

Georgia Avenue (MD 97) Pedestrian Road Safety Audit Montgomery County, Maryland



Prepared For:
Department of Transportation
Montgomery County, Maryland



In partnership with the Maryland State Highway Administration

Prepared By:



Silver Spring, Maryland

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1. Introduction

1.1 Objective

The objective of this study was to complete a pedestrian and bicycle road safety audit (PRSA) for Georgia Avenue between Spring Street and Sligo Avenue in Silver Spring, Maryland. The study area is shown on Figure 1. As a result of the audit, the PRSA team has identified a variety of issues related to pedestrian and bicycle safety and developed a number of suggestions to improve pedestrian and bicycle safety in the study area.

1.2 Background

Georgia Avenue is a six-lane arterial roadway traversing a high density, urban land-use area in Silver Spring, Maryland. The study area includes the intersection of Georgia Avenue and Colesville Road, located at the heart of the Silver Spring central business district. Georgia Avenue serves as a major commuter route within Montgomery County, Maryland and between the County and Washington, D.C. The area also has significant pedestrian activity, generated by the high-density commercial and residential land use as well as the Metrorail and MARC train stations and bus stop. The study area was identified as one of Montgomery County's High Incidence Areas for pedestrian-related collisions, as part of the Montgomery County Executives' pedestrian safety initiative. Based on collision data provided by Montgomery County and the Maryland State Highway Administration, 35 pedestrian and bicyclist collisions occurred along this corridor between January 1, 2003 and December 31, 2007. The purpose of this PRSA was to identify safety issues that may be contributing to the observed pedestrian and bicyclist collisions in the study area and identify potential measures to reduce the likelihood for future pedestrian/bicycle collisions in the future.

The PRSA was performed on March 17, 2009 and March 18, 2009 during daytime and nighttime hours. The PRSA team consisted of ten members, representing:

- Montgomery County Department of Transportation,
- Montgomery County Police Department,
- Local community members,
- Maryland State Highway Administration (MDSHA),
- District of Columbia Department of Transportation,
- Washington Metropolitan Area Transit Authority (WMATA),
- American Association of State Highway and Transportation Officials (AASHTO),
- Federal Highway Administration (FHWA), and
- Vanasse Hangen Brustlin, Inc. (VHB), the consultant.

For the purposes of consistent directions references in this report, Georgia Avenue is considered to operate in the north-south directions. All intersecting roadways are considered to operate in the east-west directions.

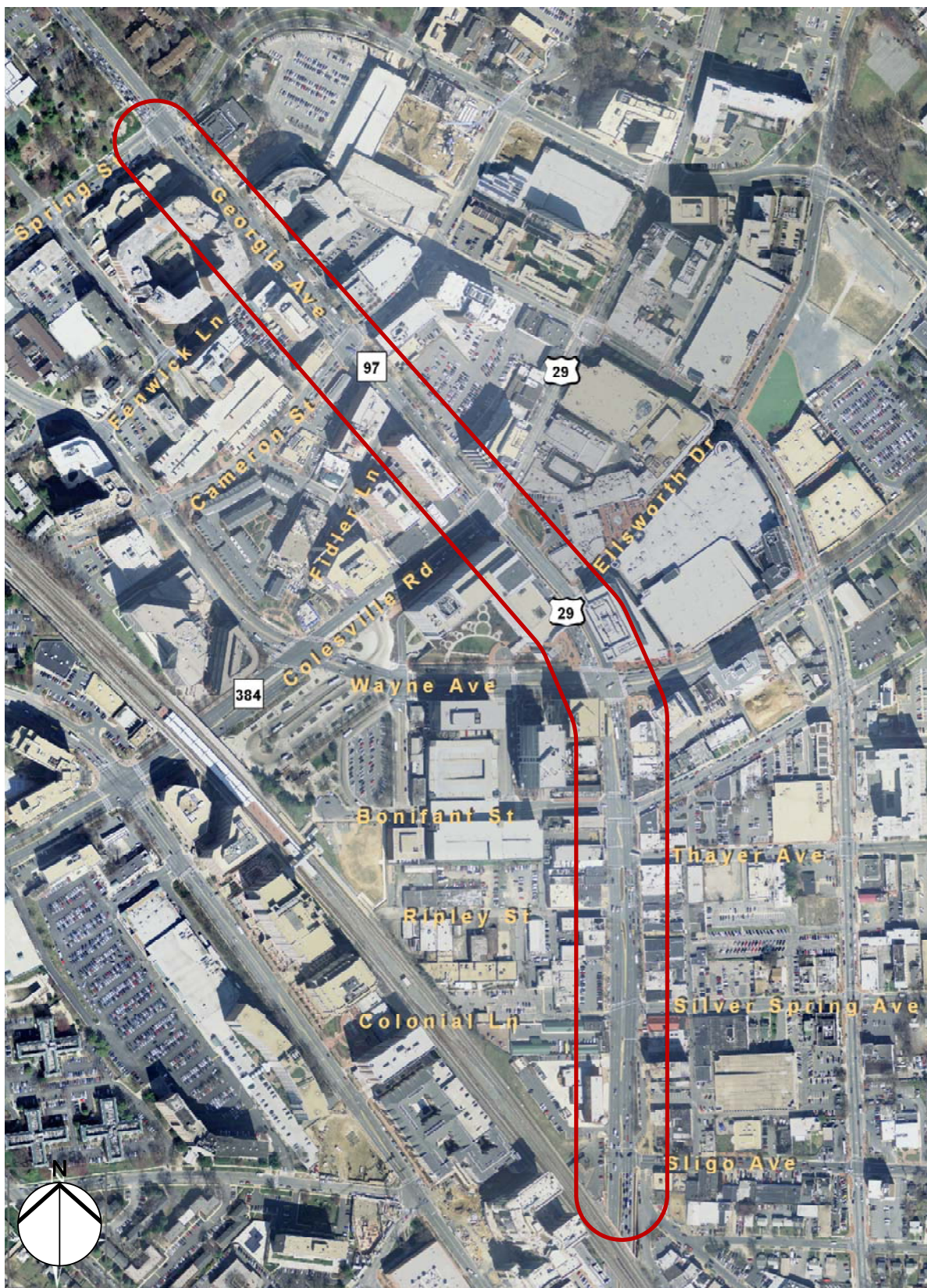


Figure 1: Study Area

1.3 Organization of the Report

This report first presents a description of the existing geometric, operational, and safety conditions for the study area based on field reviews and available data. Next, the report identifies the existing conditions and general issues identified within the corridor by the PRSA team. Finally, this report presents general suggestions for pedestrian safety improvements throughout the study area. This assessment identifies issues, possible contributing factors, and suggestions for improvement.

This report will be a resource to MDSHA and MCDOT, as well as other stakeholders, for implementing pedestrian safety improvements within the audit area. There will be an ongoing vetting of the suggestions and recommendations in this report with collaboration among agencies and stakeholders to implement short and intermediate-term recommendations and assess the feasibility and constructability of long-term projects. Ultimately, this process will assess the merits of these recommendations and establish a process whereby a range of pedestrian safety recommendations are implemented.

1.4 Existing Conditions

1.4.1 Site Characteristics

Georgia Avenue, between Spring Street and Sligo Avenue, has six travel lanes with curb and gutter and sidewalk facilities on both sides of the road. Opposing traffic along Georgia Avenue is separated by a raised median, and the posted speed along the corridor is 30 miles per hour. Parking on Georgia Avenue within the study area is prohibited at the following times:

- Northbound: 3:30 – 7:00 PM
- Southbound: 6:30 - 9:30 AM

The existing roadway offers a variety of pedestrian accommodations. All of the signalized intersections along the corridor are equipped with standard pedestrian signals at a minimum and countdown pedestrian signals are provided at numerous locations in the study area. Right-Turn-on-Red (RTOR) restrictions have been implemented at a number of intersections. In many locations, the raised median along Georgia Avenue provides an accessible pedestrian refuge from traffic along the corridor. Sidewalks are present along both sides of the roadway, providing a continuous, dedicated pathway for pedestrians. In many locations, pedestrian-scale lighting, such as street lamps or low intersections lighting, is provided to illuminate the sidewalks and crossing locations.

Georgia Avenue is a major arterial corridor between Montgomery County, Maryland (including I-495) and Washington, D.C. Georgia Avenue serves as a major commuter route and carries significant vehicular traffic, which is reflected in the average annual daily traffic (AADT) volumes shown in Table 1.

Table 1: 2008 Georgia Avenue AADT

Location	AADT
0.1 miles south of Colesville Road (MD 384)	41,901
0.1 miles south of 16 th Street (MD 390)	36,421
0.1 miles north of the Washington, D.C. line	34,821

Public transportation is heavily utilized in the study area. The Silver Spring Metrorail and MARC train stations are located nearby on Colesville Road, approximately 0.25 miles south of the Georgia Avenue and Colesville Road intersection. Several commuter and local bus routes also travel along portions of Georgia Avenue within the study area. These bus routes include the Montgomery County Ride-On 9, 12, 13, 14, 16, 17, 20, 21, 22, and 127 routes as well as the WMATA Metro Y5, Y7, Y8, Y9, J5, and Q2 bus routes.

1.4.2 Crash Data

A review of all collision records collected by Montgomery County Police in the study area during the five-year period from 2003 through 2007 allowed the PRSA team to identify the location of all reported pedestrian crashes within the corridor (Figure 2). Between 2003 and 2007, 506 vehicular crashes, 34 pedestrian crashes, and a single bicyclist crash were reported in the study area. Of the 35 pedestrian and bicyclist crashes between 2003 and 2007, 25 occurred at an intersection and 10 occurred between intersections. Figure 2 shows the location of all crashes along Georgia Avenue within the study period.

In terms of crash frequency, 2004 experienced the greatest number of both vehicular and pedestrian/bicyclist crashes, as shown in Figure 3. Since 2004, there has been a steady decline in vehicular crashes. Pedestrian/bicyclist crashes have remained lower as well.



Figure 2: Georgia Avenue Pedestrian and Bicycle Crashes 2003-2007

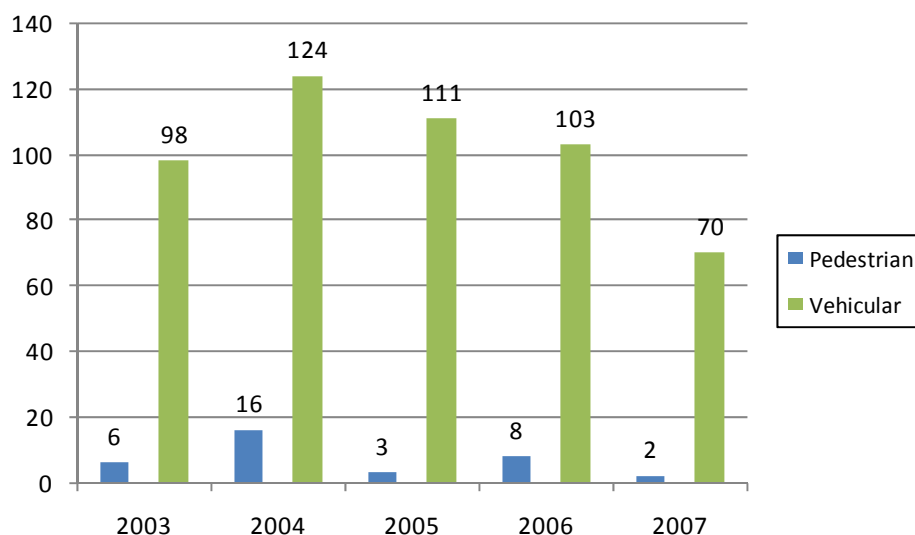


Figure 3: Study Area Crash Frequency 2003-2007

As shown in Figure 4, the Georgia Avenue/Colesville Road intersection experienced the greatest number of intersection-related pedestrian crashes (10) for any individual intersection within the corridor. The second highest frequency was observed at the Georgia Avenue/Wayne Avenue intersection, with five intersection-related pedestrian/bicyclist crashes.

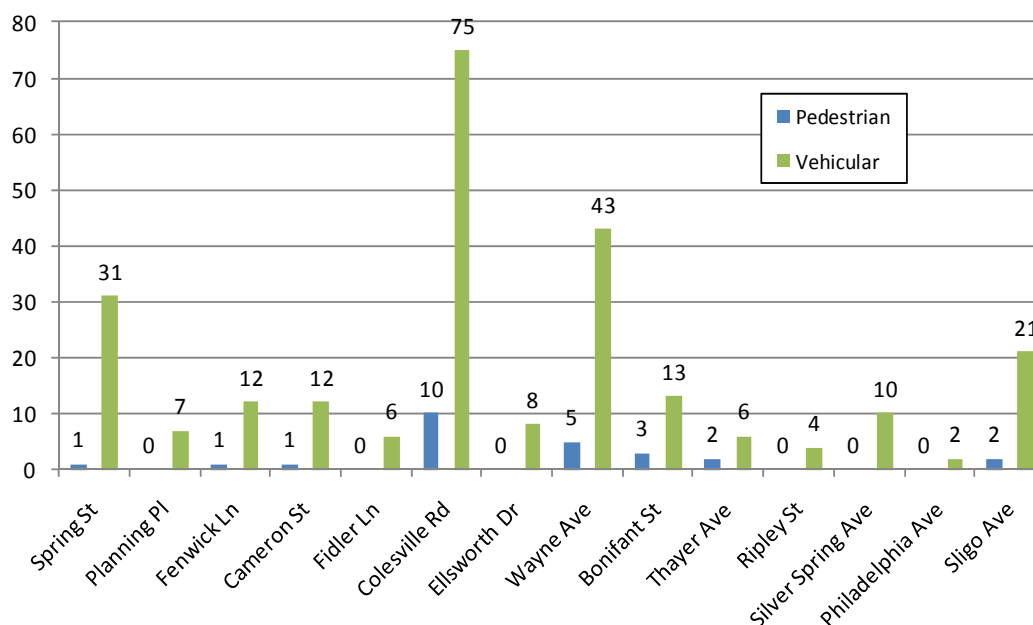


Figure 4: Intersection-Related Crash Frequency by Intersection 2003-2007

The corridor crash data shown in Figure 5 indicate that the majority of pedestrian/bicyclist crashes resulted in injuries to those involved. Of the 35 pedestrian/bicyclist crashes, only one crash did not include an injury. The clear propensity for pedestrian and bicycle collisions along this corridor to result in moderate to severe injury supports the need for pedestrian safety measures in the corridor.

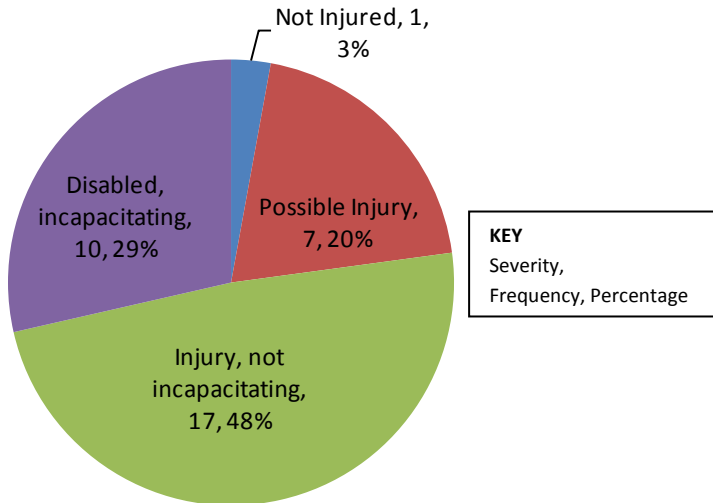


Figure 5: Pedestrian/Bicyclist Crashes by Crash Severity 2003-2007

A majority of the pedestrian/bicyclist crashes occurred during the day and under adequate lighting and roadway conditions, as shown in Figure 6. This data indicates that lighting and weather do not appear to be the major contributing factors to pedestrian/bicycle crashes along the corridor; however, these factors may contribute significantly to collisions at some specific locations.

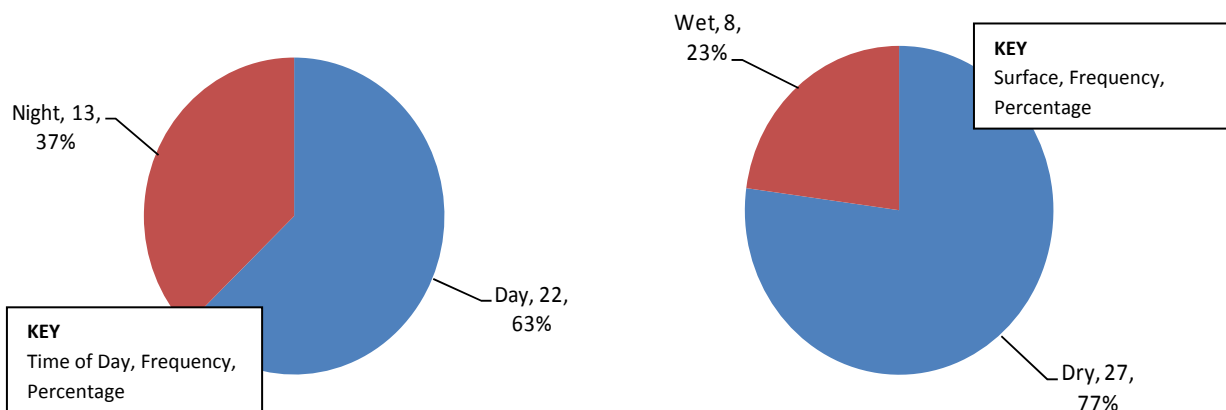


Figure 6: Pedestrian/Bicyclist Crashes by Time of Day and Road Surface Conditions 2003-2007

2. Road Safety Audit Findings

2.1 Safety Benefits of Existing Roadway Features

Notable existing roadway features that enhance pedestrian safety in the study area include but are not limited to:

- *Continuous sidewalks and crossings:* Sidewalks within the corridor are continuous and provide a comfortable walking environment.
- *Countdown signals:* Pedestrian countdown signals are used throughout the area. Countdown pedestrian signal research has shown that pedestrians easily understand how the signal works and more pedestrians start during the clearance phase but fewer people initiate walking late in clearance phase. It was also observed that no pedestrians were left in crosswalks during the steady “don’t walk” phase. Countdown pedestrian signals have been found to reduce pedestrian injury crashes and improve pedestrian compliance to traffic controls in several national studies. Countdown signals should be considered at all intersections, especially in the CBD areas.

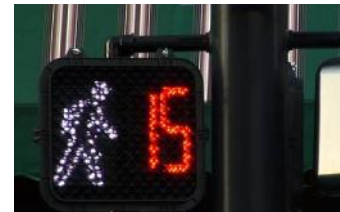


Photo of a countdown signal

These measures help improve driver awareness of pedestrians and compliance of traffic signals. Implementation of these features can reduce the potential for collisions.

The pedestrian crossing at Ellsworth Drive is an example of a crossing that incorporates some of the best principles in providing safe accommodation for pedestrians. The pedestrian crossing at Ellsworth Drive serves a major pedestrian desire line and traffic control minimizes pedestrian-vehicle conflicts.

2.2 Observed Issues, Contributing Factors, and Opportunities for Improvements

The Georgia Avenue Drive PRSA team identified a number of pedestrian safety issues in the study area during the audit. These issues were discussed by the team and prioritized to identify the issues presenting the greatest challenges to pedestrian safety in the study area. The following section describes the identified pedestrian safety issues, in order of importance to the audit team:

Pedestrian-Vehicle Conflicts – Conflicts are often an indicator of the likelihood of a pedestrian-vehicle crash. Most pedestrian-vehicle conflicts occur at intersections within the study area. Both pedestrian and vehicular traffic volumes are relatively high throughout the corridor, and phasing at most signals needs to serve concurrent pedestrian and vehicle moments as a result of the traffic volumes. These conditions unavoidably create conflicts at intersections where pedestrians and motorists may be more inclined to focus on mobility than safety. Pedestrians in the study corridor are particularly susceptible to permissive left-turn conflicts, which may be exacerbated by relatively long delays for left-turning vehicles and drivers turning through small gaps in oncoming traffic. In some areas, wide right-turn lanes may contribute to right-turn conflicts between pedestrians and vehicles at relatively high turning speeds. The PRSA team identified low impact measures to address these conflicts throughout the corridor. However, significant reduction of these conflicts may not be possible at some locations without modifications that would restrict left-turns at intersections.

Limited Sight Lines – Fixed objects located near the curb at some intersections may contribute to difficulty for drivers to see pedestrians on the sidewalks or within crosswalks. These objects include signal poles, utility boxes, and trees.

Short Pedestrian Signal Phase – Although the county's pedestrian signals are timed to allow pedestrians to cross the entire the width of the roadway, some intersections in the study area were observed to provide a shorter concurrent pedestrian phase than the corresponding vehicular green phase. The concurrent pedestrian phase could be extended to indicate that pedestrians are permitted to cross the roadway for a longer period of time.

Pedestrian Crossings at Intersection Approaches without a Crosswalk – The audit team observed pedestrians crossing Georgia Avenue at some intersections where no crosswalk was provided.

Traffic Control Devices – Some traffic signal heads are located in areas that reduce signal conspicuity (i.e. misaligned with approach lanes or placed where background can blend with signals). Some No Right Turn on Red signs have been installed in locations far from signal heads that may reduce their effectiveness. Pavement markings, including stop bars and crosswalks, in some areas are heavily worn. Some stop bars are also located well removed from an intersection, reducing visibility of pedestrians on sidewalks or crosswalks.

Driver Compliance with Traffic Signals – In some areas, vehicles were observed improperly turning left from through lanes. In some locations, drivers ignored signal indications and illegally proceeded through red signal indications.

Pedestrian Compliance with Traffic Signals – Pedestrians were observed initiating roadway crossings at times other than the beginning of the WALK interval. Possible factors that influence a pedestrian's decision when to cross include pedestrian wait times at signals, a limited understanding of pedestrian signal indications, and typical non-compliance due to impatience. To address this issue, the following actions should be considered:

- Conduct an analysis of cycle length settings. A study by Van Houten et al entitled *The Effects of Varying Minimum Green on the Percentage of Pedestrians Waiting to Cross with the WALK Signal* helps quantify how long pedestrians are willing to wait for a WALK signal. Figure 7 illustrates this relationship as described in the Van Houten study, showing lower compliance with pedestrian signals as the cycle length increases. In the Van Houten study, cycle lengths of about 120 seconds corresponded with about a 65% compliance rate.
- Implement a pedestrian education program to inform pedestrians about the safety-related consequences of improper crossing activity.

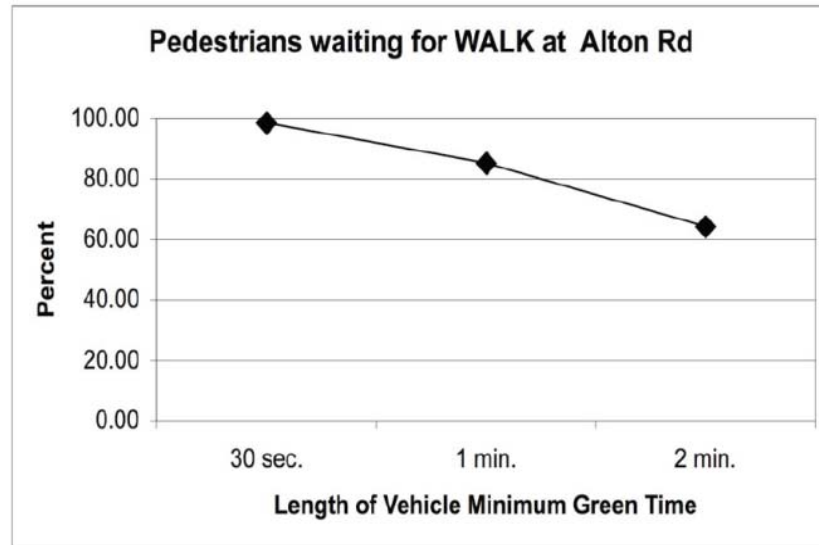


Figure 7: Relationship between Minimum Green Time and Percent of Pedestrians Waiting for WALK (Van Houten et al.).

Limited Sidewalk Accessibility – Some sidewalks in the study area contained obstacles or physical features, such as tree planters, which significantly limited the sidewalk width. The location, grades, and limited landing areas at some curb ramps may present obstacles to mobility of pedestrians throughout the corridor. As intersection or streetscape projects along the corridor are completed over time, wheelchair ramps and sidewalks should be modified as necessary to comply with the American Disabilities Act (ADA) requirements.

Lighting Conditions – While lighting has been implemented on the northern section of the corridor, lighting toward the southern part of the corridor appeared limited. Providing consistent lighting throughout the corridor ensures greater conspicuity of pedestrians.

Crosswalk Conditions – Crosswalks are not uniformly marked throughout the corridor, as some crosswalks use only transverse lines (with no hatching), while others use a high-visibility diagonal stripe marking pattern (a.k.a. zebra pattern). Crosswalk pavement conditions in many locations have also degraded due to regular wear. However, because of the large amount of pedestrian traffic and the potential for pedestrian-vehicle conflicts at intersections, Montgomery County and SHA should consider uniformly marking all pedestrian crosswalks in the corridor with markings compliant with SHA standards that increase the conspicuity of crossing locations.

2.3 Summary of Issues and Suggestions

2.3.1 Study Area Issues and Suggestions

The following section provides a summary of the issues identified during the RSA process and the suggestions for improvements throughout the study corridor. The anticipated timeframe for completion [Short Term (ST), Intermediate (I), and Long Term (LT)] is referenced after each suggestion.

Safety Issue	Suggestions
Pedestrian-Vehicle Conflicts	▪ Evaluate the potential capacity and pedestrian safety impacts of restricting right-turns on red using new or additional signage (ST). ▪ Consider installing or upgrading crosswalks, compliant with MDSHA standards (ST). ▪ Explore implementing a lead pedestrian interval (LPI) at some traffic signals (I). ▪ Evaluate the potential capacity and pedestrian safety impacts of implementing protected left-turn phasing at some traffic signals (I). ▪ Work with MDSHA to pursue installing pedestrian countdown signals (I). ▪ Determine the feasibility and constructability of constructing curb extensions (I). ▪ Determine the feasibility and constructability of constructing median end caps (I). ▪ Evaluate the need for lighting improvements at some crossing locations (I). ▪ Evaluate potential signal timing improvements to reduce traffic congestion (I). ▪ Work with MDSHA to identify potential locations to perform pedestrian studies to evaluate warrants for pedestrian signals on Georgia Avenue (ST). ▪ Monitor traffic patterns after the signal reconstruction projects and signal timing adjustments are completed (ST - MDSHA suggestion). ▪ Assess the capacity and pedestrian safety impacts of restricting left-turning vehicles from Fenwick Lane onto northbound Georgia Avenue (I - MDSHA suggestion).
Limited Sight Triangles	▪ Consider removing or relocating objects obstructing sight triangles (ST). ▪ Assess the capacity and pedestrian safety impacts of restricting right-turns on red using new or additional signage (ST). ▪ Determine the feasibility and constructability of constructing curb extensions to move crossing locations into driver sight lines and reduce vehicle turning speeds (I).

Safety Issue	Suggestions
Short Pedestrian Signal Phase	Work with Traffic Signal Operations staff to consider extending the pedestrian phase (ST).
Pedestrian Crossings at Intersection Leg without Crosswalk	- Work with MDSHA to pursue replacing existing pedestrian signals with countdown signals to encourage use of existing crossings (ST). - Review pedestrian behaviors after MDSHA signal projects are complete (I).
Traffic Control Devices	- Consider refreshing stop line pavement markings (ST). - Consider moving stop line locations on some side streets. - Consider installing supporting signage at stop lines (I). - Assess the capacity and pedestrian safety impacts of restricting right-turns on red using new or additional signage (ST). - Consider installing skip marks to guide left-turning traffic at some intersections (ST). - Assess the feasibility and constructability installing near-side traffic signals where signal conspicuity is an issue (LT). - Explore the feasibility and constructability of widening some narrow side street approach lanes (I). - Work with Traffic Signal Operations staff to evaluate signal timing intervals to ensure adequate clearance times (ST).
Driver Compliance with Signals	- Assess the capacity and pedestrian safety impacts of implementing a lagging left-turn green phase at some traffic signals (I). - Explore implementing a lead pedestrian interval (LPI) at some traffic signals (I). - Work with MDSHA to pursue pavement marking modifications (I). - Determine the feasibility and constructability of installing a median and barrier at some locations with significant uncontrolled midblock crossing activity (LT).
Pedestrian Compliance with Signals	- Ensure appropriate level of enforcement (ST). - Consider implementing a pedestrian education program (ST). - Conduct an analysis of cycle length and phasing settings to evaluate cycle length reductions (ST). - Work with Traffic Signal Operations staff to evaluate maximizing pedestrian signal timing intervals (ST).
Limited Sidewalk Width	- Consider removing sidewalk obstructions and widening choke points (I). - Determine the feasibility and constructability of reducing corner radii at some locations (I). - Pursue installing grates over tree plantings (I).
Limited Street Lighting	Consider enhancing street lighting (I).
Crossing Conspicuity	Consider installing or upgrading crosswalks, compliant with MDSHA standards (ST).
Maintenance	Work with MDSHA to assess the need for repairs to any damaged signal poles or roadway infrastructure (ST).

References

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