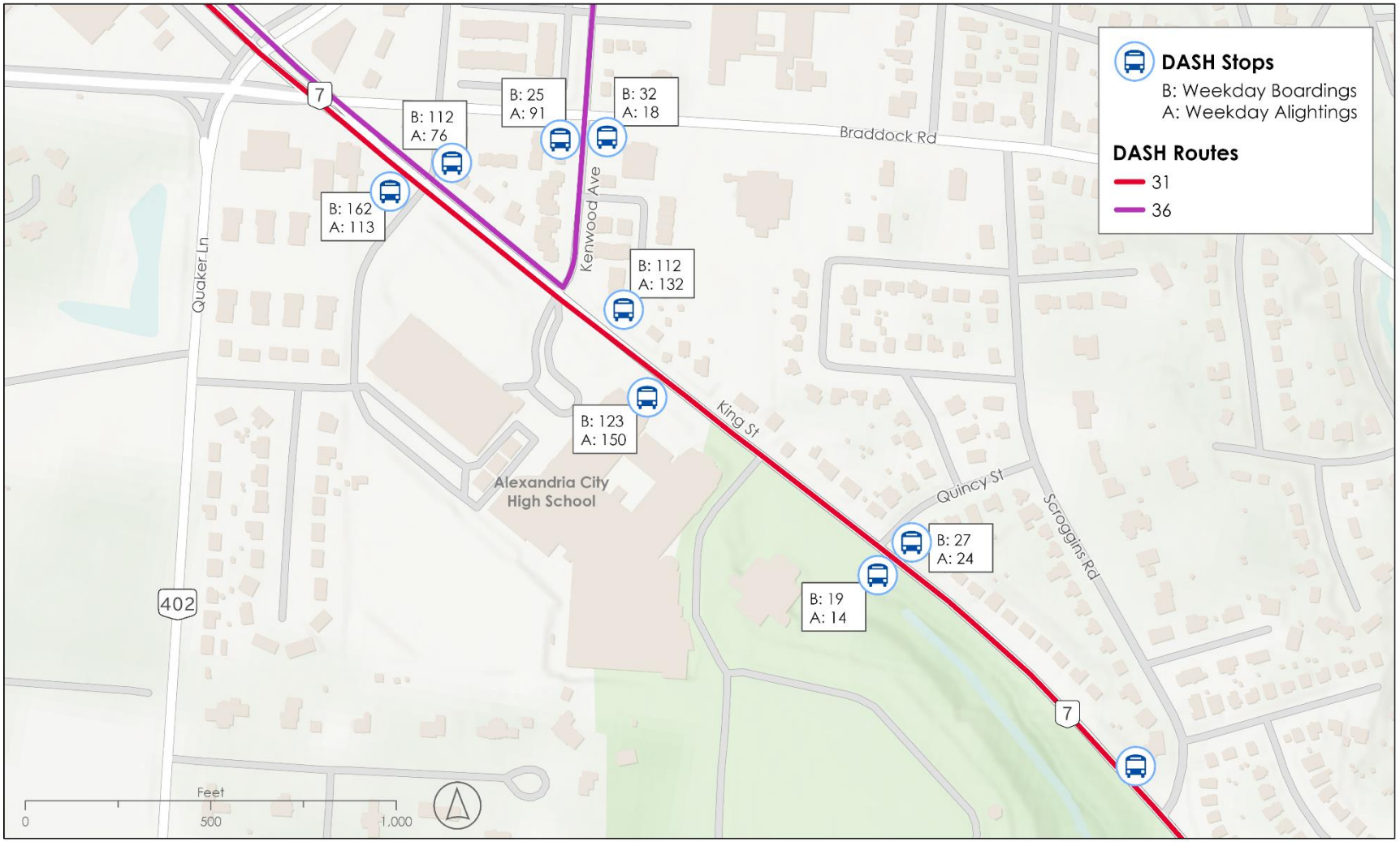
Figure 3: Existing Conditions Balanced Turning Movement Volumes



Figure 4: Existing Conditions Pedestrian Volumes



Figure 5: Existing Transit Stop Data



Crash Data

The study team collected crash data for the King Street corridor from the Virginia Road's Virginia Crash Map. The crash analysis reviewed years between January 1, 2019, through December 31, 2023. The study team collected FR-300 reports for all crashes along the study corridor within this five-year period.

King Street Crash Statistics

Over the five-year analysis period, 13 crashes occurred along the study corridor. Figure 6 the crash map along King Street.

Of these 13 crashes, 3 resulted in reported injuries. Crash severity is coded using the KABCO scale, which is defined using the following classifications:

- K = Fatal Injury
- A = Incapacitating Injury
- B = Non-incapacitating injury
- C = Nonvisible injury
- PDO = Property Damage Only

Figure 6 displays the crashes throughout the corridor by collision type. The most common collision types were rear-ends and fixed object crashes, comprising of 46 percent and 38 percent of all crashes, respectively. Angle crashes accounted for the remaining 15 percent of all crashes.

Figure 6: Crash Type Map



Injury Crash Review

3 injury crashes occurred through the study corridor: 1 rear-end collision (2023), 1 angle collision (2022), and 1 roadway departure (fixed object) (2023). The angle crash occurred at the entrance to Alexandria City High School when a vehicle leaving the high school attempting to head through on Kenwood Avenue was struck by a southbound vehicle attempting to turn left onto King Street. A possible contributor to this crash is the concurrent/permissive phasing for the side street (Kenwood Avenue and ACHS) movements, which allows vehicles from both approaches to enter the intersection at the same time. Although there is signage on both mast arms that states that left turns must yield on green, it is likely the left-turning motorist assumed they had the right-of-way. This crash occurred during the arrival period for the school.

The rear-end crash was heading eastbound on King Street approaching the Kenwood Avenue intersection, when the motorist was reportedly distracted and ran into the back of a queued vehicle, which struck another vehicle in front of it. The crash occurred during the afternoon dismissal period for the school, and rainy conditions were reported.

The third crash, roadway departure (fixed object) occurred near Quincy Street, when a motorist was reportedly experiencing a medical emergency and struck the median island. No adverse conditions were reported, and the crash occurred during the early afternoon.

Pedestrian and Bicyclist Crashes

Although the crash fell outside of the analysis period, a pedestrian crash occurred near the intersection of Radford Street in 2024 that warrants commentary in the context of this study. A pedestrian was attempting to cross King Street when they were struck by a vehicle traveling westbound. The pedestrian was attempting to cross King Street at a location with no marked crosswalks. Although there is a bus shelter located across from where the crash occurred, there are no marked crosswalks at this location along King Street.

In addition, the study team conducted a pedestrian level of comfort (PLOC) and bicycle level of traffic stress (BLTS) analysis on King Street. This analysis relied on the methodologies outlined in Montgomery County Planning Department Appendix A and Appendix D. Figure 7 and Figure 8 show the PLOC and BLTS respectively. In summary, the pedestrian level of comfort on the southside of King Street is relatively comfortable because of the wide sidewalk and grass/landscaped buffers. However, on the northside of the road, the sidewalk is much narrower with a small buffer. The bike lane does help with providing some buffer between the sidewalk and edge of travel lane, but this is often broken or abused by vehicles dropping or picking up students. Whereas the BLTS are likely higher due to either the lack of buffer due to the volumes on King Street or the complete lack of a bike lane west of Kenwood Avenue or on the eastbound lanes between Kenwood Avenue and Chinquapin.



Narrow sidewalks, narrow buffer with multiple utilities and signage (Northside King Street)

Figure 7: Existing Pedestrian Level of Comfort



Figure 8: Existing Bicycle Level of Traffic Stress



FIELD REVIEW:

A field review was conducted on January 16, 2025, and February 19, 2025, to observe existing conditions, traffic patterns, and potential safety issues during school arrival, dismissal, and the King Street PM peak hours. Below are a list of notable observations during the field visit:

- The school pick-up and drop-off is a source of significant queuing along eastbound King Street due to abuse of a right-turn lane incorrectly used for pick-up/drop-off by parents. Since there are two through lanes along eastbound King Street, the pick-up/drop-off issue causes long queues upstream due to drivers either being unaware, merging in immediately after Kenwood Avenue intersection, or reacting late to a blocked receiving lane.

- Drivers are generally observed to have aggressive behaviors with back-ups into the intersection, making lane choice decisions later, or entering the intersection to make a left-turn during yellow to red phase, or during the red-phase.

- There is a high presence of pedestrians, primarily students, crossing King Street either at crosswalks or mid-block to walk, drive, or access transit. The mid-block pedestrian crossings contribute to some of the stop-and-go traffic observed. As well, pedestrians are often walking beyond "Don't Walk" intervals.



Students crossing mid-block at student drop-off from bus stop



Drivers dropping or picking up students on Eastbound King Street



Eastbound King Street queuing extended as far back as Quaker Lane/Braddock Road



Left-turning vehicles siting in intersection or making late left-turns at Kenwood Avenue

- The Leading-Pedestrian Interval, or LPI, seems to be occurring for a short-duration at Kenwood Avenue across King Street. The LPI seems to be a concurrent phase with the northbound approach of Alexandria High School. There is no LPI located at Chinquapin Drive.

- Depending on the weather, the sun during the PM hours does impact drivers' ability to see the traffic signal faces which causes delayed reaction times during the start of the green phase. In addition, there is a tree on the Chinquapin Drive approach that may be obscuring traffic signal face. On multiple occasions drivers were observed to not reacting in a timely manner to a green on Chinquapin Drive.

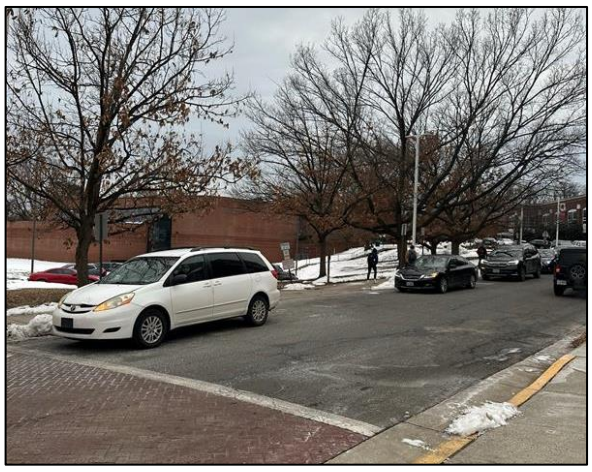
- Chinquapin Drive does back up during the school PM peak hours towards the loop area on Chinquapin Drive. This appears to be a combination of the nature of pick-up/drop-off, how drivers approach the vehicle detection location, and the slow reaction to the signal changes.

- Westbound King Street, primarily during the AM peak hour, vehicles back up beyond Quincy Street. This queue often had pedestrians or students at Quincy Street cross between cars blocking the crosswalk at Quincy Street and creating a sight distance issue for eastbound drivers.

- During the PM peak hour, both directions on King Street at Chinquapin Drive did have noticeable queuing. Along with the queuing, it appeared that either too much green time was given to Chinquapin Drive when drivers were present and to the left-turn lane on westbound King Street.
    - The signal time plans do confirm that the school PM peak hour and PM peak hour share the same signal timing inputs, and this may be a cause for the longer vehicle calls or green times for Chinquapin Drive or the left-turn. The Chinquapin Drive approach has less demand during the PM peak hours compared to the school PM peak hour.



Traffic signal at Chinquapin Drive: Visibility of signal faces are poor



View of Chinquapin Drive during student drop-off with queuing and interaction with Rec Center driveway

EXISTING TRAFFIC OPERATIONS ANALYSIS

Traffic operations during the AM, School PM, and PM peak hours were analyzed. This analysis provides a baseline for conducting future year condition analysis. The analysis was carried out using Synchro/SimTraffic Version 11.

MEASURES OF EFFECTIVENESS:

Three measures of effectives (MOEs) were used to evaluate operating conditions during the peak hours throughout:

1. Control Delay: The average amount of additional travel time, in seconds, vehicles experience due to a traffic control device (e.g. traffic signal or stop sign) – reported for each individual turning or through movement and for each intersection overall. For the intersections, SimTraffic microsimulation delay was used.

2. Pedestrian Control Delay: The estimated amount of delay, in seconds, pedestrians experience due to a traffic signal. All traffic signal ped calls are on recall, or pretimed, during the peak hours. Therefore, the average pedestrian delay is calculated using the HCM 6th edition equation for single-stage crossings, or *NCHRP 969 Traffic Signal Control Strategies for Pedestrians and Bicyclists* Equation 3-1.

3. Queue Lengths: The extent, in feet, to which vehicles at a given turning or through movement accumulate due to a traffic control device and congestion. For the intersections analyzed in SimTraffic, max and average queue lengths were reported.

LEVEL OF SERVICE CRITERIA

Level of Service (LOS) is a concept that describes how well a transportation facility operates from the traveler's perspective. The Highway Capacity Manual 6th Edition defines six levels of service, ranging from A to F. LOS A represents the best operating conditions from the traveler's perspective, and LOS F the worst. For cost, environmental impact, and other reasons, roadways are typically designed not to provide LOS A conditions during peak periods, but instead to provide somewhat lower LOS that balances individual travelers' desires against society's desires and financial resources.

Level of Service Thresholds – Vehicles

Unsignalized Intersections		Signalized Intersections	
LOS	Delay (sec)	LOS	Delay (sec)
A	≤10.0	A	≤ 10.0
B	>10.0 to ≤15.0	B	>10. to ≤20.0
C	>15.0 to ≤25.0	C	>20.1 to ≤35.0
D	>25.0 to ≤35.0	D	>35.1 to ≤55.0
E	>35.0 to ≤50.0	E	>55.1 to ≤80.0
F	>50.0	F	> 80.1

Level of Service Thresholds – Pedestrians

Pedestrian Delay	
LOS	Delay (sec)
A	≤ 10.0
B	>10. to ≤20.0
C	>20.1 to ≤30.0
D	>30.0 to ≤40.0
E	>40.1 to ≤60.0
F	> 60.1

CONTROL DELAY AND QUEUE LENGTH RESULTS

The following tables provide the peak period control delay and queue length results for the study intersections. Table 2 summarizes the control delay for each movement and overall intersection delay. Table 3 summarizes the pedestrian delay. Table 4 and 5 summarizes the peak period maximum and average queue lengths respectively.

Table 2: Peak Hour Control Delay

Intersection	Type of Control	Lane Group	Eastbound						Westbound						Northbound						Southbound						Overall		
			AM		School Peak		PM		AM		School Peak		PM		AM		School Peak		PM		AM		School Peak		PM				
			Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	AM	School	PM
Radford Street			King Street						King Street						ACHS Driveway						Radford Street								
	Two-Way Stop	Left	9.4	A	39.7	D	†	†	18.6	B	111.3	F	10.0	A	88.8	F	85.9	F	7.9	A	†	†	F	F	20.7	C	Delay	Delay	Delay
		Through	8.3	A	41.8	D	3.5	A	2.2	A	5.6	A	2.7	A	100.0	F	F	F	†	†	48.0	D	†	†	†	†	7.9	30.2	3.3
		Right	7.9	A	12.8	B	†	†	1.9	A	6.3	A	2.2	A	60.2	E	F	F	8.3	A	6.3	A	†	†	8.0	A	A	D	A
Kenwood Ave / Alexandria City HS			King Street						King Street						Alexandria City High School						Kenwood Avenue								
	Signal	Left	131.9	F	216.7	F	70.6	E	43.4	D	23.9	C	25.4	C	41.7	D	48.1	D	38.3	D	40.2	D	62.3	E	36.0	D	Delay	Delay	Delay
		Through	70.8	E	119.7	F	28.9	C	24.6	C	16.8	B	24.1	C	37.3	D	53.9	D	43.8	D	35.0	C	53.9	D	32.7	C	44.9	62.8	28.8
		Right	51.8	D	86.1	F	15.6	B	23.9	C	17.2	B	24.1	C	45.5	D	50.1	D	40.9	D	40.1	D	59.5	E	30.4	C	D	E	C
Chinquapin Drive			King Street						King Street						Chinquapin Drive						---								
	Signal	Left	†	†	†	†	†	†	36.8	D	30.8	C	18.9	B	68.8	E	42	D	36.3	D	†	†	†	†	†	†	Delay	Delay	Delay
		Through	18.0	B	17.7	B	13.5	B	27.8	C	10.6	B	7.8	A	†	†	†	†	†	†	†	†	†	†	†	†	30.2	19.1	12.6
		Right	17.2	B	16.8	B	7.4	A	†	†	†	†	†	†	67.9	E	41.8	D	34.6	C	†	†	†	†	†	†	C	B	B

† - Movement does not exist or no demand/volume serves this movement during the peak hour

F – Delay exceeds 80 seconds.

Table 3: Peak Hour Pedestrian Delay

Intersection		North - South						East-West					
		AM		School Peak		PM		AM		School Peak		PM	
		Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
Kenwood Ave / Alexandria City HS		King Street						Kenwood Ave/ACHS					
	Signal	46.8	E	51.8	E	51.8	E	49.5	E	54.5	E	54.5	E
Chinquapin Drive		King Street						Chinquapin Drive					
	Signal	49.5	E	54.5	E	54.5	E	49.5	E	54.5	E	54.5	E

Table 4: Peak Hour Maximum Queue Length

Intersection	Type of Control	Lane Group	Eastbound				Westbound				Northbound				Southbound			
			Storage Bay Length	AM Queue (ft)	School PM Queue (ft)	PM Queue (ft)	Storage Bay Length	AM Queue (ft)	School PM Queue (ft)	PM Queue (ft)	Storage Bay Length	AM Queue (ft)	School PM Queue (ft)	PM Queue (ft)	Storage Bay Length	AM Queue (ft)	School PM Queue (ft)	PM Queue (ft)
Radford Street			King Street				King Street				ACHS Driveway				Radford Street			
	Two-Way Stop	Left	285	217	309	99	385	50	95	24	---	90	86	28	145	29	46	38
		Through	285				385	50	226	28	---	90	86	28				
		Right	115	115**	115**	0					145	77	68	41				
Kenwood Ave / Alexandria City HS			King Street				King Street				Alexandria City High School				Kenwood Avenue			
	Signal	Left	370	436	475	364	140	140	110	139	---	---	---	---	420	345	405	345
		Through	370	438	463	326	560	577	497	530	---	92	182	159				
		Right	110	110**	110	101					---	---	---	---	110	80**	80**	80**
Chinquapin Drive			King Street				King Street				Chinquapin Drive				---			
	Signal	Left	---	---	---	---	255	255	191	97	---	480	368	141	---	---	---	---
		Through	575	637	449	481	380	756	357	297	---	---	---	---	---	---	---	---
		Right	575*	100*	100	108	---	---		---	---	---	---	---	---	---	---	---

* - Effective storage is less than link length due to illegal use of right-turn lane as a pick-up/drop-off zone

**- Turn lane is blocked by parallel movement

- Movement exceed storage length or link length

Table 5: Peak Hour Average Queue Length

Intersection	Type of Control	Lane Group	Eastbound				Westbound				Northbound				Southbound			
			Storage Bay Length	AM Queue (ft)	School PM Queue (ft)	PM Queue (ft)	Storage Bay Length	AM Queue (ft)	School PM Queue (ft)	PM Queue (ft)	Storage Bay Length	AM Queue (ft)	School PM Queue (ft)	PM Queue (ft)	Storage Bay Length	AM Queue (ft)	School PM Queue (ft)	PM Queue (ft)
Radford Street			King Street				King Street				ACHS Driveway				Radford Street			
	Two-Way Stop	Left	285	43	102	7	385	7	16	2	---	22	27	4	145	3	11	10
		Through	285				385	4	28	2	---	22	27	4				
		Right	115	40	107	4					145	21	15	17				
Kenwood Ave / Alexandria City HS			King Street				King Street				Alexandria City High School				Kenwood Avenue			
	Signal	Left	370	251	286	157	140	60	11	32	---	---	---	---	420	142	201	156
		Through	370	255	282	92	560	419	234	279	---	28	128	68				
		Right	110	66	37	21					---	---	---	---	110	65	46	42
Chinquapin Drive			King Street				King Street				Chinquapin Drive				---			
	Signal	Left	---	---	---	---	255	119	49	97	---	172	122	64	---	---	---	---
		Through	575	229	276	192	380	302	145	132	---	---	---	---	---	---	---	---
		Right	575*	36	43	29	---	---		---	---	---	---	---	---	---	---	---

* - Effective storage is less than link length due to illegal use of right-turn lane as a pick-up/drop-off zone

**- Turn lane is blocked by parallel movement

- Movement exceed storage length or link length

Existing Condition Operational Summary

Pedestrian Delay

Pedestrian delay is often more than half a minute within the study area as the cycle lengths are over 2 minutes during the peak hours. The walk phase is also a function of delay and pedestrians are given 7 seconds of walk time before a "Do Not Walk" phase. The longer delays may be a reason for greater non-compliance as observed in the field by students during pick-up and drop-off. However, a leading pedestrian interval at Kenwood Avenue does provide about an addition 2-3 seconds of walk time. Delay's can be reduced by investigating shorter cycle lengths or longer walk times, but a coordinated network with King Street, Quaker Lane, and Braddock Road intersection may keep cycle lengths above 100 seconds.

Kenwood Avenue and Alexandria City High School at King Street

In general, the most problematic issue for the intersection is queuing on King Street during the AM and school PM peak hours, or when school is starting or letting out. A major factor for this is the abuse of the eastbound right-turn lane east of Kenwood Avenue as a pick-up/drop-off lane by students and parents. As a result, drivers were observed merging prior to and in the intersection which cause backups towards Braddock Road and Quaker Lane. The results validate this issue as queues are often exceeding the link distances between Quaker Lane and Kenwood Avenue traveling eastbound, often with significant delays greater than 60 seconds per vehicle during this time period. Kenwood Avenue onto King Street is also problematic as it experiences multiple cycle failures, or when vehicles cannot enter the intersection due to queues blocking the intersection. This resulted in queueing back to Braddock Road, blocking the right-turn lane onto King Street from Kenwood Avenue, and aggressive behavior by left-turning vehicles entering the intersection at the end of their respective traffic signal phase.

Chinquapin Drive at King Street

In the AM peak hour, westbound King Street backs up well beyond Quincy Street, or more than 700 feet. This is primarily a result of the delays at Kenwood Avenue and King St but also the additional demand into and out of Chinquapin Drive from the student drop-off. It should be noted that both in the field and analysis, the long queues tend to be observed for the first 30 minutes during the AM peak hour, when most parents are dropping off. This is reflected as the delays traveling westbound are less than 30 seconds and the average queue is less than 300 feet. During the PM peak hour, some noticeable queuing is occurring and almost impacting upstream intersections, either at Kenwood Avenue or Quincy Street, on both directions of King Street but with minimal delays. This appeared to be a result of longer green times or recalling Chinquapin Drive more frequently, although demand is lower. It should be noted that the school PM peak hour and PM peak hour share the same signal times but different volume demands.

Future Growth and Operations

The stakeholder group determined an outyear of 2032. Future traffic volumes were estimated by applying variable linear growth rates to the study area roadways and intersections based on input from the City and VDOT. No changes are anticipated by the City, School System, or nearby developments within that time frame. A 0.25% growth rate was used for King Street, while 0% was applied to minor approaches within the study area. Future (2032) No-Build laneage and traffic control information is the same as the Existing scenario, as shown in Figure 2.

Volume Development

Based on input from the City of Alexandria and VDOT, variable linear growth rates were applied to the through movement volumes to estimate the Future (2032) No-Build traffic volumes. The resulting Future (2032) No-Build traffic volumes are shown in Figure 10.

Future No-Build Analysis

Tables 6 through 8 show the future no-build operations. As shown, there are only minor differences in delay between the Existing (2025) and Future (2032) No-Build scenarios, with the two signalized intersections at Kenwood Avenue and Chinquapin Drive operating at a LOS D in the AM peak hour and Kenwood Avenue operating at LOS E in the school PM peak hour. It should be noted that the same issues with illegal on-street parking by the school is expected to continue in the future, which is the result of the significant delays and queueing during the AM and school PM peak hours.

Figure 9: Future Turning Movement Volumes



Table 6: Peak Hour Control Delay

Intersection	Type of Control	Lane Group	Eastbound						Westbound						Northbound						Southbound						Overall		
			AM		School Peak		PM		AM		School Peak		PM		AM		School Peak		PM		AM		School Peak		PM				
			Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	AM	School	PM
Radford Street			King Street						King Street						ACHS Driveway						Radford Street								
	Two-Way Stop	Left	23.2	C	59.3	E	†	†	55.4	E	117.5	F	11.0	B	241.2	F	F	F	23.0	C	†	†	686.5	F	55.0	D	Delay	Delay	Delay
		Through	19.0	B	52.5	D	4.4	A	3.7	A	6.1	A	3.2	A	230.5	F	630.9	F	†	†	64.9	E	†		†	†	18.4	38.3	4.7
		Right	21.3	C	43.0	D	†	†	4.4	A	7.7	A	3.2	A	213.3	F	376.8	F	16.6	B	23.5	C	†		38.5	D	B	E	A
Kenwood Ave / Alexandria City HS			King Street						King Street						Alexandria City High School						Kenwood Avenue								
	Signal	Left	147.6	F	198.4	F	91.9	F	50.1	D	30.7	C	27.4	C	33.8	C	48.2	D	35.3	D	37.4	D	55.4	E	35.1	D	Delay	Delay	Delay
		Through	88.3	F	124.2	F	32.8	C	25.6	C	18.0	B	23.0	C	27.6	C	54.6	D	46.1	D	35.5	D	44.3	D	32.6	C	50.9	64.4	29.6
		Right	64.6	E	93.5	F	21.0	C	25.3	C	17.5	B	22.3	C	40.0	D	48.2	D	38.3	D	38.0	D	51.5	D	29.2	C	D	E	C
Chinquapin Drive			King Street						King Street						Chinquapin Drive						---								
	Signal	Left	†	†	†	†	†	†	45.3	D	29.3	C	19.3	B	164.3	F	42.3	D	36.2	D	†	†	†	†	†	†	Delay	Delay	Delay
		Through	17.3	B	18.5	B	13.8	B	38.1	D	10.0	A	7.9	A	†	†	†	†	†	†	†	†	†	†	†	†	46.7	19.3	13.0
		Right	18.3	B	17.6	B	8.1	A	†	†	†	†	†	†	140.7	F	42.7	D	37.0	D	†	†	†	†	†	†	D	B	B

† - Movement does not exist or no demand/volume serves this movement during the peak hour

F – Delay exceeds 80 seconds.

Table 7: Peak Hour Maximum Queue Length

Intersection	Type of Control	Lane Group	Eastbound				Westbound				Northbound				Southbound			
			Storage Bay Length	AM Queue (ft)	School PM Queue (ft)	PM Queue (ft)	Storage Bay Length	AM Queue (ft)	School PM Queue (ft)	PM Queue (ft)	Storage Bay Length	AM Queue (ft)	School PM Queue (ft)	PM Queue (ft)	Storage Bay Length	AM Queue (ft)	School PM Queue (ft)	PM Queue (ft)
Radford Street			King Street				King Street				ACHS Driveway				Radford Street			
	Two-Way Stop	Left	285	203	344	72	385	105	127	68	---	160	90	45	145	31	63	55
		Through	285				385	104	158	78	---	160	90	45				
		Right	115	115 **	115 **	--					145	65	53	39				
Kenwood Ave / Alexandria City HS			King Street				King Street				Alexandria City High School				Kenwood Avenue			
	Signal	Left	370	417	461	388	140	140**	101	130	---	---	---	---	420	348	365	298
		Through	370	431	463	336	560	579	524	500	---	103	189	160				
		Right	110	110**	110**	102					---	---	---	---	110	80**	80**	80**
Chinquapin Drive			King Street				King Street				Chinquapin Drive				---			
	Signal	Left	---	---	---	---	255	255**	177	73	---	606	376	149	---	---	---	---
		Through	575	572	580	457	380	764	331	268	---	---	---	---	---	---	---	---
		Right	575*	100**	100**	246	---	---		---	---	---	---	---	---	---	---	---

* - Effective storage is less than link length due to illegal use of right-turn lane as a pick-up/drop-off zone

**- Turn lane is blocked by parallel movement

- Movement exceed storage length or link length

Table 8: Peak Hour Average Queue Length

Intersection	Type of Control	Lane Group	Eastbound				Westbound				Northbound				Southbound			
			Storage Bay Length	AM Queue (ft)	School PM Queue (ft)	PM Queue (ft)	Storage Bay Length	AM Queue (ft)	School PM Queue (ft)	PM Queue (ft)	Storage Bay Length	AM Queue (ft)	School PM Queue (ft)	PM Queue (ft)	Storage Bay Length	AM Queue (ft)	School PM Queue (ft)	PM Queue (ft)
Radford Street			King Street				King Street				ACHS Driveway				Radford Street			
	Two-Way Stop	Left	285	72	142	12	385	16	20	5	---	45	30	6	145	4	22	12
		Through	285				385	13	29	7	---	45	10	6				
		Right	115	115**	115**	0					145	25	22	17				
Kenwood Ave / Alexandria City HS			King Street				King Street				Alexandria City High School				Kenwood Avenue			
	Signal	Left	370	286	310	173	140	65	10	30	---	---	---	---	420	129	190	148
		Through	370	282	306	108	560	501	246	275	---	26	130	69				
		Right	110	72	38	24					---	---	---	---	110	64	47	44
Chinquapin Drive			King Street				King Street				Chinquapin Drive				---			
	Signal	Left	---	---	---	---	255	145	177	29	---	286	130	70	---	---	---	---
		Through	575	557	440	183	380	412	331	132	---	---	---	---	---	---	---	---
		Right	575*	63	45	38	---	---		---	---	---	---	---	---	---	---	---

* - Effective storage is less than link length due to illegal use of right-turn lane as a pick-up/drop-off zone

**- Turn lane is blocked by parallel movement

- Movement exceed storage length or link length

Alternative Analysis and Preferred Alternative

As part of this task order, the City of Alexandria planned to extend the existing buffered bike lanes along King Street to Radford Street. This requires removing one travel lane in each direction between Radford Street and Kenwood Avenue. Additionally, the City considered removing or reducing unauthorized parking between Kenwood Avenue and Chinquapin Street, which would require reconfiguring the right-turn lane into either a bike lane or a parking lane. Early in the study process, it was determined that providing on-street parking would impact operations, safety, and mobility by affecting vehicle movement, limiting driver visibility of pedestrians, and not allowing for an adequate bike lane facility. Consequently, any on-street parking option was omitted from consideration.

In addition, the stakeholder group evaluated countermeasures that would improve safety. This included evaluation of the following countermeasures and spot improvements:

- New crosswalk at Radford Street: To support an existing unmarked pedestrian crossing used by students and transit users.
- Consolidated Bus Stops: Improve transit operations and user experience.
- Leading Pedestrian Intervals: Improve safety and operations for pedestrians at traffic signals.
- Rectangular Rapid Flashing Beacons (RRFB): Improve yielding and visibility and uncontrolled crosswalks.
- Wider/Larger Bus Pads: Improve the user experience for transit riders waiting for buses.
- Bus Pull Outs: To improve operational flow of the corridor and reduce bus blockage. However, bus bull outs do increase transit delay, as buses must now re-enter traffic.

These countermeasures were presented and discussed at multiple charette meetings involving the City, DASH, ACPS, and VDOT Transportation Planning.

Operational Analysis

The road reconfiguration was evaluated in Synchro/SimTraffic with the reduced number of travel lanes, one in each direction with bus pull outs. In addition, based on input from City Transportation Engineering staff, it was determined that an eastbound left-turn lane be provided at the intersection of Kenwood Avenue and King Street. Results are presented in Tables 9 through 11.

Table 6: Peak Hour Control Delay

Intersection	Type of Control	Lane Group	Eastbound						Westbound						Northbound						Southbound						Overall		
			AM		School Peak		PM		AM		School Peak		PM		AM		School Peak		PM		AM		School Peak		PM				
			Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	AM	School	PM
Radford Street			King Street						King Street						ACHS Driveway						Radford Street								
	Two-Way Stop	Left	11.2	B	9.1	A	†	†	9.9	A	9.4	A	16.7	B	99.7	F	†	†	12.0	B	†	†	34.3	C	31.8	C	Delay	Delay	Delay
		Through	6.1	A	3.2	A	3.2	A	2.7	A	2.5	A	4.4	A	59.9	E	36.7	D	†	†	87.6	F	†	†	†	†	5.6	3.3	4.2
		Right	0.6	A	0.4	A	†	†	2.5	A	2.3	A	3.8	A	25.4	C	18	B	31.4	C	6.3	A	†	†	8.5	A	A	A	A
Kenwood Ave / Alexandria City HS			King Street						King Street						Alexandria City High School						Kenwood Avenue								
	Signal	Left	67.4	E	7.5	A	91.4	F	85.8	F	37.3	D	31.6	C	31.7	C	38.5	D	36.6	D	35.3	D	66.1	E	36.8	D	Delay	Delay	Delay
		Through	30.2	C	27.1	C	23.4	C	55.6	E	23.5	C	23.1	C	36.6	D	44.9	D	44.0	D	31.9	C	55.2	E	31.4	C	44.3	35.1	27.3
		Right	30.4	C	28.3	C	27.2	C	55.3	E	24.7	C	22.3	C	36.1	D	42.1	D	37.6	D	35.7	D	57.0	E	31.1	C	D	D	C
Chinquapin Drive			King Street						King Street						Chinquapin Drive						---								
	Signal	Left	†	†	†	†	†	†	55.3	E	32.7	C	22.9	C	141.9	F	55.4	E	37.7	D	†	†	†	†	†	†	Delay	Delay	Delay
		Through	16.3	B	20.6	C	16.7	B	44.1	D	10.2	B	7.9	A	†	†	†	†	†	†	†	†	†	†	†	†	50.2	22.1	14.8
		Right	15.6	B	19.8	B	14.8	B	†	†	†	†	†	†	149.6	F	54.4	D	36.0	D	†	†	†	†	†	†	D	C	B

† - Movement does not exist or no demand/volume serves this movement during the peak hour

F – Delay exceeds 80 seconds.

Table 7: Peak Hour Maximum Queue Length

Intersection	Type of Control	Lane Group	Eastbound				Westbound				Northbound				Southbound			
			Storage Bay Length	AM Queue (ft)	School PM Queue (ft)	PM Queue (ft)	Storage Bay Length	AM Queue (ft)	School PM Queue (ft)	PM Queue (ft)	Storage Bay Length	AM Queue (ft)	School PM Queue (ft)	PM Queue (ft)	Storage Bay Length	AM Queue (ft)	School PM Queue (ft)	PM Queue (ft)
Radford Street			King Street				King Street				ACHS Driveway				Radford Street			
	Two-Way Stop	Left	285	302	250	98	385	167	157	184	---	54	27	26	145	30	32	31
		Through					385				---							
		Right	285	217	24	--					145	52	26	35				
Kenwood Ave / Alexandria City HS			King Street				King Street				Alexandria City High School				Kenwood Avenue			
	Signal	Left	70	72**	70**	62	140	100**	95	136	---	---	---	---	420	278	427	315
		Through	370	435	437	432	560	636	542	506	---	104	201	174				
		Right									---	---	---	---	110	80**	80**	80**
Chinquapin Drive			King Street				King Street				Chinquapin Drive				---			
	Signal	Left	---	---	---	---	255	255	174	116	---	690	442	149	---	---	---	---
		Through	575	579	625	499	380	767	376	283	---	---	---	---	---	---	---	---
		Right	575*				---	---	--	---	---	---	---	---	---	---	---	---

* - Effective storage is less than link length due to illegal use of right-turn lane as a pick-up/drop-off zone

**- Turn lane is blocked by parallel movement

- Movement exceed storage length or link length

Table 8: Peak Hour Average Queue Length

Intersection	Type of Control	Lane Group	Eastbound				Westbound				Northbound				Southbound			
			Storage Bay Length	AM Queue (ft)	School PM Queue (ft)	PM Queue (ft)	Storage Bay Length	AM Queue (ft)	School PM Queue (ft)	PM Queue (ft)	Storage Bay Length	AM Queue (ft)	School PM Queue (ft)	PM Queue (ft)	Storage Bay Length	AM Queue (ft)	School PM Queue (ft)	PM Queue (ft)
Radford Street			King Street				King Street				ACHS Driveway				Radford Street			
	Two-Way Stop	Left	285	83	34	10	385	24	15	19	---	13	4	2	145	4	5	8
		Through					385				---							
		Right	285	21	5	--					145	12	2	12				
Kenwood Ave / Alexandria City HS			King Street				King Street				Alexandria City High School				Kenwood Avenue			
	Signal	Left	70	33	27	11	140	50	11	28	---	---	---	---	420	132	198	150
		Through	370	322	252	215	560	554	292	263	---	32	129	73				
		Right									---	---	---	---	110	64	43	45
Chinquapin Drive			King Street				King Street				Chinquapin Drive				---			
	Signal	Left	---	---	---	---	255	151	46	37	---	270	144	69	---	---	---	---
		Through	575	287	333	229	380	419	142	130	---	---	---	---	---	---	---	---
		Right	575*				---	---		---	---	---	---	---	---	---	---	---

* - Effective storage is less than link length due to illegal use of right-turn lane as a pick-up/drop-off zone

**- Turn lane is blocked by parallel movement

- Movement exceed storage length or link length

It is important to note that the SimTraffic module does not assess transit impacts; consequently, results for bus pull outs are not reported. Nevertheless, implementing bus pull outs is anticipated to enhance vehicle operations compared to scenarios without them.

The analysis indicates that overall traffic operations are largely consistent with the no-build conditions regarding queue lengths. This result is expected since conditions at eastbound King Street and Kenwood Avenue previously resulted in vehicles illegally parking and then pulling out into traffic, negatively impacting operations in the adjacent through lane. As a result of this issue being addressed, motorists can anticipate more reliable operations during peak hours, in contrast to the unpredictable conditions caused by improper parking in front of Alexandria City High School.

While the PM peak hour may experience slightly increased queuing relative to the no-build scenario—due to the absence of illegal parking and two lanes being available from Braddock Road up to Chinquapin Drive—overall intersection performance and specific movement delays remain comparable between the no-build and road diet configurations.

Preferred Alternative

The City of Alexandria conducted outreach on the proposed concept and potential variations between June and July 2025. This was performed via an in-person meeting at Alexandria City High School, an online recorded presentation, and a public input form. In addition to the proposed countermeasures, three cross-sectional options were shared with the public:

- Option 1: Traditional road reconfiguration with bike lanes on both sides and bus pull outs King Street.
    - Eliminates one eastbound vehicle lane between Radford Street and Chinquapin Drive and one westbound vehicle lane between Kenwood Avenue and Radford Street.

Figure 10: Option 1



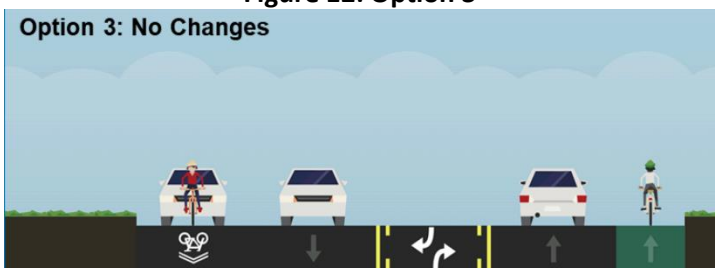
- Option 2: Traditional road reconfiguration with bike lanes on both sides
    - Eliminates one eastbound vehicle lane between Radford Street and Chinquapin Drive and one westbound vehicle lane between Kenwood Avenue and Radford Street.

Figure 11: Option 2



- Option 3: No changes to the roadway

Figure 12: Option 3



Based on the results from the City of Alexandria Public Outreach effort, 114 responses were collected with Option 1 being the preferred community option at 3.7 stars out of 5, Option 2 with 3.4 stars, and Option 3 with 1.8 stars. In July 2025, the City Traffic and Parking Board approved City Staff to implement Option 1 on King Street. The preferred plan with quantities can be found attached to this memo.

In addition to the concept plans, the following are traffic signal recommendations:

- Re-timing the corridor based on new operations (City of Alexandria Transportation Operations informed the stakeholder group as of June 2025, following the above analysis, that controllers have been updated and can now be coordinated. This change is expected to improve operations).
- Installing a left-turn phase for eastbound King Street at Kenwood Avenue.
    - Where feasible, installing flashing yellow arrows on King Street for mainline left-turn movements.
    - Due to the low volume and left-turn restrictions into the school during arrival and dismal, a permissive westbound left-turn phase may be operationally advantageous at King Street and Kenwood Avenue.
- Providing a 4 to 7-second Leading Pedestrian Interval (LPI).
- Adjusting detection devices to be in view of new lane alignments, including tree trimming at the intersection of Chinquapin Drive and King Street.