



WELLS + ASSOCIATES

MEMORANDUM

TO: Gail Harrison

FROM: Chris Kabatt, P.E.
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DATE: May 13, 2013

SUBJECT: Kensington and Williamsburg Transportation Assessment;
Arlington, Virginia

This memorandum provides a summary of our review of Arlington County's plans for the intersection improvements associated with the new Elementary School and future expansion of the Williamsburg Middle School and our recommendations. Specifically, Wells + Associates focused on the proposed infrastructure improvements to the N. Williamsburg Boulevard/N. Kensington Street intersection.

The following documents, as well as correspondences between County staff and neighbors, were reviewed:

- Williamsburg Blvd Concept Plan Kensington Street to N. Edison Street, Sheet 7 of 10, dated September 14, 2011
- Williamsburg Blvd Concept Plan Kensington Street and Williamsburg Blvd, Sheet 7 of 10 dated April 2013 showing Auto Turn Analysis
- Williamsburg Middle School and New Elementary School #1 School Transportation Plan, Final Draft, Toole Design Group, November 29, 2012.
- Williamsburg Middle School and New Elementary School #1 School Transportation Plan Appendix A, E, and F.

In addition to reviewing materials, Wells + Associates conducted a field review of the County's N.514 concept design, sight lines, elevations, horizontal and vertical curves, and existing traffic patterns on Williamsburg Boulevard and Kensington Street during the elementary school arrival hour, and assessed the vehicle turning radii and capabilities and the potential pedestrian and vehicular safety issues.

Following is a discussion of our review.

As part of the Neighborhood Conservation project, improvements are proposed at the Williamsburg Boulevard/N. Kensington Street intersection with the goal to improve pedestrian visibility and safety. The improvements include bulb-out nubs on each corner, accessible ramps, and a widened median on the east approach of Williamsburg Boulevard. N. Kensington Street would continue to operate under STOP control and Williamsburg Boulevard remaining uncontrolled. The concept plan does not show marked crosswalks, however it is assumed crosswalks will be provided across each leg of the intersection. It is noted that per the new elementary school and middle school expansion plans the northbound left turn movement from N. Harrison Street onto 36th Street N. will be prohibited. Therefore elementary school traffic will approach the drop off area on 36th Street N. via N. Kensington Street.

The nubs, as proposed on each corner would serve their purpose of reducing crossing widths for pedestrians, slowing traffic speeds, and creating better visibility of pedestrians by extending the median further west into the intersection. However, the nubs will exacerbate the transition vehicles on N. Kensington Street have to make through the intersection. The nub on the southeast corner positions a northbound traveling vehicle to conflict with southbound vehicles, directing them into the southbound lane. The nub in the southeast corner could remain on Williamsburg Boulevard but should not be built on N. Kensington Street to provide for better alignment of the N. Kensington Street approaches and not position vehicles into the opposing lane.

The horizontal curve on Williamsburg Boulevard and the angled southbound approach of N. Kensington Street result in a skewed intersection and an acute angle turn from westbound Williamsburg Boulevard onto northbound Kensington Street. The existing intersection provides a wide cross-section and large radius in the northeast corner to accommodate the right turning vehicles. The median on the east leg of Williamsburg Boulevard ends prior to the intersection to accommodate left turning vehicles from southbound N. Kensington Street to eastbound Williamsburg. The nubs and the extended median, while providing shorter crossing distances for pedestrians will make the turning movements for vehicles more difficult, particularly for buses as shown in the Auto Turn Analysis exhibit. Further the nub in the northeast corner eliminates the westbound right turn lane on Williamsburg Boulevard.

The Auto Turn Analysis indicates that a bus cannot make a westbound to northbound movement without occupying a portion of the southbound lanes on N. Kensington Street. If a car is present in the southbound lane, a bus would not be able to make the westbound right turn movement. Additional radius than what is shown on the proposed concept plan is required at the northeast corner to provide enough space for a school bus to complete a westbound right turn movement safely without entering the opposing lane, similar to the radius there today.

According to the American Association of State Highway and Transportation Officials (AASHTO), a conventional school bus requires a minimum radius of 23.8 feet for the rear wheel path and a lane width of approximately 15 feet if not to encroach into another lane when making a 90 degree turn. Similar radius would be required for fire trucks, single unit commercial trucks, and construction trucks. For this reason alone, the nub on the northeast corner should be redesigned to provide sufficient radius to permit conventional school buses, fire trucks, and trucks capable of carrying construction equipment to the elementary school site to make the right turn from Williamsburg Boulevard onto N. Kensington Street without entering into the opposing southbound lane or “jumping” the curb of the proposed nub on the northeast corner of the intersection.

Additionally, the widened median on the east leg of the intersection should be scaled back to a point where a school bus, fire truck, and large construction equipment can efficiently and safely make the southbound to eastbound left turn.

The intersection improvements as currently proposed, including the skewed N. Kensington Street approaches resulting in vehicles having to transition through the intersection, the elimination of the westbound right turn lane on Williamsburg Boulevard, and the inability of a conventional school bus, as well as similar sized fire trucks and construction trucks to make the turn from westbound Williamsburg Boulevard to N. Kensington Street without encroaching into the opposing lane are an unsafe design.

Williamsburg Boulevard has both a horizontal and vertical curve at the N. Kensington Street intersection. The posted speed limit is 30 miles per hour, and the 85th percentile speed is 36 miles per hour on Williamsburg Boulevard. Approaching the intersection with N. Kensington Street travelling westbound, the upward incline and curvature of the roadway reduces the sight distance for vehicles, thereby creating less safe conditions for pedestrians crossing the east leg of the intersection. Assuming a design speed of 40 miles per hour and a 3% upward incline, a stopping distance of 289 feet is required based on AASHTO design standards. The stopping distance travelling westbound on Williamsburg Boulevard, measured from the east leg N. Kensington Street crossing to the curve warning sign, which is the given sight distance due to the road grade and curvature, is approximately 230 feet. Since the required stopping distance is greater than the available distance, adequate stopping distance would not be provided, compromising the safety of pedestrians and reinforcing the fact that the current design is inherently unsafe.

Further, according to the Toole report, the Williamsburg Boulevard/N. Kensington Street intersection is a potential key connection for middle school students walking and bicycling to school from the southwest. It is anticipated that vehicles driven by teachers, staff members and parents of extended day participants will travel westbound on Williamsburg Boulevard and turn right onto N. Kensington Street, conflicting with middle school children crossing the east leg of the intersection. Given the inadequate vertical sight distance for westbound Williamsburg

Boulevard, a redesign of the intersection improvements should be considered to include a raised median and provide a pedestrian refuge on the west leg of the intersection. A traffic signal would mitigate the sight distance deficiencies and would provide a controlled crossing for a growing number of middle school students who are being strongly encouraged to walk or bike to school, helping reach the goal to improve pedestrian visibility and safety. The Toole report did conclude a traffic signal is warranted at the Williamsburg Boulevard/N. Kensington Street intersection.

The Williamsburg Middle School and New Elementary School Transportation Plan recommends a hybrid beacon for the Williamsburg Blvd/N. Kensington Street intersection, but also notes that the intersection would meet the “Peak Hour” signal warrant for the middle school AM arrival. Elementary school traffic was included in this analysis for the AM peak hour, but excluded in the PM peak hour due to different bell schedules for the two schools. This Plan assumes that 31 percent of Williamsburg elementary school students will arrive via personal vehicles versus an average of 39 percent reported at nearby Jamestown Elementary School and 43 percent reported at Nottingham Elementary School during a mild weather week in September 2012 (Toole Appendix A). Absent a dramatic shift in the percentage of elementary school children who walk, bike, and ride the bus to school, the number of elementary school drop off vehicles can reasonably be expected to be eight to 12 percent greater than estimates presented in the Toole report. Moreover, the Levels of Service for the Williamsburg Boulevard/N. Kensington Street intersection in the Transportation Plan were not increased for the two-thirds rainy day scenario. Further analysis would be required to determine if additional signal warrants are met.

When considered in combination, the loss of the westbound right turn lane on Williamsburg Boulevard at N. Kensington Street for school-bound drop off traffic, the inconsistency in the share of walkers and bikers projected for the elementary school at Williamsburg compared with Nottingham and Jamestown, and the failure to project traffic volumes for the two-thirds rainy day scenario, questions are raised about the actual levels of service at the Williamsburg Boulevard/N. Kensington Street intersection when the new school opens and additional analysis is called for to examine the potential congestion for vehicles entering and exiting N. Kensington Street and the probability that other signal warrants may be met.

Assuming existing infrastructure is maintained, the Williamsburg Boulevard/N. Harrison Street intersection would have an overall LOS F during the AM peak hour in the total future condition with the middle school expansion and the new elementary school (Table 12, page 40 of Toole report). The addition of a traffic signal at Williamsburg Boulevard and N. Kensington Street would create a second viable access point for the middle school site, thereby relieving congestion and delay at the Williamsburg Boulevard/N. Harrison Street intersection. The N. Kensington Street intersection would also be the primary access for the new elementary school. Assuming a redistribution of existing volumes in addition to the new site trips, the Williamsburg Boulevard/N. Harrison Street intersection improves to a LOS C during the AM

peak hour. Thus a redesign of the Williamsburg Boulevard/N. Kensington Street intersection and the installation of a traffic signal would help to improve traffic flow, preventing or alleviating congestion on all of the streets that have been designated to handle Williamsburg school-related traffic.

The redesign of the intersection and the installation of a traffic signal would also reduce the likelihood that parents, buses, and construction vehicles would use the Williamsburg Boulevard/N. Harrison Street intersection, thereby increasing the congestion and delay at the Williamsburg Boulevard/N. Kensington Street intersection, or the Williamsburg Boulevard/N. John Marshall Drive intersection, to access the elementary school. In addition, the redesign and traffic signal will improve the efficiency and the safety of the Williamsburg Boulevard/N. Kensington Street intersection during non-rush hour and non-arrival and pick-up times for the schools. Finally, the traffic signal should provide safer access to and from driveways immediately adjacent to the intersection along Williamsburg and N. Kensington because of the traffic calming effects during rush hour.

In addition, the Williamsburg Boulevard/N. Kensington Street intersection will operate at a LOS C or better for all approaches under signal control. However, the analysis in the report appears to assume a right turn lane is maintained on westbound Williamsburg Boulevard. The current County design with a nub in the northeast corner would eliminate the right turn lane, reducing capacity of the intersection and increasing the likelihood of congestion. Further, as noted previously, the elementary school trips assumed the County's goal of 50 percent walk/bike to school rate, higher than what is achieved at existing elementary schools and were not increased for the two-thirds rainy day analysis. Considering no right turn lane and a potentially higher number of elementary school trips, congestion at the Williamsburg Boulevard/N. Kensington Street intersection could be worse than reported.

Wells + Associates has prepared the attached "Alternative Concept Plan" for the Williamsburg Boulevard/N. Kensington intersection to address the deficiencies identified above in the current design. This Alternative Concept Plan would provide a useful basis for redesign of the intersection to achieve the objectives of safety for pedestrians and vehicles and efficient operation of the intersection as the primary access to the new elementary school.

Recommendations

Based on the review of the documents listed previously and considering the goal of the Neighborhood Conservation project to increase pedestrian visibility and safety as well as the County's goal to reach 50 percent bike/walk to school rate, Wells + Associates recommends the design of the proposed improvements at the Williamsburg Boulevard/N. Kensington Street intersection be re-evaluated to safely accommodate bicycles, pedestrians, vehicles, and school buses, and a traffic signal should be reconsidered for the following reasons:

1. Vehicle conflicts through the skewed intersection due to the design of the nubs on the east corners of the intersection.
2. Buses, and similar sized fire trucks and construction vehicles, cannot make the turn from westbound Williamsburg to northbound N. Kensington without encroaching on the southbound lane.
3. Visibility is limited by both the vertical and horizontal curves on Williamsburg Boulevard.
4. Congestion and delay at the N. Harrison Street intersection with Williamsburg Boulevard would be reduced with a signal at the N. Kensington Street intersection.
5. A traffic signal would provide a safe controlled crossing for bicyclists and pedestrians.
6. The peak hour signal warrant is met for a traffic signal at the Williamsburg Boulevard/N. Kensington Street intersection.
7. Other warrants for a traffic signal at the subject intersection may also be met, and should be the subject of further analysis.