

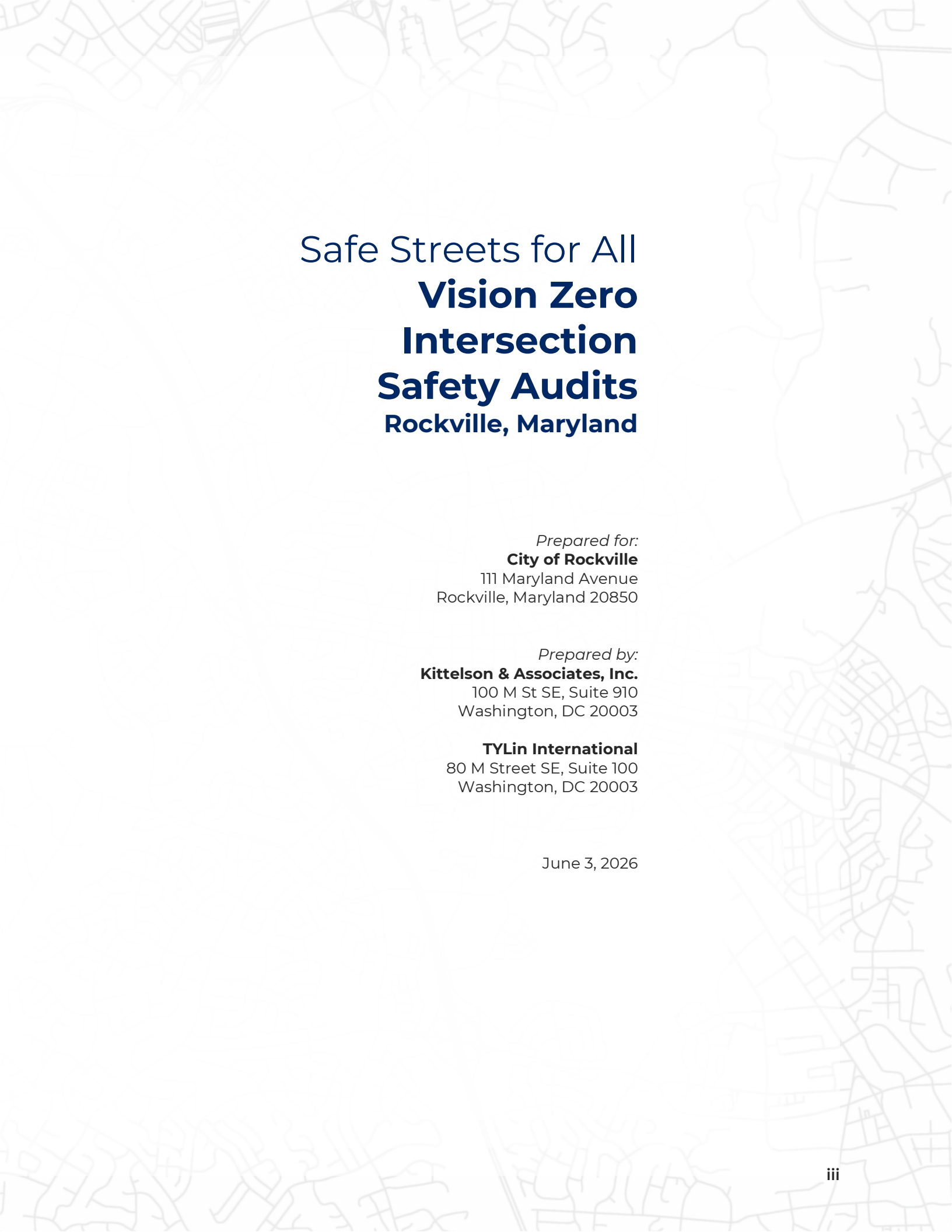
Safe Streets for All
**VISION ZERO
INTERSECTION
SAFETY AUDITS**



City of Rockville, Maryland

June 3, 2026

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Safe Streets for All **Vision Zero** **Intersection** **Safety Audits** Rockville, Maryland

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Section 1

Introduction

Introduction

The City of Rockville, Maryland (Rockville) is working to reduce traffic deaths and serious injuries through its Vision Zero program and related transportation plans. City staff have emphasized the need to improve crossings and intersections for people walking, biking, taking transit, and driving, with particular attention to vulnerable roadway users. Many of the intersections with the most serious crash histories are on state-owned roadways, so improvements often require close coordination with the Maryland Department of Transportation State Highway Administration (MDOT SHA).

This project, **Safe Streets for All Vision Zero Intersection Safety Audits**, is part of Rockville's broader effort to identify safety issues and implement practical improvements at high-priority intersections.

This project is funded in part by the United States Department of Transportation's (USDOT) [Safe Streets and Roads for All \(SS4A\)](#) program. SS4A helps communities prevent roadway fatalities and serious injuries and advances a Safe System approach that prioritizes designs and operations that reduce the likelihood that common human mistakes lead to severe outcomes. In this context, the study uses both historical crash data and proactive risk indicators to identify implementable safety improvements that the City of Rockville and partner agencies can advance.

This work also advances Rockville's adopted plans and policies, including the [Vision Zero Action Plan](#) (adopted by the Mayor and Council in July 2020), by identifying practical intersection safety improvements that support the City's goal of eliminating traffic deaths and serious injuries. It complements other City guidance, including the [Pedestrian Master Plan](#) and the [Bikeway Master Plan](#) (both tied to the [Rockville 2040 Comprehensive Plan](#)), which establish a citywide vision for safe, comfortable, and convenient walking, rolling, and bicycling. The recommendations are also consistent with Rockville's [Complete Streets Policy](#) and related implementation tools (such as sidewalk prioritization and neighborhood traffic management guidance) that emphasize designing streets for all users.

PURPOSE OF THIS REPORT

This report documents existing conditions, key safety issues, and recommended safety improvements for each audited intersection. The recommendations are intended to be practical and implementable, and to help the City and its partners prioritize actions that reduce the likelihood and severity of crashes for all roadway users.

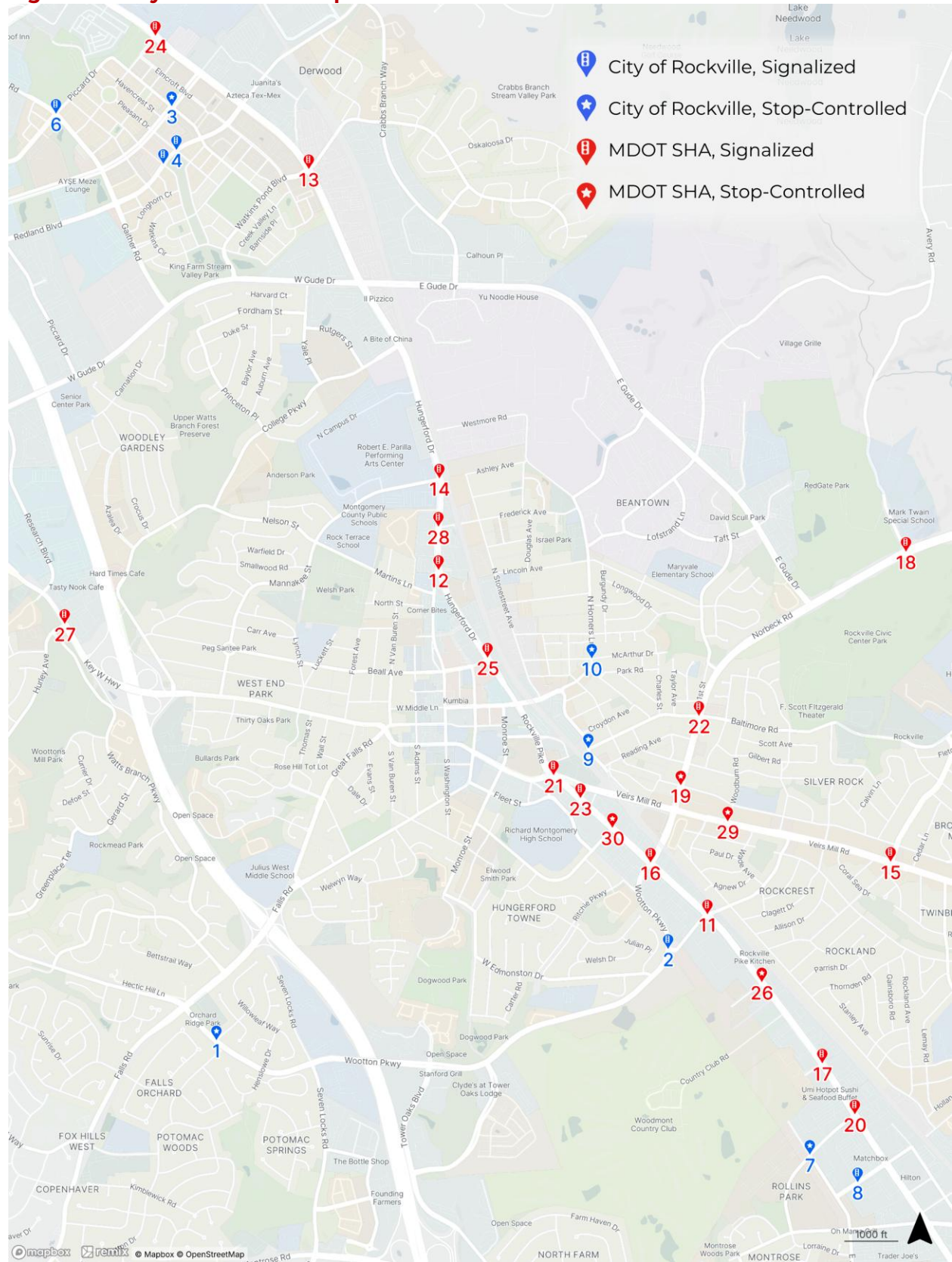
Vision Zero and the Safe System approach focus on proactive strategies. While some intersections may record few crashes within a short period, they can still have conditions that elevate risk. Therefore, this project extends beyond analyzing crash history alone by incorporating near-miss conflicts and field observations to detect and resolve issues before serious crashes occur.

STUDY INTERSECTIONS

The City is evaluating 30 intersections, including 10 City-owned and maintained and 20 state-owned and maintained. The study intersections were identified by the City based on a history of injuries and fatal crashes. A map of the study intersections listed below is displayed in Figure 1.

- #1** - Wootton Parkway & Pasture Brook Way
- #2** - Wootton Parkway & W. Edmonston Drive
- #3** - King Farm Boulevard & Grand Champion Drive
- #4** - Redland Boulevard & Pleasant Drive
- #5** - Redland Boulevard & Thompson Dairy Way
- #6** - Gaither Road & Piccard Drive
- #7** - E. Jefferson Street & Congressional Lane
- #8** - Halpine Road & Shopping Center Entrance (Congressional Plaza)
- #9** - Baltimore Road & S. Stonestreet Avenue
- #10** - Woodland Road & N. Horners Lane
- #11** - Rockville Pike (MD 355) & Edmonston Drive
- #12** - Hungerford Drive (MD 355) & N. Washington Street
- #13** - Frederick Road (MD 355) & Watkins Pond Boulevard
- #14** - Hungerford Drive (MD 355) & Mannakee Street
- #15** - Veirs Mill Road (MD 586) & Broadwood Drive
- #16** - Rockville Pike (MD 355) & First Street/Wootton Parkway
- #17** - Rockville Pike (MD 355) & Templeton Place
- #18** - Norbeck Road (MD 28) & Avery Road
- #19** - First Street (MD 28) & Grandin Avenue
- #20** - Rockville Pike (MD 355) & Congressional Lane
- #21** - Rockville Pike (MD 355) & Veirs Mill Road (MD 28)
- #22** - First Street (MD 28) & Baltimore Road
- #23** - Rockville Pike (MD 355) & Richard Montgomery Street
- #24** - Frederick Road (MD 355) & Ridgemont Avenue
- #25** - Hungerford Drive (MD 355) & Beall Avenue
- #26** - Rockville Pike (MD 355) & Talbott Street
- #27** - West Montgomery Avenue (MD 28) & Hurley Avenue
- #28** - Hungerford Drive (MD 355) & Frederick Avenue
- #29** - Veirs Mill Road (MD 586) & Woodburn Road
- #30** - Rockville Pike (MD 355) & Mt. Vernon Place

Figure 1. Study Intersection Map



SAFETY AUDIT INPUTS

Each intersection safety audit follows a consistent, repeatable process that combines data review with field observations. The intent is to develop a clear understanding of what is happening at each intersection, why safety concerns may be occurring, and which improvements are likely to help. Figure 2 shows the key inputs used across the audits.

Figure 2. Intersection Safety Audit Inputs

| Crash Review | Near-Miss Analysis | Traffic Operations Review | Field Visits |
|--|--|--|--|
| Summary of reported crashes, including severity, crash types, and contributing circumstances, based on available data sources. | Video-based review of how people move through the intersection, including identification of near-miss conflicts. Near miss severity is summarized using Post Encroachment Time (PET), a measure of how closely two road users pass through the same space in time. | Review of intersection operations during peak periods using available traffic volumes and signal timing information. | On-site observations to document roadway geometry, visibility, accessibility needs, user behavior, and multimodal comfort. Photos and detailed field notes are included in the appendix to provide transparency. |

These inputs were not treated as separate checklists. Instead, they were reviewed together to identify each intersection's priority safety issues, including documented crash patterns and conditions that create elevated risk even when severe crashes are infrequent or underreported. This approach aligns with Rockville's Vision Zero Action Plan, a data-driven strategy intended to eliminate traffic-related fatalities and serious injuries, and recognizes that people traveling by all modes make mistakes.

IDENTIFYING SAFETY ISSUES

Crash history is a vital input and is included for every audited intersection. However, this study did not depend solely on crash data to determine safety issues at each site. The rationale is clear: the goals of SS4A and the Vision Zero initiative are to reduce the risk of fatal and serious injuries. As highlighted in Rockville's Vision Zero Action Plan, this means implementing proactive safety measures rather than waiting for severe crashes to occur.

Accordingly, safety issues were identified by cross-referencing multiple inputs, including crash history, field observations, operational context, and proactive indicators of conflict. These indicators are documented in the site visit appendix, which records observed issues and conditions, and in the crash summary documentation.

This approach is also consistent with the broader Maryland safety context. Maryland's Strategic Highway Safety Plan (SHSP) highlights the continuing severity of pedestrian and bicyclist outcomes statewide and describes pedestrians and bicyclists as among the most vulnerable roadway users. That statewide context supports the rationale for using proactive

information, especially at locations that serve multimodal travel, rather than relying solely on crashes.

RECOMMENDATION DEVELOPMENT

For each intersection, recommendations are presented as short-term and long-term recommendations:

- **Short-term (quick-build) recommendations**

Recommendations that can typically be implemented more quickly using lower-cost measures such as signing, pavement markings, delineation, and operational changes.

- **Long-term recommendations**

Recommendations that generally require additional design, coordination, and funding, and may include reconstruction or more substantial geometric and signal changes.

While the report initially presents short-term recommendations for convenience, the project team developed its suggestions starting from the opposite end. They first identified the long-term concept and then adapted it into a short-term package that aligns with the same safety goals. This deliberate long-term first approach helps prevent a “band-aid” solution. In some cases, a quick fix may temporarily alleviate a symptom but could also unintentionally hinder, delay, or complicate the broader long-term plan. By defining the long-term vision early, the quick-build recommendations become more effective as interim steps that support, rather than block, a future comprehensive solution.

IMPROVEMENT MATRIX DEVELOPMENT

To ensure consistency in recommendations across the project sites, the project team developed and used an Improvement Matrix. The Matrix links common priority safety issues to treatments, describing typical applications, implementation considerations, and supporting references. It was used to identify recommendations appropriate to each intersection’s issues and context. The City emphasized the need for a locally branded document and guided the inclusion of information that connects treatments to crash types and quantifies benefits. **Appendix A** contains the **Improvement Matrix**.

The Improvement Matrix was developed using a library of documents that includes Rockville plans and policies; Maryland and MDOT SHA guidance; other regional information, such as the [Complete Streets Design Guide](#) and the [Curbless & Shared Street Design Guide](#) from Montgomery County; and national best-practice guidance.

USING THIS REPORT

This report is organized so that readers can move from “what we observed” to “what we recommend” in a clear, repeatable way at every location. The heart of the document is the

set of intersection chapters, which follow a consistent structure across all audited intersections.

Each intersection chapter is organized so that readers can quickly understand:

1. What the intersection is like today

This section outlines the current roadway context and how the intersection functions for drivers, pedestrians, wheelchair users, cyclists, and transit riders. It covers traffic control, geometry, and operational conditions that influence movement through the intersection.

2. The priority safety issues identified

This section describes the key safety issues at the intersection and explains how they were identified using the project's key inputs (crash history, field observations, and operational context) and, where available, proactive indicators such as conflicts. Supporting documentation, including site visit notes and photos, is provided in the appendix so readers can trace findings back to observed conditions.

3. The recommendations to address the priority safety issues

Recommendations are categorized into short-term (quick-build) and long-term strategies. Short-term suggestions focus on quick, low-cost measures like signing, striping, delineation, and specific operational changes that can be implemented promptly. Long-term recommendations involve major capital projects that may need extra design work, coordination, and funding.

Reporting Conventions

To ensure consistency and clarity in the report, each intersection features a diagram showing the streets and their associated cardinal directions (north, south, east, west). These labels are then used consistently in the narrative, tables, and figures so that readers can interpret recommendations and movements without ambiguity.

At certain locations, especially along corridors commonly discussed in a consistent "northbound/southbound" framework, such as Rockville Pike (MD 355), the report uses a location-specific naming convention to ensure the same corridor is described consistently across multiple intersections. For example, at Rockville Pike intersections, approaches are labeled to align with the corridor direction (such as "north" and "south"), even if the local geometry is not perfectly aligned with true north on a map. This convention is maintained throughout the intersection chapter to avoid confusion and to support cross-comparison between Rockville Pike locations.

Turning and through movements are described using the same orientation framework shown in the diagram (for example, "northbound left turn," "eastbound through," or "southbound right turn"). This convention allows recommendations, safety issues, and supporting figures to be read together without needing to reinterpret direction labels from one page to the next.

Additional Implementation Considerations

This report's recommendations focus on the intersection level within the project's scope. Many intersections studied are located along corridors or are close enough to face similar safety, access, and operational issues. In such cases, the City and partner agencies should consider whether implementing the suggested improvements through a corridor-wide or small-area study covering multiple nearby intersections could be more effective.

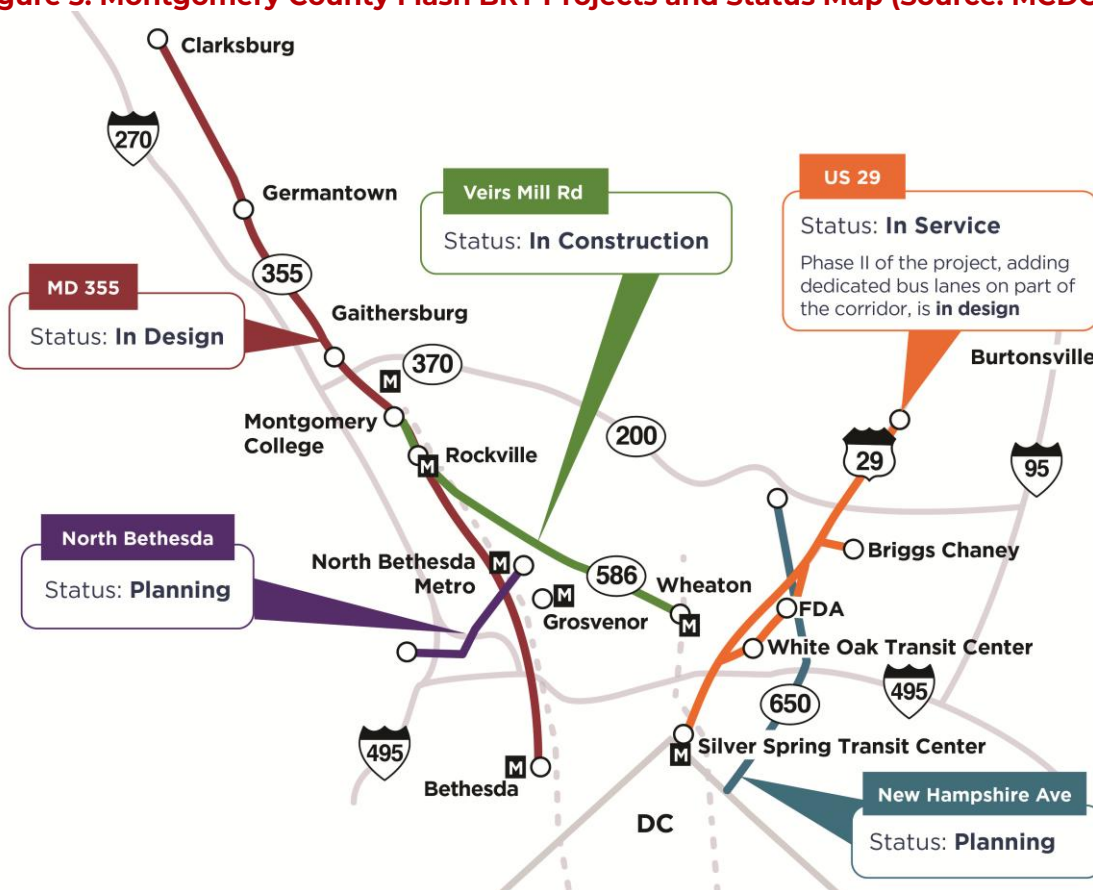
A broader study might also explore changes beyond the immediate intersection, such as lane reductions, lane reassignments, road diets, and access management strategies for bicycles, pedestrians, and transit at the corridor scale. Though these options were not examined in detail in this safety audit, they could improve safety, particularly in areas with available traffic capacity or where roadway width leads to higher speeds, longer crossings, or increased exposure for pedestrians and cyclists.

Implementation should be coordinated with routine maintenance, repaving, redevelopment, and other capital projects, like the planned Montgomery County Flash Bus Rapid Transit (BRT) network (Figure 3).

Several short-term, quick-build measures—such as signage, pavement markings, delineation, high-visibility crosswalks, stop bar adjustments, hardened centerlines, median extensions, and other low-cost measures—can be added at minimal additional cost during resurfacing or striping work. While these may not always be top priorities as standalone projects, they offer practical safety benefits when integrated into planned work.

Additionally, when new development, state projects, utility work, or other public or private improvements occur near a study intersection, the City, MDOT SHA, and partners should review this report's recommendations and consider incorporating relevant treatments into those projects.

Figure 3. Montgomery County Flash BRT Projects and Status Map (Source: MCDOT)



The project scope and schedule also limited the range of concepts evaluated at each intersection. The recommendations focus on practical short- and long-term treatments that address the priority safety issues identified in each intersection chapter.

More substantial modifications, such as installing roundabouts, removing approaches, changing circulation patterns, consolidating access points, or reconfiguring surrounding blocks, could offer additional safety improvements in certain areas. Implementing these ideas would require detailed planning, design, traffic operations analysis, coordination with the public and agencies, and funding assessment, all of which are beyond the scope of this safety audit.

As future studies or projects proceed, these findings should serve as a foundation for exploring broader geometric or network changes that could further reduce crash risk and severity.

Section 2
Intersection Safety Audit
Methodology

Intersection Safety Audit Methodology

Each intersection report follows a consistent structure, allowing readers to move from existing conditions to documented safety issues and then to recommended improvements in a clear, repeatable way. This section describes the methodology used for site visits, analyses, and the development of recommendations across all audited intersections.

INTERSECTION DESCRIPTION

Each intersection report begins with an overview of the intersection context and how the location functions today for people driving, walking, rolling, bicycling, and taking transit. The description documents include posted speed limits, roadway cross sections, the functional classification of the intersecting streets, the type of traffic control, and any notable signal phasing characteristics. Nearby land uses and multimodal generators are summarized to provide context for expected travel patterns and potential pedestrian and bicycle activity. The description also identifies key geometric features that influence safety and operations, such as lane configurations, medians, channelized turn lanes, crossing locations, and transit stop placement. A plan-view graphic is included to orient the reader and to support consistent references to approaches, movements, and crossing locations throughout the intersection report.

SAFETY REVIEW

The safety review describes the intersection's safety performance and risk profile using a combination of reported crash history and proactive conflict indicators. This section is organized to document what has occurred historically and what is currently observed to create risk.

Crash Data Analysis

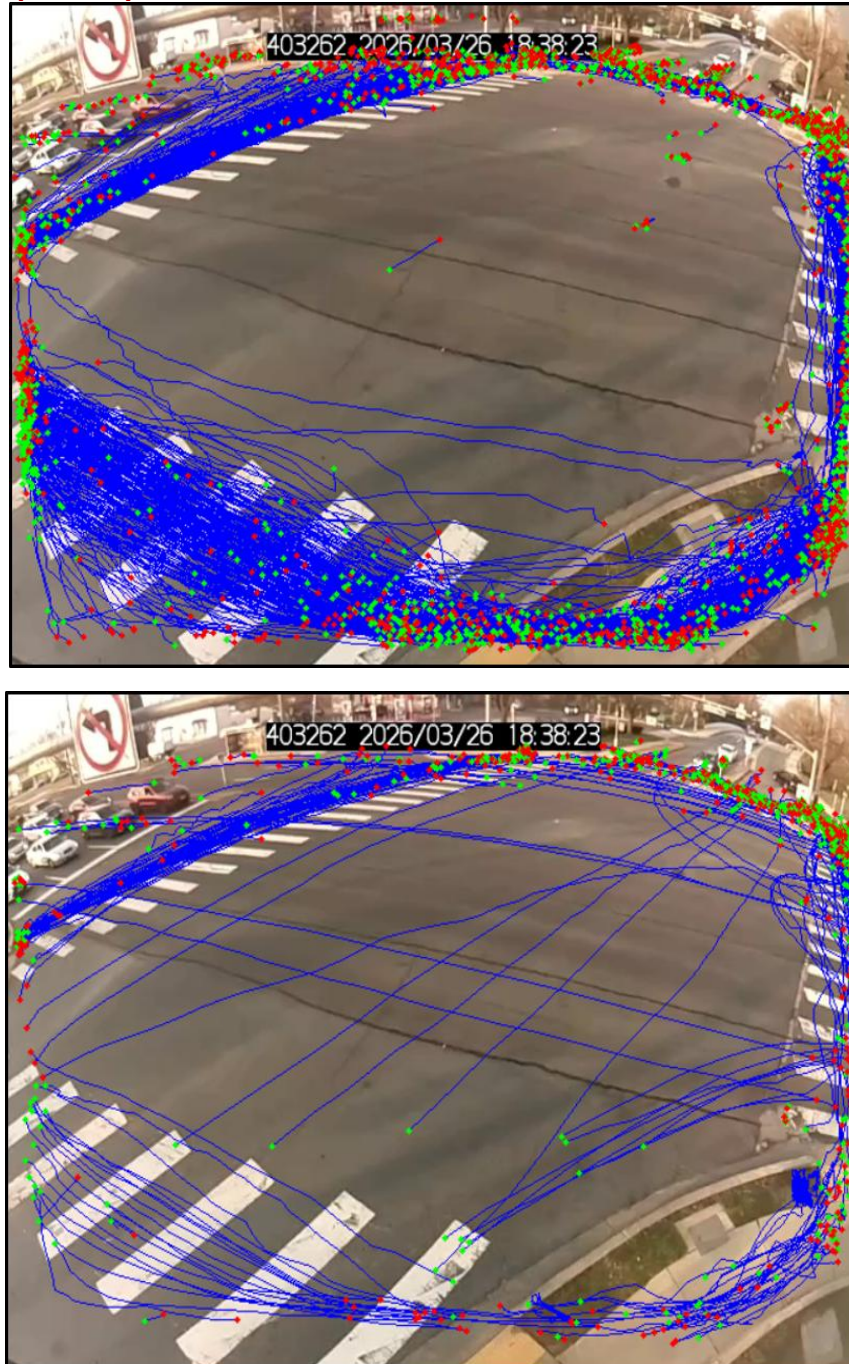
Crash history is summarized for each intersection based on available data sources. Crash summaries identify total crashes by year, crash severity, involved users, collision types, and, when available, contextual factors such as lighting and surface conditions. Contributing circumstances are summarized to highlight recurring themes, recognizing that a single crash may involve multiple contributing factors. Crash patterns are interpreted in the context of the intersection geometry, traffic control, and multimodal environment so that the safety concerns identified at each location reflect both the documented crash record and plausible contributing conditions. **Appendix B** contains the **Crash Data**.

Near-Miss Video Analysis

The safety review includes a near-miss analysis to identify conflict patterns and severity that may not be fully captured by crash history alone. Crash data remains a critical input, but it reflects only reported collisions and may not fully show how people experience an intersection during daily travel. The near-miss data supplements the crash review by documenting observed interactions between users, including conditions that occur outside typical field observation periods or when pedestrian and bicycle activity may be difficult to

capture during short-duration site visits. For this project, 24-hour video observations were reviewed at each study intersection to document conflicts, user types, and recurring movement patterns. Figure 4 displays an example of the pedestrian and bicycle paths collected at Intersection #11 - Rockville Pike (MD 355) & Edmonston Drive using the Near-Miss information.

Figure 4. Example Pedestrian (top) and Bicycle Paths (bottom) at Intersection #11 - Rockville Pike (MD 355) & Edmonston Drive



Near-miss severity is summarized using Post-Encroachment Time (PET), which quantifies the time between two users occupying the same conflict area. The analysis documents the number of observed conflicts by user type (vehicle-vehicle, vehicle-pedestrian, and vehicle-bicycle), the distribution of conflicts by PET range, and the movements most frequently associated with conflicts. Near-miss events were observed at every study intersection, and each intersection included observed activity by people walking and people biking. These findings help identify elevated-risk conditions and recurring interaction patterns that can be addressed proactively, particularly where reported crashes alone may not fully describe the safety risk for vulnerable roadway users. **Appendix C** contains the **Near-Miss Data**.

EXISTING TRAFFIC OPERATIONS

The existing traffic operations section documents the intersection's performance under current conditions using accepted Highway Capacity Manual (HCM)-based methods implemented in traffic analysis software. Operations are summarized using available traffic volumes, traffic control, lane configurations, and, where applicable, signal timing information, and results are presented consistently across intersections. The analysis reports common vehicle-operations measures, including movement-level delay, queuing, and level of service (LOS), to identify movements operating near or above capacity and to establish a baseline for evaluating the effects of recommended improvements on intersection performance.

Although operational results are often summarized for key demand periods, this project collected 24-hour turning-movement counts at each study intersection. These counts informed the near-miss analysis and helped the project team understand how vehicle demand changes throughout the day, rather than relying solely on the highest-volume peak hour. This broader view is important because designing only for peak-hour vehicle demand can leave roadway space underused for much of the day. Roadways with substantial unused capacity can support higher operating speeds, longer pedestrian crossings, wider intersections, and other conditions that increase exposure and risk for people walking and biking. Reviewing operations throughout the day helps put short periods of vehicle delay into context and supports more balanced decisions about safety, capacity, and multimodal needs.

Vehicle LOS measures driver convenience and efficiency, not safety. At intersections, LOS is typically based on vehicle delay. This differs from measures such as Bicycle Level of Traffic Stress (BLTS) and Pedestrian Level of Comfort (PLOC), which indicate whether people walking and biking have a safe, comfortable, and practical way to travel. Poor vehicle LOS may mean drivers experience additional delay. Poor BLTS or PLOC can mean that people walking or biking face stressful conditions, limited separation from traffic, long or uncomfortable crossings, or other barriers that may discourage trips entirely. For this reason, LOS, BLTS, and PLOC should not be treated as equivalent measures. In the context of Vision Zero and the Safe System approach, traffic operations findings provide useful context but should be considered alongside crash history, near-miss patterns, field observations, and the safety and comfort needs of all users.

Appendix D contains the **Traffic Count**, and **Appendix E** contains the **Traffic Operations Analysis Worksheets**.

SITE VISIT OBSERVATIONS

Field observations provide on-site documentation of roadway conditions, user behavior, and multimodal comfort. Each chapter identifies the site-visit date and summarizes the most relevant observations for the intersection, accompanied by supporting photographs and detailed notes. **Appendix F** contains the **Site Visit Comments & Photos**. Figure 5 shows the project team conducting a site visit.

Figure 5. The project team conducting a site visit at Intersection #11 - Rockville Pike (MD 355) & Edmonston Drive



Site visit observations typically document:

- Visibility and sightline conditions, including grades, curvature, vegetation, signing clutter, and lighting, that may affect detection and yielding.
- Roadway geometry and the speed environment, including corner radii, channelized movements, lane alignment, and crossing distances.
- Accessibility conditions, including curb ramp placement and alignment, detectable warning orientation, and pedestrian landing areas.
- User behavior and multimodal interactions, including yielding and compliance patterns, pedestrian crossing behavior, bicycle path choice, and transit-related interactions near stops.

Maintenance or condition issues that may affect safety and usability, such as worn markings, damaged delineation, or pavement deficiencies. **Appendix G** contains the **Maintenance Items** identified during the site visits.

IDENTIFIED SAFETY ISSUES

The 'Identified Safety Issues' section provides a clear summary of the main safety concerns at the intersection, based on safety review findings, traffic operations context, and field observations. It examines crash patterns, contributing factors, near-miss conflicts, and field-verified conditions that heighten risk. This overview focuses on the most critical safety issues that influence crash likelihood and severity for all users, especially vulnerable roadway users. The issues are systematically categorized using standard safety classifications across intersections, enabling easy comparisons and clear connections to recommended treatments. Priority safety issues are emphasized for more urgent intervention.

Development of Consistent Safety Issues

To ensure consistency across all audited intersections, safety issues are documented using a standardized set of categories and subcategories. These consistent safety issues are used in two ways. First, they support clear comparisons between intersections by describing similar conditions in similar terms. Second, they provide a direct link between identified issues and recommended treatments, allowing recommendations to be documented transparently as responses to specific safety problems.

This approach aligns with the project's Safe System emphasis on addressing both demonstrated and potential safety issues for all modes and with the broader Vision Zero principle that proactive, data-driven strategies should be used to prevent fatal and serious injury outcomes. The consistent safety issue framework is applied across intersection chapters and recommendation tables to support uniform documentation and repeatable decision-making.

SAFETY ISSUES: DEFINITIONS AND INTERPRETATION GUIDANCE

The following sections describe each consistent safety issue and explain how it is typically identified during an intersection review. These issue definitions are intended to support consistent interpretation across locations and to clarify the relationship between observed conditions, documented crash patterns, and the recommendations presented later in the report.

Speeds, Severity, and Compliance

This category includes factors that affect operating speed, turning speed, adherence to traffic signals, and the risk of crashes resulting in serious injuries. These factors are vital to a Safe System approach because speed significantly influences both the chances of crashes and the severity of injuries.

1.1 Speeds, Severity, and Compliance: High Vehicle Speeds

High Vehicle Speeds occur when drivers exceed posted speed limits or travel at speeds incompatible with nearby land use and pedestrian or cyclist activity. This problem is usually recognized through field observations of driver behavior, roadway design elements that promote higher speeds (such as wide lanes, long straight stretches, and low-friction surfaces), and crash patterns indicating limited time to stop or yield. At these high speeds, the safety margin decreases, and the risk of severe crashes increases.

Speeds, Severity, and Compliance

1.2 Speeds, Severity, and Compliance: High-Speed Turns

High-Speed Turns involve turning at speeds that increase the risk for pedestrians, bicyclists, and other vehicles. This problem typically arises from wide curb radii, slip lanes, and large receiving lanes that allow drivers to maintain speed during turns. Field studies often show rolling turns, minimal yielding, or turning paths that intrude into crosswalks. Additionally, high-speed turns may be indicated by near-miss conflicts involving turning vehicles.

1.3 Speeds, Severity, and Compliance: Crash Severity

Crash Severity indicates a crash history involving fatal or injury outcomes, or a safety context with high potential for severity, such as high speeds, large vehicles, long crossings, or limited refuge. This is identified through crash severity summaries in safety reviews, which highlight areas where typical human errors could lead to more serious consequences.

1.4 Speeds, Severity, and Compliance: Multiple-Threat Crashes

Multiple-Threat Crashes occur when one driver yields or stops, but a driver in an adjacent lane does not, resulting in a sudden, risky crossing by pedestrians or bicyclists. This situation is more common on multilane approaches and at crossings with poor sight lines or low yielding compliance. It often appears in crash patterns at crossings and is supported by field observations of multilane yielding behavior.

1.5 Speeds, Severity, and Compliance: Large Vehicles

Large vehicles refer to the presence or influence of trucks and buses on intersection safety and operations. This issue may be identified by observed heavy-vehicle volumes, evidence of turning encroachment and overtracking, frequent curb or median strikes, and conflicts caused by wide turning paths. Large vehicles can increase risk due to longer stopping distances, restricted sight lines, and turning behavior that can conflict with pedestrians and bicyclists.

Conflicts Between Users

This category highlights interaction patterns in which one user's trajectory intersects with another's, resulting in recurring conflicts or increased risk. These conflicts are documented through crash records, near-miss incidents, or observed issues with yielding and compliance during field operations.

2.1 Conflicts Between Users: Drivers Turning and Pedestrians

'Drivers Turning and Pedestrians' refers to conflicts involving turning vehicles and pedestrians crossing at crosswalks, particularly during permissive turns. This issue is often identified through crash reports detailing turn-related pedestrian accidents and near-miss incidents between turning vehicles and pedestrians, as well as field observations such as drivers focusing on traffic gaps rather than the crosswalk, executing rolling turns, or failing to yield properly.

2.2 Conflicts Between Users: Drivers and Pedestrians

Drivers and pedestrians face a wider range of conflicts beyond just turning issues. This includes pedestrian exposure to through traffic, yielding challenges at uncontrolled or yield-controlled crossings, and conflicts at complex intersections where pedestrian paths cross vehicle routes. These problems are often worsened by long crossing distances, few refuge opportunities, or crossings that are not clearly signaled to drivers.

2.3 Conflicts Between Users: Drivers and Bicyclists

Drivers and bicyclists face conflicts when bicyclists must cross or merge into vehicle traffic, often due to limited bicycle infrastructure, unclear right-of-way rules, or complex intersection layouts. These conflicts can be detected through crash reports involving bicyclists, near-misses, and field observations such as bicyclists riding on sidewalks or using crosswalks to avoid traffic.

2.3.1 Conflicts Between Users: Drivers and Bicyclists (Right Hook)

Right-turn conflicts occur when a driver turning right crosses the path of a bicyclist traveling straight, often along the curb or in a bike lane. This problem can be identified through observed or documented right-turn conflicts, near-misses, and roadway features that enable quick right turns with few opportunities to yield.

Conflicts Between Users

2.4 Conflicts Between Users: Bicyclists and Transit Riders

Bicyclists and transit riders often encounter conflicts when bicyclists pass near bus stops or when pedestrians cross or stand in bicycle zones during boarding and alighting. This issue is especially common at bus stops in cramped curbside areas, where bicycle lanes are not clearly separated from loading zones, or where stop placements create weaving and merging challenges.

Roadway Design

This category identifies geometric and contextual design factors that lead to limited visibility, ambiguous priorities, or greater exposure to conflict. These issues are usually found through field observations and help explain specific crash patterns or conflict behaviors.

3.1 Roadway Design: Inadequate Sight Distance (Lack of Driver Visibility)

Inadequate Sight Distance describes scenarios that impair a driver's ability to see other road users, traffic signals, or upcoming conflicts in time to respond. Common causes include vertical crests, curves, parked vehicles near intersections, overgrown vegetation, and excessive signage. This issue is typically identified during field inspections and highlights areas where design changes or improved visibility measures could reduce the risk of conflict.

3.2 Roadway Design: Pedestrian Visibility

Pedestrian Visibility pertains to scenarios in which pedestrians are difficult for approaching drivers to see, or in which drivers are not effectively warned about crossing points. This includes faded markings, lack of high-visibility crosswalks, insufficient lighting, parked vehicles near crossings, or large curb return radii that position vehicles closer to crosswalks at higher speeds. While this issue often relates to concerns about yielding and speed, it is recorded separately to concentrate on visibility-specific solutions.

3.3 Roadway Design: Cyclist Visibility

Cyclist Visibility refers to situations where drivers struggle to see or anticipate cyclists, often due to unclear bicycle paths at intersections, missing markings, complex merging areas, or conflicts at driveways and turn lanes. Limited visibility signs include cyclists taking detours, riding on sidewalks, or moving unpredictably due to safety concerns or unclear priorities.

3.4 Roadway Design: Nighttime Visibility

Nighttime visibility issues pose safety risks in low-light conditions, including insufficient lighting at crossings, glare, and dark entry points where pedestrians and cyclists may be less visible. This can be identified by examining nighttime crash patterns, noting poorly lit areas, and inspecting crossing features that lack retroreflectivity or adequate illumination.

3.5 Roadway Design: Access Management

Access Management addresses safety issues arising from closely spaced driveways, multiple access points near intersections, and turning movements into and out of nearby properties, all of which increase the number of conflict points. These issues can lead to unexpected stops, weaving, and complex turning behaviors within the intersection's functional area. This is typically identified through field reviews of driveway spacing and observed turning movements near corners.

Accessibility (ADA)

This category captures conditions that affect accessibility for people with disabilities, including wheelchair users and people with vision disabilities. Accessibility issues are identified through field observations and reflect whether pedestrian infrastructure provides usable, aligned, and continuous access through the intersection environment.

4.1 Accessibility (ADA): Insufficient Curb Ramps

Insufficient Curb Ramps include missing curb ramps, ramps misaligned with crossings, ramps that do not provide accessible routes to crossings, or ramps that otherwise restrict usable access. This problem is usually recorded during field visits with photos and notes, especially when accessibility gaps impact how people navigate the intersection.

Accessibility (ADA)

4.2 Accessibility (ADA): Insufficient surface for pedestrians with disabilities (provides a flat surface)

This issue highlights locations where pedestrian areas lack a stable, continuous, level surface suitable for people with disabilities. Typical problems include insufficient landing zones, uneven terrain, steep cross slopes, or limited refuge areas where pedestrians must wait. This category aims to ensure that recommendations focus not only on the existence of crossings but also on their accessibility and usability for everyone.

Pedestrian

This category emphasizes the pedestrian crossing function, network continuity, and comfort, including the presence, directness, and contextual reasonableness of pedestrian routes.

5.1 Pedestrian: Intersection Crossing

Intersection Crossing assesses whether pedestrian crossing facilities at an intersection are adequate. It considers the presence of crosswalks on legs with expected pedestrian flow, the logical placement of crossings, and the effectiveness of traffic controls in ensuring safe crossing. The evaluation relies on the intersection description, crash and conflict data, and on-site verification of crossing locations and usability.

5.1.1 Pedestrian: Intersection Crossing (Long Crossing)

Long Crossing refers to pedestrian crossings that span long distances, contain multiple lanes, or feature high-speed turn lanes without adequate refuge. This situation raises pedestrians' exposure time, which can reduce compliance and comfort. Typically, such crossings are identified during field assessments by examining roadway geometry, crossing lengths, median refuges, and staging options.

5.2 Pedestrian: Missing or Inadequate Sidewalk

Missing or Inadequate Sidewalk pertains to gaps in the sidewalk network, sidewalks that fail to connect to crossings, or segments that are too narrow or unsuitable for pedestrian traffic. This issue is identified through field review and helps ensure that recommendations address overall network continuity rather than focusing solely on intersection footprints.

5.3 Pedestrian: Low-Comfort Facility

Low-Comfort Facilities are areas where pedestrian movement is technically feasible but feels uncomfortable due to proximity to fast-moving traffic, narrow buffers, high traffic volumes, or unclear priority rules. Signs of such conditions include pedestrians taking indirect routes, waiting for large gaps in traffic, or avoiding crossings that appear unsafe or inconvenient.

Bicyclist

This category emphasizes crossing needs, network connectivity, and comfort for bicyclists, acknowledging that they may choose different routes when facilities are absent or conditions are stressful.

6.1 Bicyclist: Intersection Crossing

Intersection Crossing for bicyclists addresses whether bicyclists have a clear, safe way to cross the intersection, consistent with the surrounding bicycle network. This issue may be identified through field observations of bicyclist routing, crash or near-miss patterns, and the presence or absence of bicycle crossing guidance.

6.2 Bicyclist: Insufficient bicycle facilities

Insufficient bicycle facilities refer to missing, discontinuous, or unclear bicycle accommodations approaching or through the intersection. This includes gaps in bike lanes, missing markings, or conditions in which bicyclists must merge into high-speed traffic without clear priority. This issue is commonly reflected in bicyclists riding on sidewalks or using crosswalks due to discomfort in the roadway.

6.2.1 Bicyclist: Insufficient bicycle facilities (Lack of Queuing Space)

Lack of Queuing Space refers to conditions where bicyclists do not have a safe place to wait or position themselves at signals or stop-controlled approaches, which can lead to unpredictable positioning, blocking of crosswalk space, or unsafe merging. This issue is identified through field review of approach geometry, signal stop lines, and observed bicyclist behavior.

6.3 Bicyclist: High-Stress Facility

High-Stress Facility describes locations where bicyclists travel that require them to mix with high-speed or high-volume traffic, navigate complex turning areas, or cross multilane approaches without protection or clear guidance. This category captures comfort and stress as practical safety concerns that influence user behavior and route choice.

User Behavior

This category includes observed and documented behaviors that pose risks and often reveal how users respond to the built environment. These behaviors may be observed in crash-contributing circumstances, near-miss conflict patterns, and field observations.

7.1 User Behavior: Failure to Drive in Lane

Failure to Drive in Lane involves lane-discipline issues such as drifting, encroaching, or inconsistent lane use. Factors such as unclear markings, lane shifts, wide approaches, or complex road geometry can influence this behavior, increasing the risk of sideswipe and fixed-object crashes.

7.2 User Behavior: Wrong Way

Wrong-way behavior involves drivers or bicyclists moving in the opposite direction of the intended traffic flow, often occurring at complex intersections, confusing channelized areas, or places with poor wayfinding. This problem is usually detected through field observations and can be corroborated by crash reports.

7.3 User Behavior: Driver Awareness

Driver Awareness refers to situations in which drivers appear unaware of crossing points, pedestrians, or the need to yield. This can be due to poor visibility of signing and marking, distractions, complex decision-making contexts, or inconsistent traffic control. It is typically identified through field observations and becomes relevant when enhancing visibility and simplifying intersection layouts are necessary.

7.4 User Behavior: Driver Yielding

Driver Yielding refers to observed or documented failures to yield to pedestrians, bicyclists, or other vehicles where required. This issue often occurs at turn movements, uncontrolled crossings, slip lanes, and multilane approaches, where expectations for yielding are unclear or not consistently reinforced.

7.5 User Behavior: Unpredictable Behavior

Unpredictable Behavior involves actions by any road user that create conflicts, such as sudden lane changes, midblock or diagonal crossings, or last-minute turns. Such behaviors usually occur where infrastructure is absent or where the design fails to clearly indicate expected routes and priorities.

User Behavior

7.6 User Behavior: Sidewalk Riding

Sidewalk Riding occurs when bicyclists choose to ride on sidewalks and crosswalks rather than the street, often because the street is perceived as stressful or lacks adequate bike facilities. This behavior can lead to conflicts with pedestrians and cause bicyclists to cluster in crosswalk zones.

7.7 User Behavior: Failure to Stop at a Stop-Controlled Intersection

Failure to stop at stop-controlled intersections occurs when drivers roll through or disregard stop signs, increasing the risk of angle and turning crashes. This behavior reduces yielding compliance and creates safety conflicts with cross traffic, pedestrians, and bicyclists, particularly on higher-speed roadways.

Conflict Type

This category identifies typical crash and conflict patterns based on movement and crash type. These labels help summarize crash histories and guide the selection of countermeasures targeting the root conflict mechanisms.

8.1 Conflict Type: Rear End

Rear-end conflicts typically happen in heavy traffic, during unexpected stops, or where signal timing and queuing cause sudden braking. They can also be related to limited sight distance or complicated access points near intersections.

8.2 Conflict Type: Opposite Direction

Conflicts involving opposite directions, such as head-on and wrong-way interactions, may be linked to confusion, lane misalignment, or unusual road geometry.

8.3 Conflict Type: Sideswipe

Sideswipe conflicts frequently stem from poor lane discipline, weaving into turn lanes, or ambiguous lane markings. They often happen when drivers merge late or when road markings are faded or confusing.

8.4 Conflict Type: Left Turn

Left-turn conflicts occur when vehicles turning left interact with oncoming traffic, pedestrians, or bicyclists. Permissive signaling, insufficient gaps, complex intersection design, and competing demands typically cause these issues.

8.5 Conflict Type: Angle

Angle conflicts often occur during crossing movements when one user breaches control or when sightlines are inadequate and decision-making time is insufficient. These conflicts can occur at signalized or stop-controlled intersections, depending on adherence to rules and visibility conditions.

8.6 Conflict Type: Parked Vehicle

Parked Vehicle conflicts include collisions with parked cars or issues caused by parking close to intersections, which can restrict visibility and lead to sudden maneuvers.

8.7 Conflict Type: Fixed Object

Fixed Object conflicts involve collisions with medians, poles, curb features, or other roadside elements. They may suggest issues with alignment, visibility, or speed conditions that impact control.

8.8 Conflict Type: U-Turn

U-turn conflicts occur in areas with frequent U-turns or limited turning options, often due to access-control patterns or median openings.

8.9 Conflict Type: Backing

Backing conflicts frequently occur near driveways, commercial access points, or parking areas, where vehicles reverse into travel lanes at intersections.

Vehicle Movements

This category identifies operational movement patterns that frequently generate safety conflicts, particularly in areas where multiple modes share limited space.

9.1 Vehicle Movements: Bus Movement/Merge Operations

Bus movement and merge operations involve buses merging into traffic, reentering lanes after stops, or navigating tight turns. These actions can influence traffic flow and may lead to conflicts with bicyclists and pedestrians near stops and crossings.

9.2 Vehicle Movements: Bicyclists Merging into Traffic

Bicyclists merge into traffic at points where bike lanes end or where intersection design forces them to join main lanes. This can create conflicts with through-and-turning vehicles, especially in areas with higher speeds and fewer gaps.

9.2.1 Vehicle Movements: Bicyclists Merging into Traffic (Making Turns)

This issue highlights bicyclists making turns that involve crossing multiple lanes or repositioning within the intersection due to the absence of dedicated turn space or guidance. Such situations can cause unpredictable routes and conflicts if the intersection doesn't offer clear, low-stress turning options.

Signal Timing

This category covers signal timing and phasing conditions affecting safety, comfort, and compliance for all users, especially pedestrians. It is identified by examining signal timing, observing how the system operates, and noting behaviors such as long delays, red-light running, or pedestrians crossing outside designated phases.

10.1 Signal Timing: Clearance Intervals

Clearance intervals include yellow and all-red phases, as well as the time allowed for vehicles to clear the intersection safely. Insufficient clearance increases the risk of red-light violations and angle crashes, especially on higher-speed approaches.

10.1.1 Signal Timing: Clearance Intervals (High-Speed Turns)

This issue underscores concerns about clearance timing for turning movements, where vehicles turning might not have enough time to do so safely or could conflict with pedestrians entering the crosswalk at the start of the next phase.

10.2 Signal Timing: Inadequate Pedestrian Crossing Time

Inadequate Pedestrian Crossing Time refers to pedestrian signals that do not provide sufficient walk and clearance periods to cover the crossing distance and accommodate expected walking speeds, including those of slower walkers and users of mobility devices. This problem often occurs with long crossings, limited refuge options, and restrictive signal cycle timings.

10.3 Signal Timing: High Pedestrian Delays

High Pedestrian Delays occur when pedestrians experience long wait times, reducing comfort and potentially leading to noncompliance or crossing outside the designated phase. This problem is detected through timing reviews and field observations, especially in areas with high pedestrian volume or crossings with multiple stages.

Priority Safety Issues

Priority safety issues were identified by reviewing each intersection through multiple sources of evidence. Crash history was the starting point for this review because it documents reported safety outcomes, including crash severity, crash type, involved users, and contributing circumstances. Where crash patterns were clear, those patterns were used to identify the primary safety issues and to focus recommendations on the conditions most directly associated with documented crashes.

Crash data alone, however, does not always describe the full safety risk at an intersection. Some locations had few reported crashes during the available crash period, but still included geometric, operational, or user-behavior conditions known to increase the likelihood or severity of crashes. For that reason, the project team also reviewed near-miss conflicts, field observations, traffic operations, roadway geometry, pedestrian and bicycle activity, accessibility conditions, visibility, speed environment, and multimodal comfort. These sources helped identify conditions that may not have resulted in many reported crashes, but that still create elevated exposure or recurring conflicts for people walking, biking, taking transit, and driving.

The project team assigned the highest priority to safety issues supported by multiple sources of information. For example, an issue was considered higher priority when a crash pattern aligned with near-miss conflicts, field observations confirmed the same conflict mechanism, or roadway geometry explained the observed behavior. Issues affecting people walking and biking were also reviewed carefully, as these users are more likely to sustain severe injuries in conflicts. This approach supports the Safe System emphasis on reducing the risk of fatal and serious injury while still grounding the recommendations in documented, location-specific evidence.

Not every observed deficiency was treated as a priority safety issue. Some conditions were documented as maintenance items, accessibility needs, or lower-priority implementation opportunities when they did not appear to be a primary contributor to severe crash risk at that location. This distinction was important for keeping the recommendations practical and implementable. The safety issue tables, therefore, identify priority safety issues that focus on those most relevant to reducing the likelihood and severity of crashes at each intersection, while other observed needs are documented so they can be addressed and incorporated efficiently into broader implementation efforts.

RECOMMENDATION DEVELOPMENT

Recommendations were specifically tailored to address the priority safety issues identified at each intersection. The project team began by analyzing crash data, near-miss incidents, traffic operations, field observations, and roadway context to pinpoint the primary safety concerns at each location. These concerns were subsequently organized into standardized safety-issue categories and subcategories, as detailed in this section. This method guarantees a direct connection between the safety problems identified and the recommended improvements.

The Improvement Matrix was used as the primary tool for translating priority safety issues into potential treatments. The Matrix links common safety issues to candidate countermeasures, typical applications, implementation considerations, and supporting references. It was developed using a broad library of source materials, including Rockville plans and policies, Maryland and MDOT SHA guidance, Montgomery County design guidance, and national best-practice resources. This source material, summarized in the reference table below, provides the basis for selecting treatments that are consistent with local priorities, state requirements, and current safety practices. Together, these sources support a consistent treatment selection process while allowing the recommendations to reflect Rockville-specific policies, state roadway design requirements, and proven safety countermeasures.

Rockville Plans and Policies

- [City of Rockville Vision Zero Action Plan](#)
- [City of Rockville Pedestrian Master Plan](#)
- [City of Rockville Complete Streets Policy](#)
- [City of Rockville Bikeway Master Plan](#)
- [City of Rockville Sidewalk Prioritization Policy](#)
- [City of Rockville Marked Crosswalk Guidelines](#)

Maryland and MDOT SHA Guidance

- [Maryland Manual on Uniform Traffic Control Devices \(MdMUTCD\), 2011 Edition](#)
- [MDOT SHA Context Driven: Access and Mobility for All Users](#)
- [MDOT SHA Pedestrian Safety Treatments Best Practices Guidelines](#)
- [MDOT SHA Bicycle Policy and Design Guide](#)
- [MDOT SHA Complete Streets Policy](#)
- [Maryland Strategic Highway Safety Plan \(2026–2030\)](#)
- [Maryland Vulnerable Road User \(VRU\) Safety Assessment](#)
- [MDOT SHA ADA Transition Plan](#)
- [MDOT SHA Traffic Control Devices Design Manual](#)
- [MDOT SHA Guidelines for Automated Speed Enforcement Systems in School Zones](#)
- [MDOT SHA Accessibility Policy & Guidelines for Pedestrian Facilities along State Highways](#)
- [MDOT SHA Lighting Design Guidelines](#)

National Best-Practice Guidance

AASHTO (American Association of State Highway and Transportation Officials)

- AASHTO – A Policy on Geometric Design of Highways and Streets (Green Book)
 - AASHTO – Guide for the Development of Bicycle Facilities (5th Edition, 2024)
 - [AASHTO – Highway Safety Manual \(HSM\)](#)
 - AASHTO – Roadside Design Guide and Manual for Assessing Safety Hardware (MASH)
-

FHWA (Federal Highway Administration)

- [FHWA – Achieving Multimodal Networks: Applying Design Flexibility and Reducing Conflicts](#)
- [FHWA – Bikeway Selection Guide](#)
- [FHWA – Designing Sidewalks and Trails for Access, Part II of II: Best Practices Design Guide \(Chapter 8\)](#)
- [FHWA – Evaluation of Lane Reduction "Road Diet" Measures on Crashes](#)
- [FHWA – Field Guide for Selecting Countermeasures at Uncontrolled Pedestrian Crossing Locations](#)
- [FHWA – Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations](#)
- [FHWA – Integrating Speed Management within Roadway Departure, Intersections, and Pedestrian and Bicyclist Safety Focus Areas](#)
- [FHWA – Manual on Uniform Traffic Control Devices \(MUTCD\)](#)
- [FHWA – Methods and Practices for Setting Speed Limits: An Informational Report](#)
- [FHWA – Pedestrian Hybrid Beacon Guide: Recommendations and Case Study](#)
- [FHWA – Proven Safety Countermeasures](#)
- [FHWA – Proven Safety Countermeasures: Roundabouts](#)
- [FHWA – Red Light Camera Systems Operational Guidelines](#)
- [FHWA – Road Diet Informational Guide](#)
- [FHWA – Safe Transportation for Every Pedestrian \(STEP\) Resources](#)
- [FHWA – Safety Effectiveness of the HAWK Pedestrian Crossing Treatment](#)
- [FHWA – Speed Limit Setting Handbook \(2025\)](#)
- [FHWA – Traffic Signal Timing Manual \(Chapter 4\)](#)

NACTO (National Association of City Transportation Officials)

- [NACTO – Bike Signal Design](#)
- [NACTO – City Limits: Setting Safe Speed Limits on Urban Streets](#)
- [NACTO – Don't Give Up at the Intersection](#)
- [NACTO – Transit Street Design Guide](#)
- [NACTO – Urban Bikeway Design Guide \(Third Edition\)](#)
- [NACTO – Urban Street Design Guide](#)

NCHRP (National Cooperative Highway Research Program) & TRB

- [NCHRP – Project 03-72: Synthesis on Channelized Right Turns at Intersections on Urban and Suburban Arterials](#)
- [NCHRP – Report 562 & TRB Report 112: Improving Pedestrian Safety at Unsignalized Intersections](#)
- [NCHRP – Report 834: Crossing Solutions at Roundabouts and Channelized Turn Lanes for Pedestrians with Vision Disabilities: A Guidebook](#)
- [NCHRP – Report 926: Guidance to Improve Pedestrian and Bicyclist Safety at Intersections](#)
- [NCHRP – Report 1043: Guide for Roundabouts](#)
- [NCHRP – Web-Only Document 117A: Accessible Pedestrian Signals: A Guide to Best Practices](#)
- [NCHRP – Web-Only Document 208: Design Guidance for Channelized Right-Turn Lanes](#)

PBIC (Pedestrian and Bicycle Information Center)

- [PBIC – Evaluation of Bicycle-Related Roadway Measures: A Summary of Available Research](#)
- [PBIC – Pedestrian and Bicycle Information Center \(Main Website\)](#)
- [PBIC / FHWA – BIKESAFE: Bicycle Safety Guide and Countermeasure Selection System](#)
- [PBIC / FHWA – PEDSAFE: Pedestrian Safety Guide and Countermeasure Selection System](#)

Other Federal & Regional Organizations

- [Access Board – Americans with Disabilities Act Accessibility Guidelines \(ADAAG\) for Buildings and Facilities](#)
 - [Access Board – Public Right-of-Way Accessibility Guidelines \(PROWAG\)](#)
 - [Alta Planning + Design – Advisory Bike Lanes in North America](#)
 - [Baltimore City DOT – Baltimore Bicycle Facilities Toolkit](#)
 - [ITE \(Institute of Transportation Engineers\) – Unsignalized Intersection Improvement Guide \(UIIG\)](#)
 - [Michigan DOT / AASHTO Innovation Initiative – User Guide for RI-6 Gateway Treatment for Pedestrian Crossings](#)
 - [NHTSA \(National Highway Traffic Safety Administration\) – Countermeasures That Work](#)
-

For each intersection, the project team utilized the Improvement Matrix to select treatments aligned with the specific safety issues of that location. They then tailored these treatments to the intersection context, including traffic control, roadway layout, pedestrian and bicycle presence, transit activity, accessibility requirements, right-of-way limitations, and collaboration needs with the City of Rockville or MDOT SHA. This approach ensured that recommendations were customized to the observed and documented conditions at each site, rather than applied uniformly.

Short-term recommendations were developed to address the main safety concerns, with solutions that can typically be implemented quickly and cost-effectively. These include signing, pavement markings, delineation, curb extensions with flexible posts, median extensions, stop bar adjustments, high-visibility crosswalks, and targeted operational changes. The goal of these recommendations is to deliver practical safety improvements within the current roadway layout whenever possible. Each recommendation is directly linked to the specific safety issue(s) it aims to resolve.

Long-term recommendations were developed to establish a more durable safety outcome, with priority issues likely requiring reconstruction, more substantial geometric changes, signal modifications, or additional design and coordination. These recommendations generally address the same underlying safety issues as the short-term recommendations, but through more permanent changes. The short-term and long-term recommendations are intended to be complementary. In many cases, the short-term recommendation provides an interim step toward the long-term safety concept.

Design Vehicle vs. Control Vehicle

Intersection geometry is informed by two related but distinct vehicle concepts: the design vehicle and the control vehicle. Distinguishing between these vehicles helps balance day-to-day operations with pedestrian safety and context-sensitive design.

Design Vehicle

The design vehicle is the largest vehicle that routinely uses streets or intersections. It is used to establish curb radii and evaluate turning movements during design. Designing for this vehicle ensures that common users, such as delivery trucks or buses on regular routes, can operate safely and efficiently without oversizing the intersection. Selecting the smallest appropriate design vehicle supports shorter pedestrian crossing distances and lower turning speeds.

Control Vehicle

The control vehicle is a larger vehicle that uses the street infrequently but must still be accommodated, such as an emergency response vehicle. Control vehicles do not typically dictate permanent intersection geometry. Instead, they may be allowed to encroach into adjacent lanes or mountable areas during turning movements. This approach avoids designing corners around rare events and helps preserve pedestrian safety and urban design objectives.

Why the Distinction Matters

By designing intersections around the design vehicle and confirming that the control vehicle can still navigate the intersection under defined encroachment assumptions, agencies can meet operational needs while prioritizing safety, accessibility, and context.

HOW TO READ THE RECOMMENDATION TABLES

Each intersection chapter includes tables of recommendations for short- and long-term concepts. Each recommendation is assigned a unique ID and a narrative description of the proposed change. The table also includes a “Safety issue(s) addressed” field that identifies the specific, location-level safety issues each recommendation is intended to mitigate. To interpret this field, readers should cross-reference the safety issue codes in the recommendation table with the intersection’s key safety issues table in the Identified Safety Issues section. This structure is used throughout the report to make the rationale for each recommendation transparent and to create a direct, traceable link between documented safety concerns and proposed improvements.

Many treatments address more than one safety problem at the same time. In the recommendation tables, this is shown by listing multiple safety issue codes in the “Safety issue(s) addressed” field, separated by commas. For example, a single quick-build treatment, such as narrowing a slip lane with markings and flexible posts, can reduce turning speeds and pedestrian exposure, so it may be tagged to multiple safety issues. This aligns with how recommendations are developed and documented across the project: recommendations are intended to address the priority safety issues identified at each intersection, and each recommendation is explicitly tied to the relevant issue codes so reviewers can see the full set of safety outcomes expected from that one improvement.

When multiple codes are shown, they should be read as a combined safety mechanism rather than as separate, standalone actions. In other words, the recommendation is not duplicative; it is a single treatment that addresses multiple contributing factors. This multi-tag approach is also reflected in the project’s toolkit and improvements matrix structure, where individual countermeasures are linked to multiple safety issue types when they address more than one recurring safety concern.

SHORT-TERM RECOMMENDATIONS

Short-term recommendations outline quick-build improvements that can typically be implemented quickly and at lower cost through measures such as signing, pavement markings, delineation, and operational changes. Short-term concepts are presented with a sketch to convey the overall intent and the location of key treatments. These recommendations are designed to directly address priority safety issues and provide meaningful safety benefits while, where possible, remaining feasible within the existing roadway footprint.

Key Elements of the Short-Term Recommendations

Key elements are presented in a consistent format and describe the specific improvements included in the short-term concept. Each element clearly communicates the safety mechanism it supports, such as reducing speeds, clarifying driver expectations, improving yielding behavior, increasing crossing visibility, shortening crossing distances, improving accessibility, or reducing exposure to conflict. Short-term elements are selected as interim steps that support the longer-term safety vision for the intersection.

Cost Estimate

Planning-level cost estimates are provided for the short-term recommendations. These estimates support implementation planning and prioritization and reflect the conceptual design level associated with quick-build treatments. Cost estimates were developed by determining the quantities for each short-term recommendation and applying unit prices from recent Maryland SHA price index sheets. Quantities reflect only the items shown in the short-term recommendation exhibits and tables.

The recommended treatments are small in scale relative to typical roadway construction projects, and the associated quantities are correspondingly small. Unit prices for small-quantity work can differ from those associated with larger bid schedules. In general, smaller quantities tend to yield lower effective prices for the items included in these recommendations.

These planning-level estimates represent only direct item costs. They do not include contingency, mobilization, maintenance of traffic, design, permitting, construction management, utility adjustments, or other project delivery costs. The estimates are intended for relative comparison across intersections and for near-term implementation planning.

Traffic Impact Analysis

A traffic impact analysis is provided for the short-term recommendations, where applicable. The analysis describes anticipated operational effects based on the existing operations baseline and the nature of the proposed changes, including any signal timing or phasing adjustments that are part of the short-term concept.

LONG-TERM RECOMMENDATIONS

Long-term recommendations outline capital improvements that typically require additional design, coordination, and funding and may include reconstruction or more substantial geometric and signal modifications. Long-term concepts are presented with a sketch that conveys the proposed end state and the primary design changes intended to address safety issues at their source. These recommendations establish a durable safety vision for each intersection and guide future programming and implementation.

Key Elements of the Long-Term Recommendations

Key elements of the long-term recommendations outline the specific improvements within the long-term concept and the safety issues they address. The accompanying sketch of long-term solutions does not show every element recommended in the long-term recommendations table, instead showing only larger-scale improvements like new curbs and crosswalks. Long-term elements typically focus on reducing conflict points, lowering operating speeds through geometric design, improving accessibility and crossing alignment, and providing more complete and comfortable multimodal facilities. Short-term and long-term recommendations are designed to be complementary, with the long-term concept defining the preferred safety outcome and the short-term package serving as an interim step that supports, rather than hinders, future implementation. Improvements recommended in the short-term concepts are not repeated in the long-term concepts.

Section 3 Intersection Reports & Recommendations

Intersection Reports & Recommendations

#1 – WOOTTON PARKWAY & PASTURE BROOK WAY

Existing Conditions

INTERSECTION DESCRIPTION

The intersection of Wootton Parkway & Pasture Brook Way, shown in Figure 6, is a three-leg, stop-controlled intersection. Wootton Parkway serves as the major north-south minor arterial with a posted speed limit of 30 mph, while Pasture Brook Way functions as the minor eastern approach with a posted speed limit of 25 mph. Along Wootton Parkway, the southern approach consists of a two-stage pedestrian crossing with two lanes in each direction, separated by an approximately 17-foot-wide grass median. The northern approach also includes a divided cross-section with a narrow concrete median and a five-lane configuration, including a center left-turn lane; no pedestrian crossing is provided on this leg. An approximately 8-foot-wide shared-use path is located along the east side of Wootton Parkway, and a 5-foot sidewalk is provided along the west side, separated from the roadway by a 2- to 3-foot utility strip. Pasture Brook Way operates as a two-lane local roadway with one lane in each direction and no centerline striping. Sidewalks are provided on both sides of the roadway and are separated from the travel lanes by an approximately 11-foot utility strip. A marked crosswalk is present across this approach.

Surrounding land uses are predominantly residential, except for the northeast quadrant, which includes a public park and a shared-use path along Wootton Parkway. In 2024, Annual Average Daily Traffic (AADT) on Wootton Parkway was approximately 18,440 vehicles per day.¹

Figure 6. #1 – Wootton Parkway & Pasture Brook Way Intersection



SAFETY REVIEW

A total of two (2) crashes were recorded at the intersection during the three-year period from 2022 to 2024. One of the reported crashes involved a pedestrian who sustained serious injury. Table 1 summarizes the crash characteristics, including collision types, lighting conditions, and roadway surface conditions.

Table 1. Summary of Three-Year (2022-24) Crashes at Intersection #1 – Wootton Parkway & Pasture Brook Way

| Total Crashes | Total Crashes by Year | | | Total Crashes by User | | |
|---------------|-----------------------|------|------|-----------------------|---------|------------|
| 2 | 2022 | 2023 | 2024 | Auto | Cyclist | Pedestrian |
| | 0 | 2 | 0 | 1 | 0 | 1 |

| Total Crashes by Severity | | | | |
|---------------------------|---------|-------|-----------------|-----------------|
| Fatal | Serious | Minor | Possible Injury | Property Damage |
| 0 | 1 | 0 | 0 | 1 |

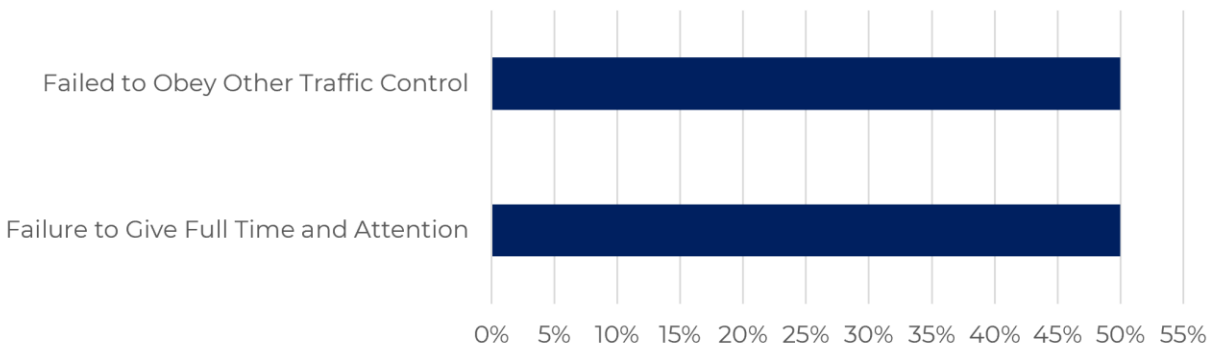
| Total Crashes by Collision Type | |
|---------------------------------|-------|
| Head On | Other |
| 1 | 1 |

| Lighting | | Road Surface |
|----------|---------|--------------|
| Daylight | Unknown | Dry |
| 1 | 1 | 2 |

Note: Crash summaries are based on the available crash data reviewed for this study. Reported crash totals and locations may vary across source datasets due to differences in reporting methods, geocoding, and intersection buffers.

Figure 7 illustrates the percentage of crashes accounting for each contributing circumstance associated with crashes at the intersection during the 2022–2024 study period. A single crash may involve multiple contributing circumstances, as documented in the crash reports. As shown in the figure, the identified contributing factors include failure to give full-time and attention and failure to obey other traffic control devices. Both contributing circumstances relate to driver behavior, indicating that driver inattention and noncompliance with traffic control are key factors influencing crash occurrence at the intersection.

Figure 7. Percentage of Crashes Accounting for Each Contributing Circumstance at Intersection #1 – Wootton Parkway & Pasture Brook Way



NEAR-MISS VIDEO ANALYSIS

Post-Encroachment Time (PET), which measures the temporal separation between two users occupying the same conflict area, was used to assess the severity of these interactions and is calculated only when both users pass through the same conflict point. Based on 24-hour video observations at the intersection, a total of 16 near-miss events were identified, as summarized in Table 2. Of these, nine (9) involved vehicle-to-vehicle conflicts, five (5) involved vehicle-to-pedestrian conflicts, and two (2) involved vehicle-to-bicyclist conflicts. As shown in Table 2, most observed conflicts (15 out of 16) fall within the 2–3-second PET range, with only one (1) conflict occurring within the 0–1.5-second range, indicating generally moderate conflict severity. However, given that a portion of these conflicts involve vulnerable road users (pedestrians and bicyclists), the intersection exhibits potential for serious injury or fatal crashes under higher-risk conditions.

Table 2. Summary of Near Misses for a Day (24-hours) at Intersection #1 – Wootton Parkway & Pasture Brook Way

| Post Encroachment Time (PET) | Vehicle-Vehicle | Vehicle-Pedestrian | Vehicle-Bicyclist | Total |
|------------------------------|-----------------|--------------------|-------------------|-----------|
| 0.0 - 1.5s | 0 | 1 | 0 | 1 |
| 1.5 - 2.0s | 0 | 0 | 0 | 0 |
| 2.0 - 3.0s | 9 | 4 | 2 | 15 |
| Total | 9 | 5 | 2 | 16 |

Based on video analysis of near-miss events, Table 3 summarizes the most frequent conflict types observed at the intersection. The highest number of conflicts (7) occurred between eastbound left-turning vehicles and westbound through vehicles. The next most frequent conflicts include interactions between north-leg pedestrians and westbound right-turning vehicles, and between southbound left-turning vehicles and westbound through vehicles, each recorded twice. These findings indicate that both left-turn movements and pedestrian interactions with turning vehicles are key contributors to conflicts at the intersection, highlighting areas where targeted safety improvements may be needed.

Table 3. Top Three Conflict Types by Movements based on Near Miss Video Analysis at Intersection #1 – Wootton Parkway & Pasture Brook Way

| Conflict Rank | Movement 1 | Movement 2 | Conflicts |
|---------------|----------------------|-------------------|-----------|
| 1. | Eastbound Left | Westbound Through | 7 |
| 2. | North Leg Pedestrian | Westbound Right | 2 |
| 3. | Southbound Left | Westbound Through | 2 |

EXISTING TRAFFIC OPERATIONS

Table 4 shows the results of traffic operations analysis for this intersection based on existing lane configurations, peak-hour traffic volumes, and signal timing parameters.

Table 4. Results of Traffic Operation Analysis at Intersection #1 – Wootton Parkway & Pasture Brook Way

| Approach | Movement | Weekday AM Peak Hour | | | Weekday PM Peak Hour | | |
|-----------------------------|-------------------------|----------------------|----------|----------------------------|----------------------|----------|----------------------------|
| | | Delay (sec) | LOS | 95th Percentile Queue (ft) | Delay (sec) | LOS | 95th Percentile Queue (ft) |
| Westbound | Westbound Left | 11.9 | B | - | 16.3 | C | - |
| | Overall Approach | 11.9 | B | | 16.3 | C | |
| Northbound | Northbound Through | 0.0 | A | - | 0.0 | B | - |
| | Overall Approach | 0.0 | - | | 0.0 | - | |
| Southbound | Southbound Left | 8.5 | - | - | 10.6 | - | - |
| | Southbound Through | 0.0 | - | - | 0.0 | - | - |
| | Overall Approach | 0.2 | - | | 0.3 | - | |
| Overall Intersection | | 0.5 | A | | 0.4 | A | |

LOS = Level of Service
 # = 95th percentile volume exceeds capacity, queue may be longer

SITE VISIT OBSERVATIONS

A site visit was conducted on Wednesday, April 1, 2026, to document existing conditions for people walking, people biking, and drivers. Photos and comments are included in Appendix F and in the figures below.

During the visit, the team observed that crossing conditions for the mainline are challenging due to the wide crossing distance across Wootton Parkway and the absence of a median refuge. Pedestrians must cross multiple lanes of high-speed traffic with limited traffic control. Field observations noted faded crosswalk markings and outdated or worn pedestrian warning signage. Several pedestrian curb ramps lack detectable warning surfaces, and some detectable warnings do not align with the intended crossing direction.

Driver behavior observations indicate higher operating speeds along Wootton Parkway than the posted speed limit. Evidence of prior vehicle impacts was observed on medians and roadside signs, suggesting run-off-the-road or loss-of-control events. Roadway geometry

contributes to these conditions, including wide curb radii that allow higher-speed right turns and limited sight distance due to the vertical and horizontal alignment.

Figure 8: Median Damage at Intersection #1 – Wootton Parkway & Pasture Brook Way



Figure 9: Outdated Pedestrian Crossing Sign at Intersection #1 – Wootton Parkway & Pasture Brook Way



Figure 10: Northbound Approach Hillcrest at Intersection #1 – Wootton Parkway & Pasture Brook Way



IDENTIFIED SAFETY ISSUES

Key safety issues and other findings are shown in Table 5 and described below.

Table 5. Key Safety Issues for Intersection #1 – Wootton Parkway & Pasture Brook Way

| Issue ID | Safety Issue | Safety Issue Type | Crash Data | Near-Miss Video | Site Visit |
|----------|--|--|------------|-----------------|------------|
| 1-A | Pedestrians have to cross 4 lanes of traffic (68') without any traffic control or a crossing refuge. | 5.1 Pedestrian: Intersection Crossing | | | ✓ |
| 1-B | Driver speeds often reached or exceeded 45 MPH on Wootton Parkway (speed limit = 35 MPH). | 1.1 Speeds, Severity, and Compliance: Excessive Speed | | | ✓ |
| 1-C | The only traffic control is a pedestrian warning sign (MUTCD W11-2, W16-7P). | 5.1 Pedestrian: Intersection Crossing | | | ✓ |
| 1-D | The pedestrian curb ramp on the south side of this intersection does not have detectable warning surfacing. | 4.1 Accessibility (ADA): Insufficient Curb Ramps | | | ✓ |
| 1-E | The pedestrian warning sign on the south side of this intersection is outdated and dirty. | 5.1 Pedestrian: Intersection Crossing | | | ✓ |
| 1-F | A wide curb radius allows westbound right-turning drivers to make this uncontrolled movement at high speeds. | 1.2 Speeds, Severity, and Compliance: High-Speed Turns | | | ✓ |

Bold indicates a priority safety issue.

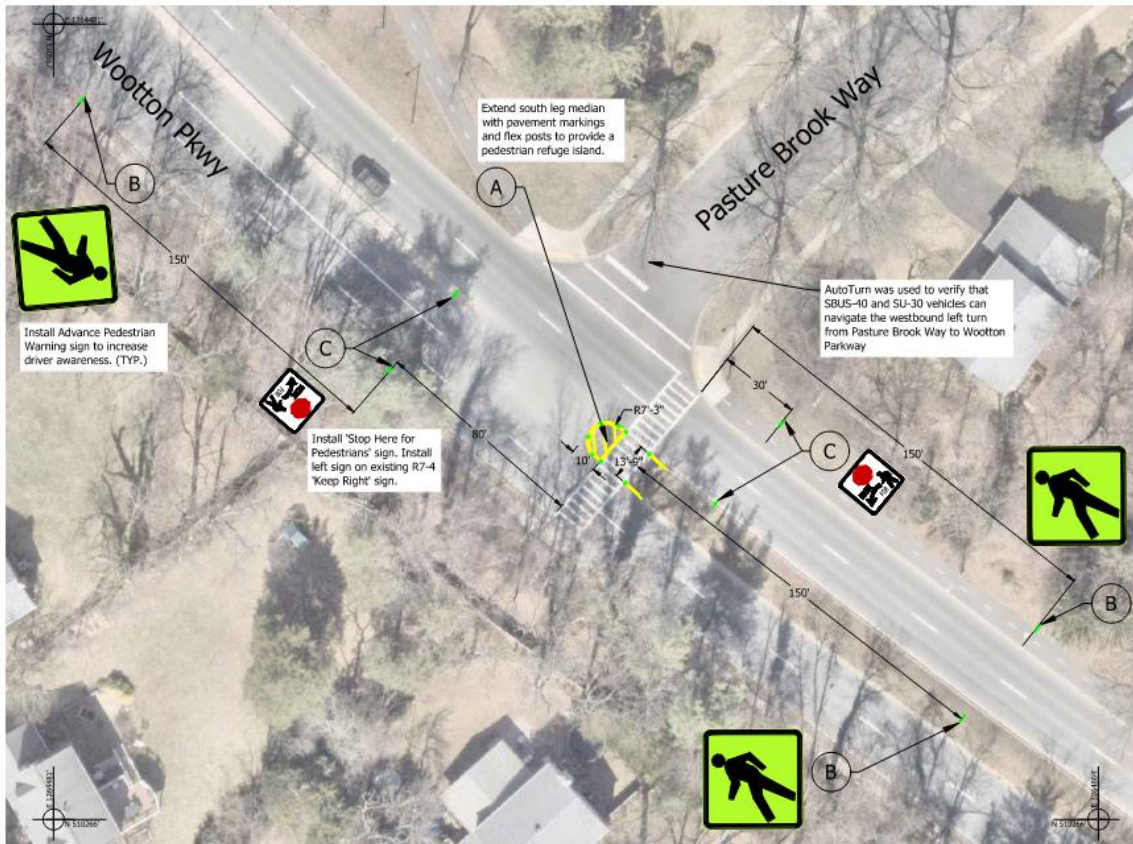
Recommendations

SHORT-TERM RECOMMENDATIONS

Figure 11 illustrates the proposed short-term, quick-build improvements for the Wootton Parkway & Pasture Brook Way intersection, with additional detail provided in Table 6. The short-term concept focuses on improving pedestrian visibility and crossing conditions, reinforcing driver yielding behavior, and reducing turning speeds through targeted pavement markings, signage, and minor geometric adjustments.

These recommendations rely on low-cost, implementable treatments (signing, striping, and delineation) to reduce driver uncertainty, improve yielding compliance, and make pedestrian crossings more visible and predictable.

Figure 11. Short-Term Recommendations for Intersection #1 – Wootton Parkway & Pasture Brook Way



LEGEND

- (A) Proposed striped median extension with flex posts (See Detail C)
- (B) Proposed Advance Pedestrian Warning sign (W11-2): 36" x 36"
- (C) Proposed Stop here for Pedestrians' signs (R1-6a(3)): 30" x 30"

Table 6. Short-Term Recommendations for Intersection #1 – Wootton Parkway & Pasture Brook Way

| Rec. ID | Recommendation | Safety issue(s) addressed |
|---------|--|---------------------------|
| 1-S-1 | Extend south leg median with pavement markings and flex posts to provide a pedestrian refuge island. | 1-A |
| 1-S-2 | Install advanced pedestrian warning signs (W11-2) on the north and south legs. | 1-C |
| 1-S-3 | Add 'Stop Here For Pedestrians' signs (R1-6A(3)) in advance of crosswalk. | 1-C |

COST ESTIMATE

Table 7 provides a planning-level cost estimate for the short-term recommendations, based on item quantities and recent Maryland SHA price index sheets, and excludes contingency and mobilization.

Table 7. Planning-Level Cost Estimate at Intersection #1 – Wootton Parkway & Pasture Brook Way

| Item | Description | Unit | Unit Price | Quantity | Item Cost |
|------------------|--|------|------------|----------|-------------------|
| Pavement Marking | 5" double yellow marking | LF | \$4.60 | 55.53 | \$255.44 |
| Pavement Marking | 5" solid marking (yellow) | LF | \$7.00 | 29.23 | \$204.61 |
| Sign | New sign post | EACH | \$193.76 | 6 | \$1,162.56 |
| Sign | Advance Pedestrian Warning sign [W11-2] | EACH | \$180.00 | 3 | \$540.00 |
| Sign | Stop Here for Pedestrians sign [R1-6a (3)] | EACH | \$500.00 | 4 | \$2,000.00 |
| Other | Flex Post | EACH | \$39.67 | 7 | \$277.70 |
| Total: | | | | | \$4,440.31 |

LONG-TERM RECOMMENDATIONS

Figure 12 illustrates the proposed long-term capital improvements for the Wootton Parkway & Pasture Brook Way intersection. The long-term concept focuses on reducing intersection complexity, improving pedestrian accommodations, and lowering vehicle speeds through geometric reconstruction, automated speed enforcement (which may require a warrant), and enhanced multimodal infrastructure. The recommended long-term approach includes median reconstruction and improved pedestrian crossings to better separate users and create a safer, more predictable corridor (Table 8).

Figure 12. Long-Term Recommendations for Intersection #1 – Wootton Parkway & Pasture Brook Way



LEGEND

- (A)** Curb extension
- (B)** High-visibility continental crosswalk
- (C)** Pedestrian refuge island

Table 8. Long-Term Recommendations for Intersection #1 – Wootton Parkway & Pasture Brook Way

| Rec. ID | Recommendation | Safety issue(s) addressed |
|---------|---|---------------------------|
| 1-L-1 | Consider installing curb extensions to slow turning traffic and shorten crossing distance. | 1-A, 1-F |
| 1-L-2 | Consider reconstructing the south leg median, and install a concrete pedestrian refuge island | 1-A, 1-F |
| 1-L-3 | Consider installing a Pedestrian Hybrid Beacon (PHB). | 1-C |
| 1-L-4 | Consider installing perpendicular curb ramps with aligned detectable warning surfaces. | 1-D |
| 1-L-5 | Consider installing a high-visibility continental crosswalk on the east leg. | 1-A |
| 1-L-6 | Consider installing pedestrian-scale lighting. | 1-A |
| 1-L-7 | Consider widening and repairing the sidewalk. Increase separation from the roadway. | 1-B |
| 1-L-8 | Consider installing a landscaped buffer to separate the Shared-Use Path from the roadway | 1-B |
| 1-L-9 | Consider installing automated speed enforcement | 1-F |

#2 - WOOTTON PARKWAY & W. EDMONSTON DRIVE

Existing Conditions

INTERSECTION DESCRIPTION

The intersection of Wootton Parkway & W. Edmonston Drive is shown in Figure 13. Wootton Parkway is a four-lane minor arterial with a 30 MPH speed limit and is identified as the northbound (south) and southbound (north) approaches. At the intersection, Wootton Parkway has dedicated southbound left-turn and northbound right-turn lanes. W. Edmonston Drive is a two-lane major collector with a 25 MPH speed limit and is identified as the westbound (east) approach. At the intersection, W. Edmonston Drive has a dedicated westbound right-turn slip lane and dual westbound left-turn lanes. The intersection is signalized, with protected-permissive left turns on Edmonston Drive and on Wootton Parkway. In 2024, Annual Average Daily Traffic (AADT) on Wootton Parkway was 18,440, and 16,415 on Edmonston Drive¹.

According to the Rockville Comprehensive Land Use Policy Map², land uses adjacent to the intersection are “residential” to the west, “commercial residential mix” to the south, and “office commercial residential mix” to the north. There is one RideOn bus stop at this intersection, serving route 81. On the west side of Wootton Parkway is the Carl Henn Millennium Trail, a shared-use path. On the east side of Wootton Parkway, a sidewalk veers away from the intersection and continues along the south side of W. Edmonston Drive. There is a sidewalk along the north side of W. Edmonston Drive that connects to the Millennium Trail via a crosswalk across Wootton Parkway.

Figure 13. #2 - Wootton Parkway & W. Edmonston Drive Intersection



SAFETY REVIEW

CRASH DATA ANALYSIS

A total of five (5) crashes were recorded at the intersection during the three-year period from 2022 to 2024. All reported crashes involved only vehicles and resulted in property-damage-only (PDO) outcomes, with no injuries reported. Table 9 summarizes the crash characteristics, including collision types, lighting conditions, and roadway surface conditions.

Table 9. Summary of Three-Year (2022-24) Crashes at Intersection #2 - Wootton Parkway & W. Edmonston Drive

| Total Crashes | Total Crashes by Year | | | Total Crashes by User | | |
|---------------|-----------------------|------|------|-----------------------|---------|------------|
| 5 | 2022 | 2023 | 2024 | Auto | Cyclist | Pedestrian |
| | 1 | 3 | 1 | 5 | 0 | 0 |

| Total Crashes by Severity | | | | |
|---------------------------|---------|-------|-----------------|-----------------|
| Fatal | Serious | Minor | Possible Injury | Property Damage |
| 0 | 0 | 0 | 0 | 5 |

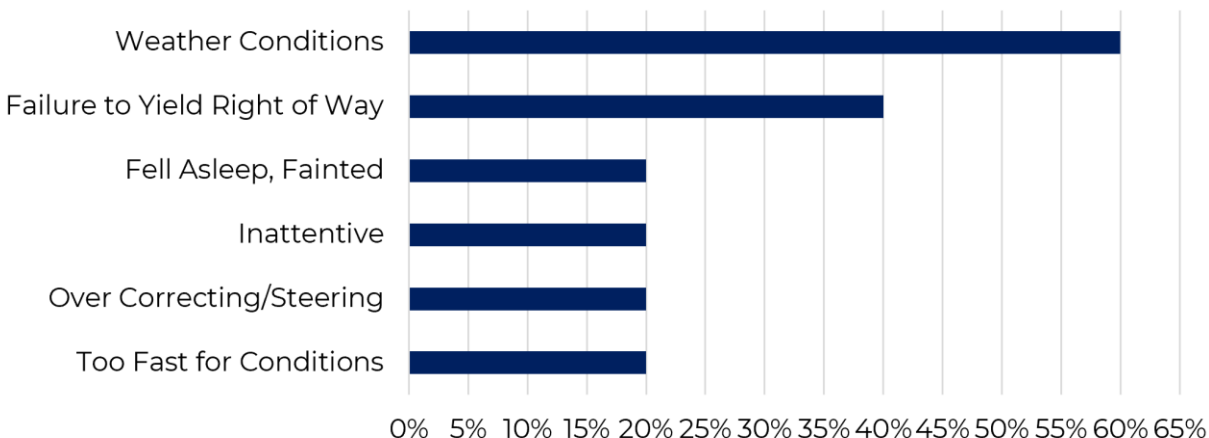
| Total Crashes by Collision Type | | | |
|---------------------------------|-------------------------|----------------|-------|
| Head On Left Turn | Same Direction Rear End | Single Vehicle | Other |
| 1 | 1 | 2 | 1 |

| Lighting | | | Road Surface | | | |
|----------|--------------|------|--------------|-----|-----------|---------|
| Daylight | Dark-Lighted | Dawn | Dry | Wet | Ice/Frost | Unknown |
| 3 | 1 | 1 | 3 | 1 | 1 | 1 |

Note: Crash summaries are based on the available crash data reviewed for this study. Reported crash totals and locations may vary across source datasets due to differences in reporting methods, geocoding, and intersection buffers.

Figure 14 illustrates the percentage of crashes accounting for each contributing circumstance associated with crashes at the intersection during the 2022–2024 study period. A single crash may involve multiple contributing circumstances, as documented in the crash reports. As shown in the figure below, except for weather-related conditions, most contributing circumstances are associated with driver behavior.

Figure 14. Percentage of Crashes Accounting for Each Contributing Circumstance at Intersection #2 - Wootton Parkway & W. Edmonston Drive



NEAR-MISS VIDEO ANALYSIS

Post-Encroachment Time (PET), which measures the temporal separation between two users occupying the same conflict area, was used to assess the severity of these interactions and is calculated only when both users pass through the same conflict point. Based on 24-hour video observations at the intersection, a total of 23 near-miss events were identified, as summarized in Table 10. Of these, 18 involved vehicle-to-vehicle conflicts, three (3) involved vehicle-to-pedestrian, and two (2) involved vehicle-to-bicyclist. As shown in Table 10 below, nearly all observed conflicts fall within the 2–3-second PET range, with only one (1) conflict in the 1.5–2-second range, indicating generally moderate conflict severity.

Table 10. Summary of Near Misses for a Day (24-hours) at Intersection #2 - Wootton Parkway & W. Edmonston Drive

| Post Encroachment Time (PET) | Vehicle-Vehicle | Vehicle-Pedestrian | Vehicle-Bicyclist | Total |
|------------------------------|-----------------|--------------------|-------------------|-----------|
| 0.0 - 1.5s | 0 | 0 | 0 | 0 |
| 1.5 - 2.0s | 1 | 0 | 0 | 1 |
| 2.0 - 3.0s | 17 | 3 | 2 | 22 |
| Total | 18 | 3 | 2 | 23 |

Based on video analysis of near-miss events, Table 11 summarizes the most frequent conflict types observed at the intersection. The highest number of conflicts (14) occurred between southbound left-turning vehicles and northbound through vehicles, followed by conflicts between westbound left-turning vehicles and northbound through vehicles, indicating that left-turn movements are a primary source of interaction and potential risk at the intersection.

Table 11. Top Three Conflict Types by Movements based on Near Miss Video Analysis at Intersection #2 - Wootton Parkway & W. Edmonston Drive

| Conflict Rank | Movement 1 | Movement 2 | Conflicts |
|---------------|----------------------|--------------------|-----------|
| 1. | Southbound Left | Northbound Through | 14 |
| 2. | Westbound Left | Northbound Through | 4 |
| 3. | North Leg Pedestrian | Northbound Through | 1 |

EXISTING TRAFFIC OPERATIONS

Table 12 shows the results of traffic operations analysis for this intersection based on existing lane configurations, peak-hour traffic volumes, and signal timing parameters. Drivers making a westbound left turn experience the most delay, with this movement showing an LOS D during the PM peak due to higher volumes and a shorter left-turn phasing. All other movements report relatively low levels of delay.

Table 12. Results of Traffic Operation Analysis at Intersection #2 - Wootton Parkway & W. Edmonston Drive

| Approach | Movement | Weekday AM Peak Hour | | | Weekday PM Peak Hour | | |
|-----------------------------|-------------------------|----------------------|----------|----------------------------|----------------------|----------|----------------------------|
| | | Delay (sec) | LOS | 95th Percentile Queue (ft) | Delay (sec) | LOS | 95th Percentile Queue (ft) |
| Westbound | Westbound Left | 26.4 | C | 114 | 36.8 | D | 176 |
| | Westbound Right | 22.1 | C | 21 | 29.2 | C | 38 |
| | Overall Approach | 26.0 | C | | 35.4 | D | |
| Northbound | Northbound Through | 8.6 | A | 116 | 12.3 | B | 290 |
| | Northbound Right | 10.5 | B | 60 | 11.5 | B | 53 |
| | Overall Approach | 9.7 | A | | 12.0 | B | |
| Southbound | Southbound Left | 4.6 | A | 18 | 6.4 | A | 31 |
| | Southbound Through | 6.0 | A | 128 | 5.2 | A | 74 |
| | Overall Approach | 5.9 | A | | 5.4 | A | |
| Overall Intersection | | 11.7 | B | | 15.7 | B | |

LOS = Level of Service
 # = 95th percentile volume exceeds capacity, queue may be longer

SITE VISIT OBSERVATIONS

A site visit was conducted on Wednesday, April 1, 2026, to evaluate multimodal safety conditions at this signalized intersection. Pedestrian facilities are limited, with only one marked crosswalk provided across Wootton Parkway. That crossing is a standard marked crosswalk and does not include high-visibility markings. Pedestrian push button signage was observed to be outdated.

The intersection is adjacent to the Rockville Millennium Trail, and multiple people biking were observed crossing Wootton Parkway during the site visit. Heavy truck activity was documented, including frequent right- and left-turn movements that create conflicts with pedestrians and cyclists. Pavement markings were generally in good condition, though channelization at slip lanes lacks physical refuge for pedestrians.

Photos in Appendix F show crosswalk conditions, truck turning paths, slip lane geometry, and pedestrian facilities. Photos can also be found in Figure 15, Figure 16, and Figure 17.

Figure 15. Truck making a left turn from Wootton Parkway onto W. Edmonston Drive at Intersection #2 - Wootton Parkway & W. Edmonston Drive



Figure 16. Truck making right turn from Wootton Parkway onto W. Edmonston Drive at Intersection #2 - Wootton Parkway & W. Edmonston Drive



Figure 17. A bicyclist crosses Wootton Parkway headed eastbound onto W. Edmonston Drive at Intersection #2 - Wootton Parkway & W. Edmonston Drive



IDENTIFIED SAFETY ISSUES

Key safety issues and other findings are shown in Table 13 and described below.

Table 13. Key Safety Issues for Intersection #2 - Wootton Parkway & W. Edmonston Drive

| Issue ID | Safety Issue | Safety Issue Type | Crash Data | Near-Miss Video | Site Visit |
|----------|---|---|------------|-----------------|------------|
| 2-A | There is only one crosswalk (on the north side of the intersection crossing Wootton Parkway). It is a standard crosswalk, not high-visibility. It is used by pedestrians and bicyclists. | 5.1 Pedestrian: Intersection Crossing 6.2 Bicyclist: Insufficient bicycle facilities | | | ✓ |
| 2-B | Heavy truck traffic making right turns onto northbound Wootton Parkway from westbound Edmonston Drive, and left turns onto Edmonston Drive from southbound Wootton Parkway. | 2 Conflicts Between Users 2.1 Conflicts Between Users: Drivers Turning and Pedestrians | | ✓ | ✓ |

Bold indicates a priority safety issue.

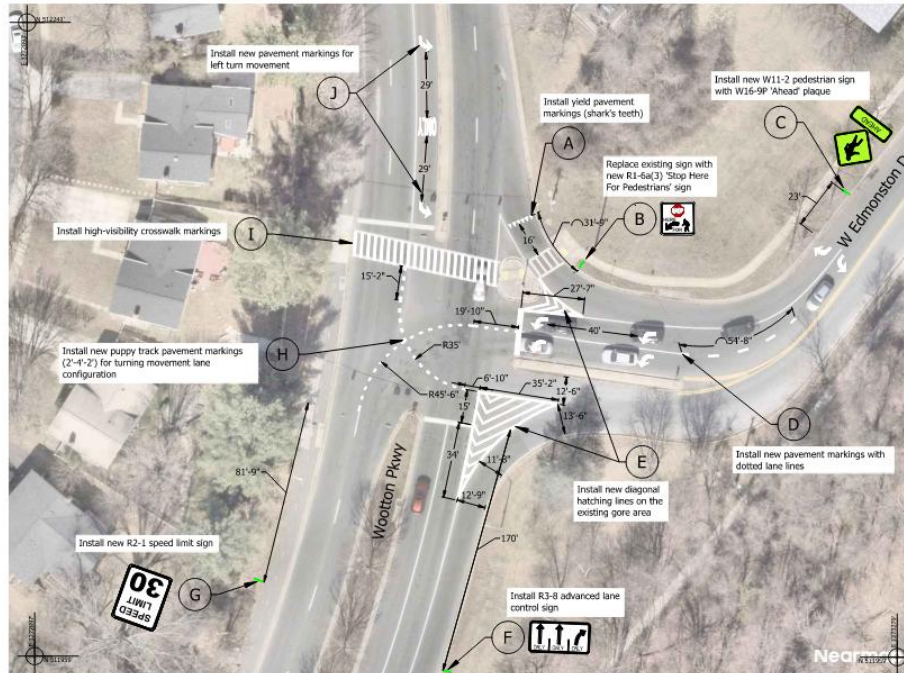
Recommendations

SHORT-TERM RECOMMENDATIONS

Figure 18 shows the proposed short-term, quick-build improvements for the Wootton Parkway & W. Edmonston Drive intersection, with additional detail provided in Table 14. The short-term concept focuses on clarifying lane use, tightening the intersection footprint with pavement markings and flexible posts, and improving pedestrian crossing visibility and priority, especially where turning movements and channelized areas create higher-speed conflicts.

Overall, these recommendations rely on low-cost, implementable treatments (signing, striping, and delineation) to reduce driver uncertainty, slow turning speeds, and make pedestrian crossings more visible and predictable. The intent is to deliver near-term safety benefits while longer-term capital reconstruction options are advanced.

Figure 18. Short-Term Recommendations for Intersection #2 - Wootton Parkway & W. Edmonston Drive



LEGEND

- | | | | |
|---|--|---|--|
| (A) Proposed yield pavement markings. See Detail D. | (D) Proposed turn lane pavement markings | (G) Proposed speed limit sign (R2-1): 24" x 30" | (J) Proposed turn lane pavement markings |
| (B) Proposed Stop Here for Pedestrian sign (R1-6a(3)): 30" x 30" | (E) Proposed channelized gore area. See Detail B2. | (H) Proposed turning pavement guides | |
| (C) Proposed pedestrian sign (W11-2): 30" x 30" with Ahead plaque (W16-9P): 24" x 12" | (F) Proposed lane control sign (R3-8): 48" x 30" | (I) Proposed crosswalk markings. See Detail A. | |

Table 14. Short-Term Recommendations for Intersection #2 - Wootton Parkway & W. Edmonston Drive

| Rec. ID | Recommendation | Safety issue(s) addressed |
|---------|---|---------------------------|
| 2-S-1 | Install high-visibility crosswalk markings on the north leg of Wootton Parkway. | 2-A |
| 2-S-2 | Install puppy tracks (2'-4'-2') for southbound left-turns onto W Edmonston Drive. | 2-A |
| 2-S-3 | At right-turn slip lane onto Wootton Parkway, install a (R1-6A(3)) 'Stop Here for Pedestrians' sign and high-visibility crosswalk markings. | 2-A |
| 2-S-4 | Install diagonal hatching lines on the existing gore area of both slip lane medians. | 2-A, 2-B |
| 2-S-5 | Install R2-1 Speed Limit (30 MPH) sign on southbound Wootton Parkway. | 2-B |
| 2-S-6 | Install advanced intersection lane control (R3-8) sign with arrow marking for the lane configuration on northbound Wootton Parkway lanes. | 2-B |
| 2-S-7 | Install Yield pavement markings (shark's teeth) at receiving lane northbound on Wootton Parkway. | 2-B |
| 2-S-8 | Install turning arrows and ONLY letters marking for the southbound Wootton Parkway left-turn lane. | 2-B |
| 2-S-9 | Install new W11-2 'Pedestrian' sign with W16-9P 'Ahead' plaque at westbound Edmonston Dr. | 2-B |
| 2-S-10 | Install arrow markings with dotted lane lines for the lane configuration on westbound approach. | 2-B |

COST ESTIMATE

Table 15 provides a planning-level cost estimate for the short-term recommendations, based on item quantities and recent Maryland SHA price index sheets, and excludes contingency and mobilization.

Table 15. Planning-Level Cost Estimate at Intersection #2 - Wootton Parkway & W. Edmonston Drive

| Item | Description | Unit | Unit Price | Quantity | Item Cost |
|------------------|--|------|------------|----------|--------------------|
| Pavement Marking | 12" Crosswalk | LF | \$6.19 | 220 | \$1,361.38 |
| Pavement Marking | 5" solid marking (white) | LF | \$7.00 | 394 | \$2,758.00 |
| Pavement Marking | 5" dashed marking (white) | LF | \$1.75 | 15 | \$26.25 |
| Pavement Marking | Yield (sharks teeth) marking | LF | \$60.49 | 12 | \$725.83 |
| Pavement Marking | Puppy track turn guidance marking (white) | LF | \$1.15 | 28 | \$32.20 |
| Pavement Marking | Turn arrow marking | EACH | \$395.15 | 8 | \$3,161.19 |
| Pavement Marking | ONLY' marking (letter) | EACH | \$375.23 | 4 | \$1,500.92 |
| Sign | New sign post | EACH | \$193.76 | 4 | \$775.04 |
| Sign | Stop Here for Pedestrians sign [R1-6a (3)] | EACH | \$500.00 | 1 | \$500.00 |
| Sign | Speed limit sign [R2-1] | EACH | \$400.00 | 1 | \$400.00 |
| Sign | Advanced lane control sign (multilane) [R3-8b] | EACH | \$800.00 | 1 | \$800.00 |
| Sign | Pedestrian' warning sign [W11-2] | EACH | \$500.00 | 1 | \$500.00 |
| Sign | 'Ahead' plaque (under pedestrian sign) [W11-2] | EACH | \$200.00 | 1 | \$200.00 |
| Total: | | | | | \$12,740.81 |

LONG-TERM RECOMMENDATIONS

Figure 19 illustrates the planned long-term capital improvements for the Wootton Parkway & W. Edmonston Drive intersection. The long-term concept focuses on reducing the size and complexity of the intersection footprint, particularly in the right-turn slip lane area, so that turning vehicles move more slowly and pedestrians have a more protected, predictable crossing environment (Table 16).

Overall, the recommended long-term approach is to use median and corner reconstruction to tighten geometry and channelize movements. This includes extending and widening medians to shrink the intersection's travel area, and converting the slip-lane/gore area into a more controlled configuration, either by installing a concrete median or by closing the right-turn slip lane to create a hardened, lower-speed right turn.

Figure 19. Long-Term Recommendations for Intersection #2 - Wootton Parkway & W. Edmonston Drive



LEGEND

- (A)** Proposed intersection reconstruction and slip lane removal
- (B)** Extend median to reduce traveling area and protect pedestrian
- (C)** Extend/widen median to reduce travel area and turning movement speed

Table 16. Long-Term Recommendations for Intersection #2 - Wootton Parkway & W. Edmonston Drive

| Rec. ID | Recommendation | Safety issue(s) addressed |
|---------|--|---------------------------|
| 2-L-1 | Consider extending the median at the north leg of the intersection to shrink the intersection traveling area and protect pedestrians. | 2-A |
| 2-L-2 | Consider reconstructing northeast corner of intersection and remove channelizing island, closing existing slip lane for a regular right-turn lane. | 2-A |
| 2-L-3 | Consider extending/widening the median at the southern leg to shrink the intersection traveling area and lower the turning movement speed. | 2-B |

#3 – KING FARM BOULEVARD & GRAND CHAMPION DRIVE

Existing Conditions

INTERSECTION DESCRIPTION

The intersection of King Farm Boulevard & Grand Champion Drive is a two-way, two-stage stop-controlled intersection (Figure 20). King Farm Boulevard functions as the major north-south roadway, while Grand Champion Drive serves as the minor east-west approach. King Farm Boulevard consists of one travel lane in each direction with on-street parking and a wide landscaped median that creates a two-stage pedestrian crossing. Sidewalks are provided on both sides of the roadway outside of the median, 5' wide and separated from the roadway by an approximately 4' utility strip. Sharrow pavement markings are present along the corridor.

Grand Champion Drive consists of one travel lane in each direction, with on-street parking on both sides. Sidewalks are provided on both sides of the roadway, approximately 5 feet wide and separated by a 4-foot utility strip. This approach is stop-controlled, with control provided at the median to accommodate the two-stage crossing configuration and a 15'-wide (at max) sidewalk on the median. All approaches are classified as local roads with posted speed limits of 25 mph and have crosswalks. Surrounding land uses are predominantly residential, consisting primarily of multi-family developments with some attached residential units.

Figure 20. #3 – King Farm Boulevard & Grand Champion Drive Intersection



SAFETY REVIEW

A total of two (5) crashes were recorded at the intersection during the three-year period from 2022 to 2024. The reported crashes involved only vehicles and resulted mostly in property-damage-only (PDO) outcomes, with one minor injury reported in a 2022 crash. Table 17 summarizes the crash characteristics, including collision types, lighting conditions, and roadway surface conditions.

Table 17. Summary of Three-Year (2022-24) Crashes at Intersection #3 – King Farm Boulevard & Grand Champion Drive

| Total Crashes | Total Crashes by Year | | | Total Crashes by User | | |
|---------------|-----------------------|------|------|-----------------------|---------|------------|
| 4 | 2022 | 2023 | 2024 | Auto | Cyclist | Pedestrian |
| | 3 | 0 | 1 | 4 | 0 | 0 |

| Total Crashes by Severity | | | | |
|---------------------------|---------|-------|-----------------|-----------------|
| Fatal | Serious | Minor | Possible Injury | Property Damage |
| 0 | 0 | 1 | 0 | 3 |

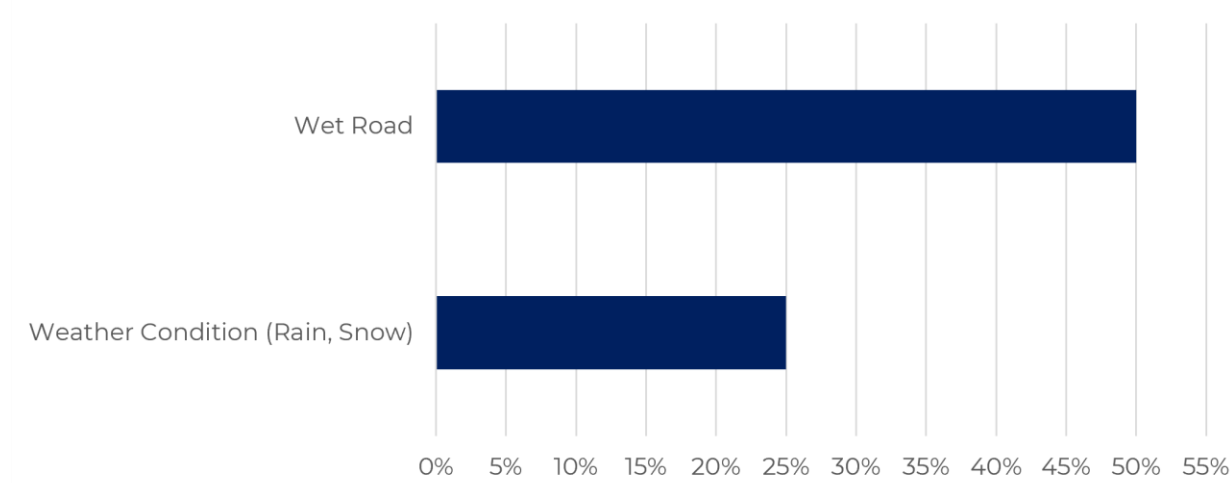
| Total Crashes by Collision Type | |
|---------------------------------|-------|
| Angle | Other |
| 4 | 1 |

| Lighting | | Road Surface | |
|----------|----------------|--------------|-----|
| Daylight | Dark Lights On | Dry | Wet |
| 4 | 1 | 3 | 2 |

Note: Crash summaries are based on the available crash data reviewed for this study. Reported crash totals and locations may vary across source datasets due to differences in reporting methods, geocoding, and intersection buffers.

Figure 21 illustrates the percentage of crashes accounting for each contributing circumstance associated with crashes at the intersection during the 2022–2024 study period. A single crash may involve multiple contributing circumstances, as documented in the crash reports. As shown in the figure, weather conditions (rain and snow) were the most frequently reported contributing factor, followed by wet roadway conditions. These findings indicate that environmental factors, particularly adverse weather and surface conditions, played a significant role in crashes at the intersection.

Figure 21. Percentage of Crashes Accounting for Each Contributing Circumstance at Intersection #3 – King Farm Boulevard & Grand Champion Drive



NEAR-MISS VIDEO ANALYSIS

Post-Encroachment Time (PET), which measures the temporal separation between two users occupying the same conflict area, was used to assess the severity of these interactions and is calculated only when both users pass through the same conflict point. Based on 24-hour video observations at the intersection, a total of 22 near-miss events were identified, as summarized in Table 18. Of these, 10 involved vehicle-to-vehicle conflicts, 10 involved vehicle-to-pedestrian conflicts, and two (2) involved vehicle-to-bicyclist conflicts. As shown in Table 18, most observed conflicts (21 out of 22) fall within the 2–3 second PET range, with only one (1) conflict occurring within the 1.5–2 second range, indicating generally moderate levels of conflict severity. However, given that a significant portion of these conflicts involve vulnerable road users (pedestrians and bicyclists), the intersection exhibits potential for serious injury or fatal crashes under higher-risk conditions.

Table 18. Summary of Near Misses for a Day (24-hours) at Intersection #3 – King Farm Boulevard & Grand Champion Drive

| Post Encroachment Time (PET) | Vehicle-Vehicle | Vehicle-Pedestrian | Vehicle-Bicyclist | Total |
|------------------------------|-----------------|--------------------|-------------------|-----------|
| 0.0 - 1.5s | 0 | 0 | 0 | 0 |
| 1.5 - 2.0s | 0 | 1 | 0 | 1 |
| 2.0 - 3.0s | 10 | 9 | 2 | 21 |
| Total | 10 | 10 | 2 | 22 |

Based on video analysis of near-miss events, Table 19 summarizes the most frequent conflict types observed at the intersection. The highest number of conflicts (5) occurred between southbound through vehicles and north leg pedestrians, indicating notable pedestrian interaction with through traffic. The next most frequent conflicts include interactions between westbound through and northbound through vehicles (4 conflicts) and eastbound through and northbound through vehicles (3 conflicts). These findings suggest that both pedestrian crossings and through-vehicle interactions across multiple approaches are key contributors to conflicts at the intersection, highlighting potential areas for operational and safety improvements.

Table 19. Top Three Conflict Types by Movements based on Near Miss Video Analysis at Intersection #3 – King Farm Boulevard & Grand Champion Drive

| Conflict Rank | Movement 1 | Movement 2 | Conflicts |
|---------------|--------------------|----------------------|-----------|
| 1. | Southbound Through | North Leg Pedestrian | 5 |
| 2. | Westbound Through | Northbound Through | 4 |
| 3. | Eastbound Through | Northbound Through | 3 |

EXISTING TRAFFIC OPERATIONS

Table 20 shows the results of traffic operations analysis for this intersection based on existing lane configurations, peak-hour traffic volumes, and signal timing parameters.

Table 20. Results of Traffic Operation Analysis at Intersection #3 – King Farm Boulevard & Grand Champion Drive

| Approach | Movement | Weekday AM Peak Hour | | | Weekday PM Peak Hour | | |
|-----------------------------|-------------------------|----------------------|----------|----------------------------|----------------------|----------|----------------------------|
| | | Delay (sec) | LOS | 95th Percentile Queue (ft) | Delay (sec) | LOS | 95th Percentile Queue (ft) |
| Eastbound | Eastbound Through | 10.2 | B | - | 11.3 | B | - |
| | Overall Approach | 10.2 | B | | 11.3 | B | |
| Westbound | Westbound Through | 10.4 | B | - | 11.8 | B | - |
| | Overall Approach | 10.4 | B | | 11.8 | B | |
| Northbound | Northbound Through | 1.0 | A | - | 1.0 | A | - |
| | Overall Approach | 1.0 | - | | 1.0 | - | |
| Southbound | Southbound Through | 0.7 | A | - | 0.6 | A | - |
| | Overall Approach | 0.7 | - | | 0.6 | - | |
| Overall Intersection | | 3.0 | A | | 2.0 | A | |

LOS = Level of Service
 # = 95th percentile volume exceeds capacity, queue may be longer

SITE VISIT OBSERVATIONS

A site visit was conducted on Wednesday, April 1, 2026 to review pedestrian, bicycle, and vehicle operations. Photos and comments are included in Appendix F and in the figures below.

King Farm Boulevard is marked with shared lane markings, but field observations indicate that it is operated at speeds exceeding the posted limit, reducing comfort for cyclists. Drivers were observed traveling at or above 30 miles per hour in a 25 mile per hour zone. The major street is not controlled by stop or yield signs, which contributes to higher operating speeds through the intersection.

Roadway geometry further affects safety. Wide curb radii allow higher speed turning movements, and a vertical grade on the eastbound approach limits pedestrian visibility. Pavement markings and parking controls near the corners are inconsistent or faded.

Figure 22: Wide curb radii at Intersection #3 – King Farm Boulevard & Grand Champion Drive



Figure 23: Median sidewalk at Intersection #3 – King Farm Boulevard & Grand Champion Drive



Figure 24: West leg faded stop bar at Intersection #3 – King Farm Boulevard & Grand Champion Drive



IDENTIFIED SAFETY ISSUES

Key safety issues and other findings are shown in Table 21 and described below.

Table 21. Key Safety Issues for Intersection #3 – King Farm Boulevard & Grand Champion Drive

| Issue ID | Safety Issue | Safety Issue Type | Crash Data | Near-Miss Video | Site Visit |
|------------|---|--|------------|-----------------|------------|
| 3-A | The crosswalks at this intersection are not high-visibility; they lack transverse bars. | 5.1 Pedestrian: Intersection Crossing | | | ✓ |
| 3-B | While marked with sharrows, King Farm Boulevard is not a comfortable street for bicyclists to share with drivers. | 6.2 Bicyclist: Insufficient Bicycle Facilities | | | ✓ |
| 3-C | Driver speeds often reached or exceeded 30 MPH on King Farm Boulevard (speed limit = 25 MPH). | 1.1 Speeds, Severity, and Compliance: Excessive Speed | | | ✓ |
| 3-D | The wide curb radii at this intersection encourage high-speed uncontrolled right-turning movements onto Grand Champion Drive. | 1.2 Speeds, Severity, and Compliance: High-Speed Turns | | | ✓ |
| 3-E | The hill heading east on King Farm Boulevard blocks pedestrian visibility. | 3.1 Roadway Design: Inadequate Sight Distance (Lack | | | ✓ |
| 3-F | Detectable warning surfaces are missing at all corners. | 4.1 Accessibility (ADA): Insufficient Curb Ramps | | | ✓ |

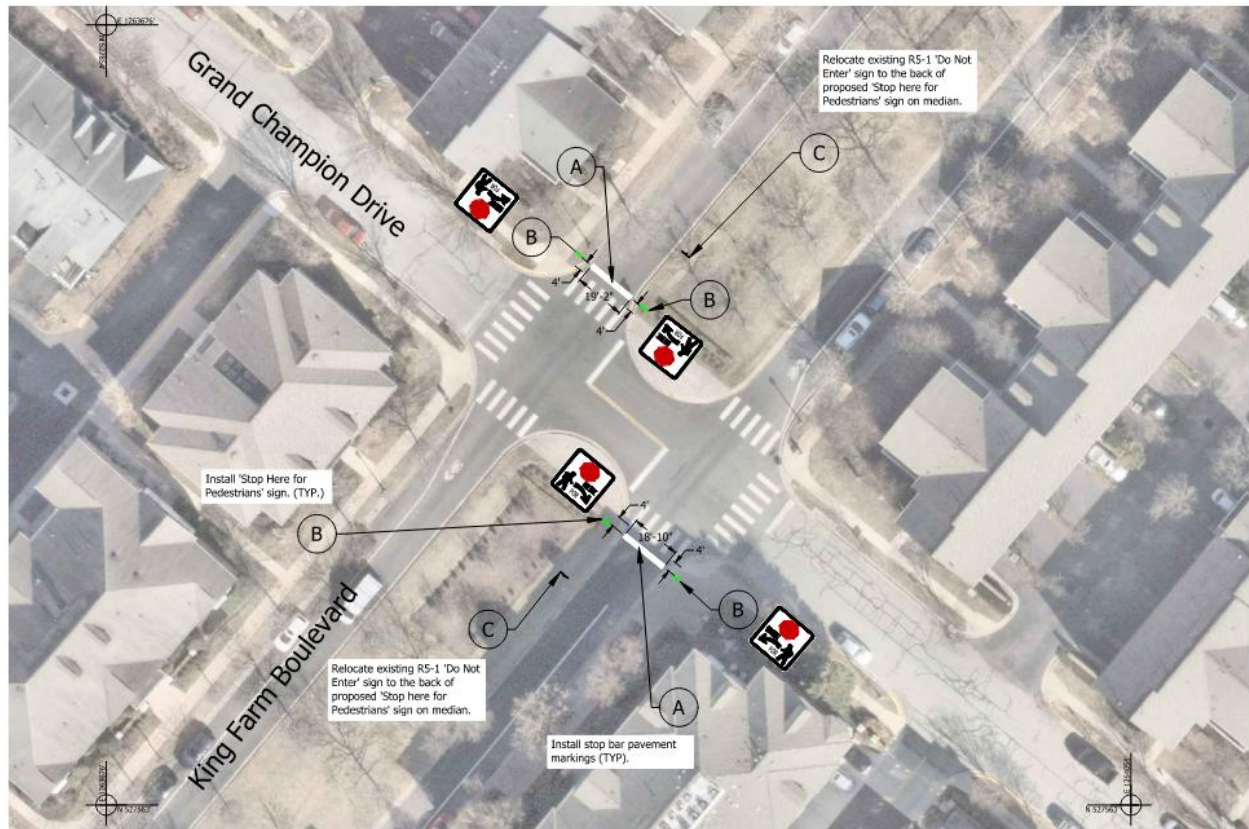
Bold indicates a priority safety issue.

Recommendations

SHORT-TERM RECOMMENDATIONS

Figure 25 presents the proposed short-term, quick-build improvements for the King Farm Boulevard & Grand Champion Drive intersection, with additional detail in Table 22. The short-term concept focuses on improving intersection control, clarifying right-of-way, and enhancing pedestrian visibility through targeted pavement markings, signage, and flexible delineation. Generally, these recommendations emphasize low-cost, implementable treatments to reduce vehicle speeds, improve driver awareness, and create more visible and predictable pedestrian crossings.

Figure 25. Short-Term Recommendations for Intersection #3 – King Farm Boulevard & Grand Champion Drive



LEGEND

- (A) Proposed stop bar pavement markings
- (B) Proposed Stop here for Pedestrians signs (R1-6a(3)): 30" x 30"
- (C) Relocated Do Not Enter sign (R5-1): 30" x 30"

Table 22. Short-Term Recommendations for Intersection #3 – King Farm Boulevard & Grand Champion Drive

| Rec. ID | Recommendation | Safety issue(s) addressed |
|---------|---|---------------------------|
| 3-S-1 | Install stop bars. | 3-D |
| 3-S-2 | Install 'Stop Here For Pedestrians' (R1-6A(3)) signs at the uncontrolled crosswalks of this intersection. | 3-D |

COST ESTIMATE

Table 23 provides a planning-level cost estimate for the short-term recommendations, based on item quantities and recent Maryland SHA price index sheets, and excludes contingency and mobilization.

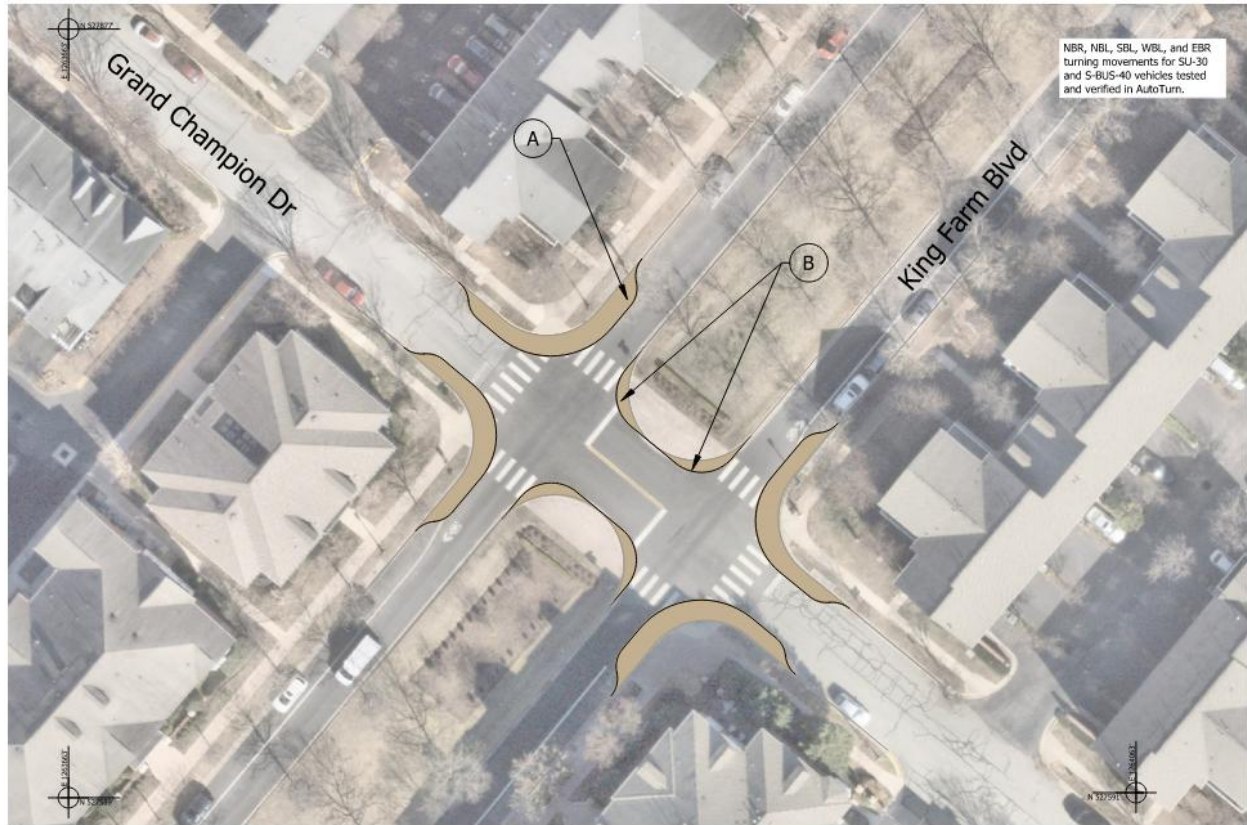
Table 23. Planning-Level Cost Estimate at Intersection #3 – King Farm Boulevard & Grand Champion Drive

| Item | Description | Unit | Unit Cost | Quantity | Cost |
|------------------|--|------|-----------|----------|-------------------|
| Pavement Marking | 24" Stop Bar | LF | \$21.75 | 38 | \$826.50 |
| Sign | New sign post | EACH | \$193.76 | 4 | \$775.04 |
| Sign | Relocate sign post | EACH | \$79.54 | 2 | \$159.08 |
| Sign | Stop Here for Pedestrians sign [R1-6a (3)] | EACH | \$500.00 | 4 | \$2,000.00 |
| Total: | | | | | \$3,760.62 |

LONG-TERM RECOMMENDATIONS

Figure 26 shows the planned long-term capital improvements for the King Farm Boulevard & Grand Champion Drive intersection. The long-term concept focuses on reconstructing the intersection to reduce turning speeds, shorten pedestrian crossing distances, and provide more consistent and accessible pedestrian facilities. The recommended long-term approach emphasizes geometric redesign to create a more controlled and predictable intersection (Table 24). This includes tightening curb radii, adding curb extensions, and improving pedestrian accommodations to better support multimodal travel.

Figure 26. Long-Term Recommendations for Intersection #3 – King Farm Boulevard & Grand Champion Drive



LEGEND

- (A)** Curb extension
- (B)** Median extension

Table 24. Long-Term Recommendations for Intersection #3 – King Farm Boulevard & Grand Champion Drive

| Rec. ID | Recommendation | Safety issue(s) addressed |
|---------|--|---------------------------|
| 3-L-1 | Consider exploring warrants for converting this intersection to all-way stop. | 3-C |
| 3-L-2 | Consider adjusting medians to reduce the wide existing curb radii and reduce pedestrian crossing distances. | 3-D |
| 3-L-3 | Explore adding curb extensions to all corners. | 3-D |
| 3-L-4 | Consider adding ADA compliant directional perpendicular curb ramps and detectable warning surfaces at all corners. | 3-F |

#4 – REDLAND BOULEVARD & PLEASANT DRIVE

Existing Conditions

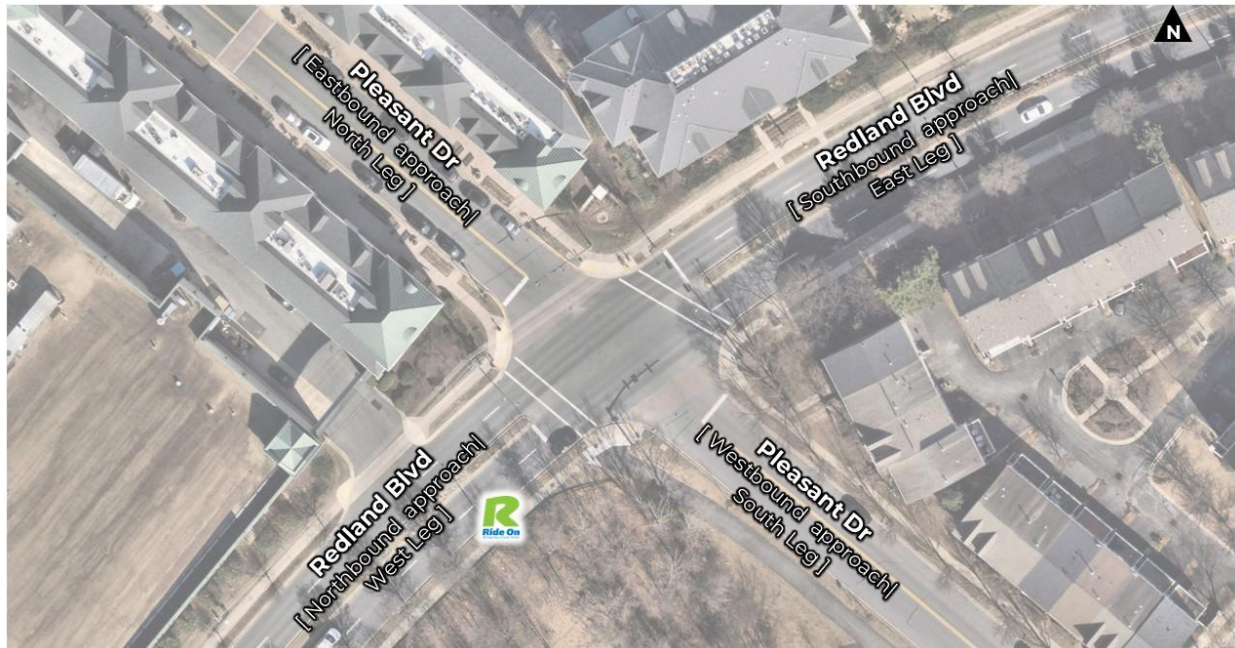
INTERSECTION DESCRIPTION

Redland Boulevard & Pleasant Drive intersect at the southern entrance to the Village Center (Figure 27). The intersection has a traffic signal with a pedestrian phase and push buttons on all corners. Redland Boulevard is a major collector road running north-south, with two northbound and two southbound travel lanes separated by a 4' concrete median. The speed limit on Redland Boulevard is 30 mph. In 2024, Redland Boulevard saw an Annual Average Daily Traffic (AADT) of 13,035 vehicles and 14,345 trucks.

Adjacent land uses include Commercial Residential Mix, which is the Village Center with big-box stores and retail, as well as residential condominiums on the west side and medium-density attached residential homes and a public park on the east side of Redland Boulevard. There are narrow sidewalks (4') with a 5' landscaped buffer on Redland Boulevard.

Pleasant Drive is a local road with a 25 mph speed limit and one lane in each direction, separated by a double yellow line. To the west of the intersection, on the north approach, the sidewalks are wider (10'), while the south approach has a 5' sidewalk on the north side and an 8' shared-use path on the south side.

Figure 27. #4 – Redland Boulevard & Pleasant Drive Intersection



SAFETY REVIEW

Only (1) crash was recorded at the intersection in 2023 during the three-year period from 2022 to 2024. The reported crash is a single-vehicle collision and resulted in a property-damage-only (PDO) outcome. Table 25 summarizes the crash characteristics, including collision types, lighting conditions, and roadway surface conditions.

Table 25. Summary of Three-Year (2022-24) Crashes at Intersection #4 – Redland Boulevard & Pleasant Drive

| Total Crashes | Total Crashes by Year | | | Total Crashes by User | | |
|---------------|-----------------------|------|------|-----------------------|---------|------------|
| 1 | 2022 | 2023 | 2024 | Auto | Cyclist | Pedestrian |
| | 0 | 1 | 0 | 1 | 0 | 0 |

| Total Crashes by Severity | | | | |
|---------------------------|---------|-------|-----------------|-----------------|
| Fatal | Serious | Minor | Possible Injury | Property Damage |
| 0 | 0 | 0 | 0 | 1 |

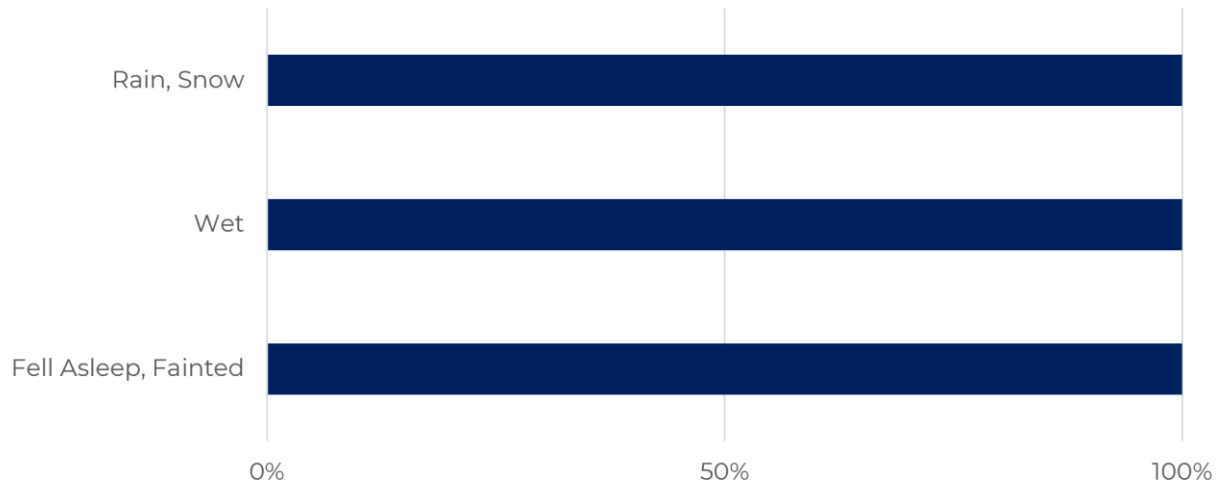
| Total Crashes by Collision Type | | | | |
|---------------------------------|--------------|-------------------------|-------------------------|-------|
| Single Vehicle | Rear To Side | Same Direction Rear End | Straight Movement Angle | Other |
| 1 | 0 | 0 | 0 | 0 |

| Lighting | | Road Surface | |
|----------|----------------|--------------|-----|
| Daylight | Dark Lights On | Dry | Wet |
| 1 | 0 | 0 | 1 |

Note: Crash summaries are based on the available crash data reviewed for this study. Reported crash totals and locations may vary across source datasets due to differences in reporting methods, geocoding, and intersection buffers.

Figure 28 illustrates the percentage of crashes accounting for each contributing circumstance associated with crashes at the intersection during the 2022–2024 study period. A single crash may involve multiple contributing circumstances, as documented in the crash reports. As shown in the figure, contributing factors include rain/snow weather conditions, wet roadway conditions, and driver impairment (fell asleep or fainted). These results indicate that both environmental conditions and driver-related factors contributed to the crash at the intersection.

Figure 28. Percentage of Crashes Accounting for Each Contributing Circumstance at Intersection #4 – Redland Boulevard & Pleasant Drive



NEAR-MISS VIDEO ANALYSIS

Post-Encroachment Time (PET), which measures the temporal separation between two users occupying the same conflict area, was used to assess the severity of these interactions and is calculated only when both users pass through the same conflict point. Based on 24-hour video observations at the intersection, a total of 24 near-miss events were identified, as summarized in Table 26. Of these, four (4) involved vehicle-to-vehicle conflicts, 19 involved vehicle-to-pedestrian conflicts, and one (1) involved a vehicle-to-bicyclist conflict. Most observed conflicts (22 out of 24) shown in Table 26 fall within the 2–3-second PET range, while two (2) conflicts fall within the lower PET ranges (0–2 seconds), indicating relatively higher-risk interactions. Notably, most of these conflicts involve pedestrians, suggesting greater exposure and vulnerability at the intersection and indicating a potential for more severe crashes under adverse conditions.

Table 26. Summary of Near Misses for a Day (24-hours) at Intersection #4 – Redland Boulevard & Pleasant Drive

| Post Encroachment Time (PET) | Vehicle-Vehicle | Vehicle-Pedestrian | Vehicle-Bicyclist | Total |
|------------------------------|-----------------|--------------------|-------------------|-----------|
| 0.0 - 1.5s | 0 | 1 | 0 | 1 |
| 1.5 - 2.0s | 0 | 1 | 0 | 1 |
| 2.0 - 3.0s | 4 | 17 | 1 | 22 |
| Total | 4 | 19 | 1 | 24 |

Based on video analysis of near-miss events, Table 27 summarizes the most frequent conflict types observed at the intersection. The highest number of conflicts (4) occurred between west leg pedestrians and southbound right-turning vehicles, and northbound through vehicles and south leg pedestrians, indicating notable interactions between pedestrians and turning or through traffic. The next most frequent conflict (3) involved northbound left-turning vehicles and southbound through vehicles. These findings suggest that pedestrian movements, particularly at the west and south legs, as well as left-turn conflicts, are key contributors to overall intersection risk, highlighting areas where targeted safety improvements may be needed.

Table 27. Top Three Conflict Types by Movements based on Near Miss Video Analysis at Intersection #4 – Redland Boulevard & Pleasant Drive

| Conflict Rank | Movement 1 | Movement 2 | Conflicts |
|---------------|---------------------|----------------------|-----------|
| 1. | West Leg Pedestrian | Southbound Right | 4 |
| 2. | Northbound Through | South Leg Pedestrian | 4 |
| 3. | West Leg Pedestrian | Southbound Right | 4 |

EXISTING TRAFFIC OPERATIONS

Table 28 shows the results of traffic operations analysis for this intersection based on existing lane configurations, peak-hour traffic volumes, and signal timing parameters.

Table 28. Results of Traffic Operation Analysis at Intersection #4 – Redland Boulevard & Pleasant Drive

| Approach | Movement | Weekday AM Peak Hour | | | Weekday PM Peak Hour | | |
|-----------------------------|-------------------------|----------------------|----------|----------------------------|----------------------|----------|----------------------------|
| | | Delay (sec) | LOS | 95th Percentile Queue (ft) | Delay (sec) | LOS | 95th Percentile Queue (ft) |
| Eastbound | Eastbound Through | 23.7 | C | 40 | 24.7 | C | 62 |
| | Overall Approach | 23.7 | C | | 24.7 | C | |
| Westbound | Westbound Through | 20.2 | C | 18 | 20.6 | C | 31 |
| | Overall Approach | 20.2 | C | | 20.6 | C | |
| Northbound | Northbound Through | 8.4 | A | 78 | 9.6 | A | 72 |
| | Overall Approach | 8.4 | A | | 9.6 | A | |
| Southbound | Southbound Through | 9.4 | A | 97 | 8.6 | A | 51 |
| | Overall Approach | 9.4 | A | | 8.6 | A | |
| Overall Intersection | | 9.8 | A | | 10.4 | B | |

LOS = Level of Service

= 95th percentile volume exceeds capacity, queue may be longer

SITE VISIT OBSERVATIONS

A site visit was conducted on Wednesday, April 1, 2026, to assess safety and accessibility conditions. Photos and comments from the visit are included in Appendix F and in Figure 29, Figure 30, and Figure 31.

During the visit, it was observed that the southbound approach is sloped downhill, encouraging higher speed turning movements, particularly for southbound right turns. Parking regulations near the intersection are inconsistent, with some signs misplaced or unclear. Parking is permitted along Redland Boulevard during evenings and weekends, which may increase conflicts among parked vehicles, through traffic, and pedestrians.

Figure 29. The crosswalks at this intersection do not have high visibility markings at Intersection #4 – Redland Boulevard & Pleasant Drive



Figure 30. Narrow sidewalks along Redland Boulevard at Intersection #4 – Redland Boulevard & Pleasant Drive



Figure 31. No-parking regulations near the intersection could contribute to conflicts between traveling and parked vehicles at Intersection #4 – Redland Boulevard & Pleasant Drive



IDENTIFIED SAFETY ISSUES

Key safety issues are shown in Table 29 and described below.

Table 29. Key Safety Issues for Intersection #4 – Redland Boulevard & Pleasant Drive

| Issue ID | Safety Issue | Safety Issue Type | Crash Data | Near-Miss Video | Site Visit |
|----------|---|--|------------|-----------------|------------|
| 4-A | Southbound drivers descend a hill as they approach the intersection and make high-speed southbound right turns, creating high-speed turning conflicts with crossing pedestrians. | 2.1 Conflicts Between Users: Drivers Turning and Pedestrians 3.2 Roadway Design: Pedestrian Visibility | | ✓ | ✓ |
| 4-B | There is a large truck access driveway just south of this intersection, potentially conflicting with higher speed southbound traffic. | 1.5 Speeds, Severity, and Compliance: Large Vehicles 2.2 Conflicts Between Users: Drivers and Pedestrians | | | ✓ |
| 4-C | The crosswalks at this intersection are not high-visibility. | 2.2 Conflicts Between Users: Drivers and Pedestrians 3.2 Roadway Design: Pedestrian Visibility 5.1 Pedestrian: Intersection Crossing | | ✓ | ✓ |
| 4-D | Drivers were observed parking close to the intersection on the westbound approach and restricting pedestrian visibility. | 3.2 Roadway Design: Pedestrian Visibility | | ✓ | ✓ |
| 4-E | Parking along Redland Boulevard is allowed during evenings and weekends, which could contribute to conflicts between traveling and parked vehicles. | 2.2 Conflicts Between Users: Drivers and Pedestrians 3.2 Roadway Design: Pedestrian Visibility 8.6 Conflict Type: Parked Vehicle | | | ✓ |
| 4-F | The sidewalks along Redland Boulevard are four feet wide, which is less than the minimum five-foot width. | 5.2 Pedestrian: Missing or Inadequate Sidewalk 5.3 Pedestrian: Low-Comfort Facility | | | ✓ |

Bold indicates a priority safety issue.

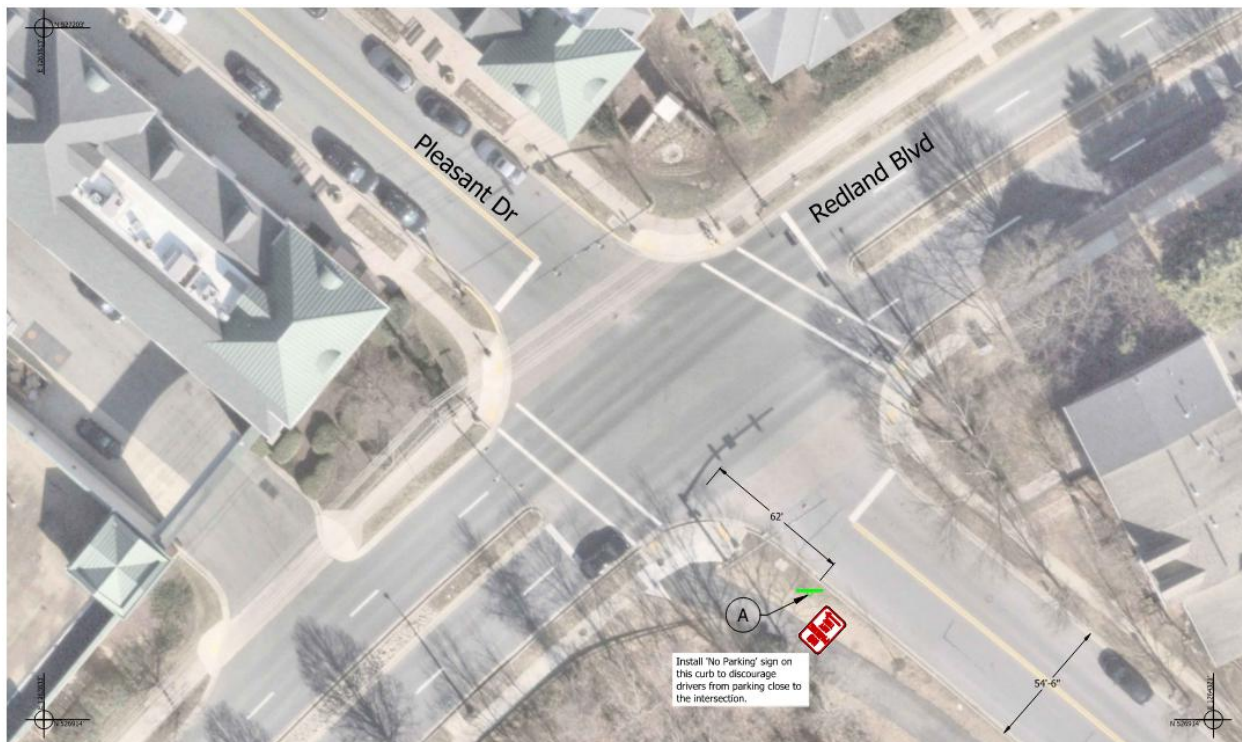
Recommendations

SHORT-TERM RECOMMENDATIONS

Figure 32 shows the proposed short-term, quick-build improvements for the Redland Boulevard & Pleasant Drive intersection, with additional detail in Table 30. The short-term recommendations focus on the priority safety issues that can be addressed through short-term treatments. Generally, these recommendations emphasize low-cost, implementable treatments to reduce vehicle speeds, improve driver awareness, and create more visible and predictable pedestrian crossings.

At the Redland Boulevard & Pleasant Drive intersection, the proposed short-term treatment improves pedestrian visibility on the westbound approach by restricting parking near the intersection. This addresses a priority safety issue identified in the near-miss video and site visit.

Figure 32. Short-Term Recommendations for Intersection #4 – Redland Boulevard & Pleasant Drive



LEGEND

- (A) Proposed R7-1 parking restriction sign (12" x 18")

Table 30. Short-Term Recommendations for Intersection #4 – Redland Boulevard & Pleasant Drive

| Rec. ID | Recommendation | Safety issue(s) addressed |
|---------|---|---------------------------|
| 4-S-1 | Add parking restrictions on the southern curb of the westbound approach | 4-D |

COST ESTIMATE

Table 31 provides a planning-level cost estimate for the short-term recommendations, based on item quantities and recent Maryland SHA price index sheets, and excludes contingency and mobilization.

Table 31. Planning-Level Cost Estimate at Intersection #4 – Redland Boulevard & Pleasant Drive

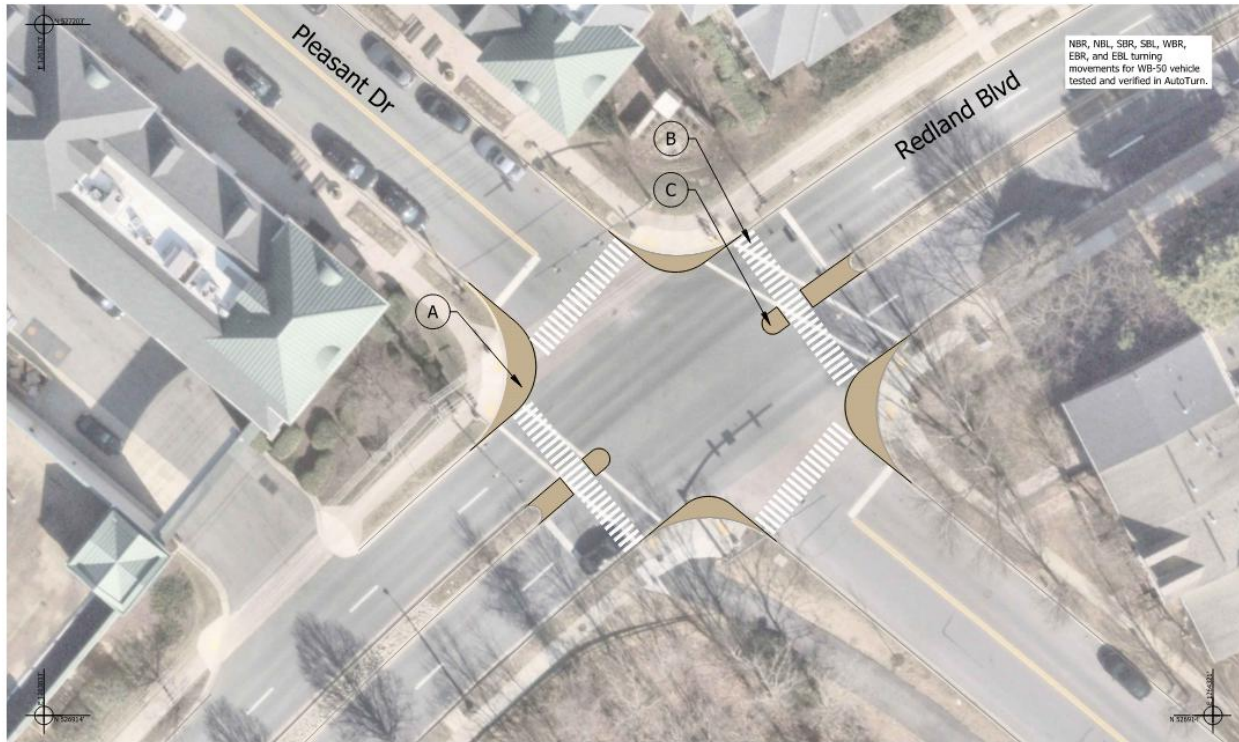
| Item | Description | Unit | Unit Cost | Quantity | Cost |
|---------------|--------------------------------|------|-----------|----------|-----------------|
| Sign | New sign post | EACH | \$193.76 | 1 | \$193.76 |
| Sign | Parking regulation sign [R7-1] | EACH | \$120.00 | 1 | \$120.00 |
| Total: | | | | | \$313.76 |

LONG-TERM RECOMMENDATIONS

Figure 33 presents the proposed long-term recommendations for the Redland Boulevard and Pleasant Drive intersection, with additional detail in Table 32.

The long-term recommendations address all identified safety concerns, including priority issues not covered in the short-term recommendations. At the Redland Boulevard & Pleasant Drive intersection, the proposed long-term treatments address high-speed southbound right turns that create high-speed turning conflicts with crossing pedestrians by reducing curb radii and hardening centerlines. This addresses a priority safety issue identified during the near-miss video and site visit. Additionally, pedestrian visibility and comfort are enhanced by high-visibility crosswalks, pedestrian refuge islands, and wider sidewalks that meet current design standards.

Figure 33. Long-Term Recommendations for Intersection #4 – Redland Boulevard & Pleasant Drive



LEGEND

- (A)** Tighten curb radii
- (B)** High-visibility continental crosswalk
- (C)** Pedestrian refuge island

Table 32. Long-Term Recommendations for Intersection #4 – Redland Boulevard & Pleasant Drive

| Rec. ID | Recommendation | Safety issue(s) addressed |
|---------|--|---------------------------|
| 4-L-1 | Coordinate with King Farm HOA to install a new high-visibility continental crosswalk on all four legs (Adjust this crosswalk and stop bar to be perpendicular to the roadway.) | 4-C |
| 4-L-2 | Consider adjusting the NW corner to tighten curb radii on all four corners and ensure ADA-compliant directional pedestrian ramps. | 4-D, 4-A |
| 4-L-3 | Explore extending the medians to add pedestrian refuge islands on the northbound and southbound approaches. | 4-A |
| 4-L-4 | Widen sidewalks to a minimum of 6' on both sides to accommodate pedestrians. (MDOT SHA Guidelines). | 4-F |

#5 – REDLAND BOULEVARD & THOMPSON DAIRY WAY

Existing Conditions

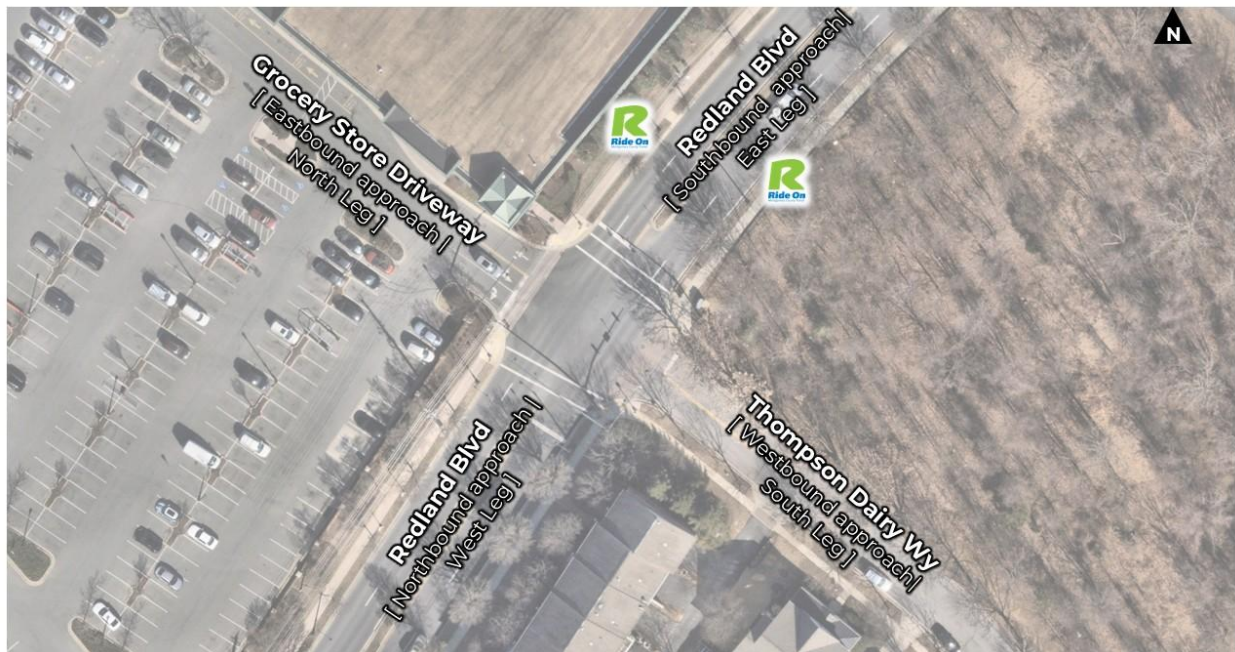
INTERSECTION DESCRIPTION

Redland Boulevard and Thompson Dairy Way form a three-legged intersection next to King Farm Village Center, with the entrance to the shopping center, also known as Crestfield Drive, serving as the fourth leg (Figure 34). The intersection has a traffic signal with an actuated pedestrian signal with a countdown display on all corners. Redland Boulevard is a major collector road running north-south, with two northbound and two southbound travel lanes separated by a 4' concrete median. The speed limit on Redland Boulevard is 30 mph. In 2024, Redland Boulevard saw an Annual Average Daily Traffic (AADT) of 13,035 vehicles and 14,345 trucks.

Adjacent land uses include Commercial Residential Mix, which is the Village Center, featuring big-box stores and retail, as well as residential condominiums on the west side, and medium-density attached residential homes and a public park on the east side of Redland Boulevard. There are narrow sidewalks (4') with a 5' landscaped buffer on Redland Boulevard.

Thompson Dairy Way is a two-way local road with a 25-mph speed limit and double yellow lines. The west side lacks a sidewalk, while the east side has a 5-foot sidewalk.

Figure 34. #5 – Redland Boulevard & Thompson Dairy Way Intersection



SAFETY REVIEW

A total of six (6) crashes were recorded at the intersection during the three-year period from 2022 to 2024. Four (4) of the reported crashes involved vehicles, one (1) involved a cyclist, and one (1) involved a pedestrian. A possible injury was reported in the pedestrian-involved crash, while all other crashes resulted in property-damage-only (PDO) outcomes. Table 33 summarizes the crash characteristics, including collision types, lighting conditions, and roadway surface conditions. No contributing circumstances have been reported regarding the two crashes at the intersection.

Table 33. Summary of Three-Year (2022-24) Crashes at Intersection #5 – Redland Boulevard & Thompson Dairy Way

| Total Crashes | Total Crashes by Year | | | Total Crashes by User | | |
|---------------|-----------------------|------|------|-----------------------|---------|------------|
| 2 | 2022 | 2023 | 2024 | Auto | Cyclist | Pedestrian |
| | 1 | 0 | 1 | 1 | 1 | 0 |

| Total Crashes by Severity | | | | |
|---------------------------|---------|-------|-----------------|-----------------|
| Fatal | Serious | Minor | Possible Injury | Property Damage |
| 0 | 0 | 0 | 0 | 2 |

| Total Crashes by Collision Type | | | | |
|---------------------------------|--------------|-------------------------|-------------------------|-------|
| Rear To Rear | Rear To Side | Same Direction Rear End | Straight Movement Angle | Other |
| 1 | 1 | 0 | 0 | 0 |

| Lighting | | Road Surface | |
|----------|----------------|--------------|---------|
| Daylight | Dark Lights On | Dry | Unknown |
| 2 | 0 | 2 | 0 |

Note: Crash summaries are based on the available crash data reviewed for this study. Reported crash totals and locations may vary across source datasets due to differences in reporting methods, geocoding, and intersection buffers.

NEAR-MISS VIDEO ANALYSIS

Post-Encroachment Time (PET), which measures the temporal separation between two users occupying the same conflict area, was used to assess the severity of these interactions and is calculated only when both users pass through the same conflict point. Based on 24-hour video observations at the intersection, a total of 31 near-miss events were identified, as summarized in Table 34. Of these, 18 involved vehicle-to-vehicle conflicts, 12 involved vehicle-to-pedestrian conflicts, and one (1) involved a vehicle-to-bicyclist conflict. As shown in Table 34 all observed conflicts (31 out of 31) fall within the 2–3-second PET range, with no conflicts recorded in the lower PET ranges. This indicates generally moderate levels of conflict severity at the intersection. However, the presence of conflicts involving vulnerable road users (pedestrians and bicyclists) suggests potential for more severe outcomes under higher-risk conditions.

Table 34. Summary of Near Misses for a Day (24-hours) at Intersection #5 – Redland Boulevard & Thompson Dairy Way

| Post Encroachment Time (PET) | Vehicle-Vehicle | Vehicle-Pedestrian | Vehicle-Bicyclist | Total |
|------------------------------|-----------------|--------------------|-------------------|-----------|
| 0.0 - 1.5s | 0 | 0 | 0 | 0 |
| 1.5 - 2.0s | 0 | 0 | 0 | 0 |
| 2.0 - 3.0s | 18 | 12 | 1 | 31 |
| Total | 18 | 12 | 1 | 31 |

Based on video analysis of near-miss events, Table 35 summarizes the most frequent conflict types observed at the intersection. The highest number of conflicts (15) occurred between northbound left-turning vehicles and southbound through vehicles, indicating that left-turn movements are a primary source of conflict at the intersection. The next most frequent conflicts (3 each) involve interactions between north leg pedestrians and eastbound left-turning vehicles, and northbound through vehicles and north leg pedestrians, highlighting notable pedestrian-related interactions. These findings suggest that both left-turn movements and pedestrian crossings, particularly along the north leg, are key contributors to conflicts at the intersection, indicating areas where targeted safety improvements may be warranted.

Table 35. Top Three Conflict Types by Movements based on Near Miss Video Analysis at Intersection #5 – Redland Boulevard & Thompson Dairy Way

| Conflict Rank | Movement 1 | Movement 2 | Conflicts |
|---------------|----------------------|----------------------|-----------|
| 1. | Northbound Left | Southbound Through | 15 |
| 2. | North Leg Pedestrian | Eastbound Left | 3 |
| 3. | Northbound Through | North Leg Pedestrian | 3 |

EXISTING TRAFFIC OPERATIONS

Table 36 shows the results of traffic operations analysis for this intersection based on existing lane configurations, peak-hour traffic volumes, and signal timing parameters.

Table 36. Results of Traffic Operation Analysis at Intersection #5 – Redland Boulevard & Thompson Dairy Way

| Approach | Movement | Weekday AM Peak Hour | | | Weekday PM Peak Hour | | |
|-----------------------------|-------------------------|----------------------|----------|----------------------------|----------------------|----------|----------------------------|
| | | Delay (sec) | LOS | 95th Percentile Queue (ft) | Delay (sec) | LOS | 95th Percentile Queue (ft) |
| Eastbound | Eastbound Through | 39.4 | D | 49 | 39.0 | D | 94 |
| | Eastbound Right | 34.7 | C | 0 | 30.4 | C | 0 |
| | Overall Approach | 38.3 | D | | 37.8 | D | |
| Westbound | Westbound Through | 35.5 | D | 25 | 30.8 | C | 25 |
| | Overall Approach | 35.5 | D | | 30.8 | C | |
| Northbound | Northbound Through | 2.2 | A | 36 | 4.7 | A | 146 |
| | Overall Approach | 2.2 | A | | 4.7 | A | |
| Southbound | Southbound Through | 1.3 | A | 22 | 1.9 | A | 17 |
| | Overall Approach | 1.3 | A | | 1.9 | A | |
| Overall Intersection | | 4.4 | A | | 7.7 | A | |

LOS = Level of Service
 # = 95th percentile volume exceeds capacity, queue may be longer

SITE VISIT OBSERVATIONS

A site visit was conducted on April 7, 2026, to evaluate pedestrian crossing operations and vehicle behavior at this signalized intersection. Photos and comments are included in Appendix F and in Figure 35, Figure 36, and Figure 37.

During the visit, the team observed that the crosswalks are not high-visibility and that the pedestrian push buttons were covered with plastic. There is no sidewalk on the north side of Thompson Dairy Way. Pedestrian visibility is limited from the southwest corner due to a brick wall blocking views of pedestrians waiting or crossing here, and vegetation partially obscures the westbound traffic signals. Drivers making permissive turns into the grocery store create conflicts with pedestrians and opposing traffic. Some southbound right-turning drivers overtrack across the double yellow line.

Figure 35. Stop bar too close to the crosswalk at Intersection #5 – Redland Boulevard & Thompson Dairy Way



Figure 36. Sidewalk is missing on the westbound approach at Intersection #5 – Redland Boulevard & Thompson Dairy Way



Figure 37. Lack of ADA-Compliant access on the northwest corner at Intersection #5 – Redland Boulevard & Thompson Dairy Way



IDENTIFIED SAFETY ISSUES

Key safety issues and other findings are shown in Table 37 and described below.

Table 37. Key Safety Issues for Intersection #5 – Redland Boulevard & Thompson Dairy Way

| Issue ID | Safety Issue | Safety Issue Type | Crash Data | Near-Miss Video | Site Visit |
|----------|---|--|------------|-----------------|------------|
| 5-A | A moderately high volume of drivers were observed performing a permissive NBL turn to access the grocery store, waiting for gaps in two lanes of traffic. | 3.5 Roadway Design: Access Management | | ✓ | ✓ |
| 5-B | The stop bar on the eastbound approach is too close to the crosswalk. | 5.1 Pedestrian: Intersection Crossing | | | ✓ |
| 5-C | Views of pedestrians waiting on the SW corner of this intersection are obstructed from drivers exiting the grocery store by a large brick wall. Drivers performing an EBR movement may not see crossing pedestrians. | 3.1 Roadway Design: Inadequate Sight Distance (Lack of Driver Visibility) | | | ✓ |
| 5-D | The crosswalks at this intersection are not high-visibility. | 5.1 Pedestrian: Intersection Crossing | | ✓ | ✓ |
| 5-E | The singular 'No Parking' signs on the westbound approach of this intersection are discrete and easy to miss. A car was parked illegally near the intersection on this approach. | 3.2 Roadway Design: Pedestrian Visibility | | | ✓ |
| 5-F | There is a desire path on the north side of the westbound approach of this intersection where a sidewalk is missing. | 5.2 Pedestrian: Missing or Inadequate Sidewalk | | | ✓ |
| 5-G | The green phase serving NBT and SBT drivers is much longer in duration than its accompanying pedestrian crossing phase. | 10.2 Signal Timing: Inadequate Pedestrian Crossing Time | | | ✓ |
| 5-H | There is a bus stop on the southbound approach of this intersection with no amenities. | 5.3 Pedestrian: Low-Comfort Facility | | | ✓ |
| 5-I | The grocery store is not accessible by wheelchair from this intersection; there are stairs leading from the sidewalk to the store entrance. | 5.3 Pedestrian: Low-Comfort Facility 4.2 Accessibility (ADA): Insufficient surface for pedestrians with disabilities (provides a flat surface) | | | ✓ |
| 5-J | Drivers performing a SBR movement to access the grocery store sometimes overtracked across the double yellow line on the eastbound approach. | 3.5 Roadway Design: Access Management | | ✓ | ✓ |

Recommendations

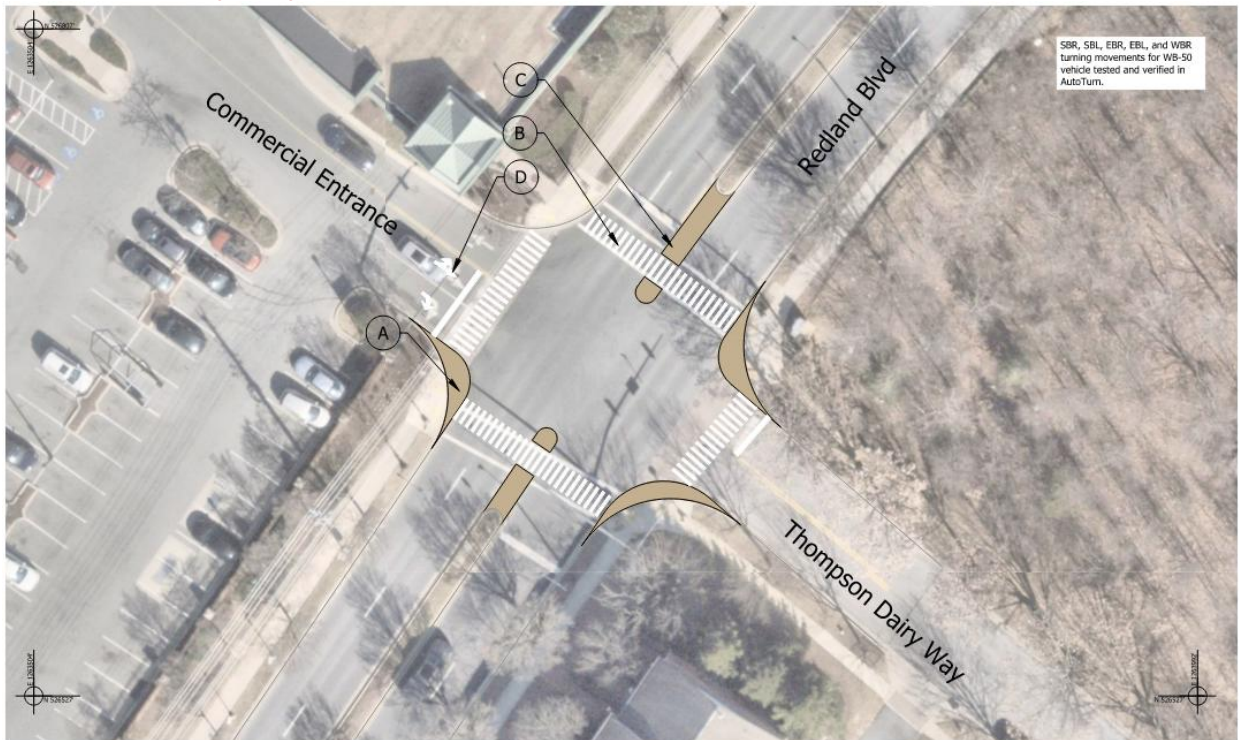
SHORT-TERM RECOMMENDATIONS

There are no proposed short-term, quick-build improvements for this intersection.

LONG-TERM RECOMMENDATIONS

Figure 38 shows the proposed long-term improvements for the Redland Boulevard & Thompson Dairy Way intersection, with additional detail in Table 38. This concept focuses on improving intersection geometry and extending medians to provide pedestrian refuge islands, shortening crossing distances, and improving traffic circulation and turning movements. Generally, these recommendations emphasize improved driver awareness and the creation of more visible and predictable pedestrian crossings.

Figure 38. Long-Term Recommendations for Intersection #5 – Redland Boulevard & Thompson Dairy Way



LEGEND

- | | |
|--|--|
| (A) Tighten curb radii | (C) Pedestrian refuge island |
| (B) High-visibility continental crosswalk | (D) Shift stop bar and lane markings farther from crosswalk |

Table 38. Long-Term Recommendations for Intersection #5 – Redland Boulevard & Thompson Dairy Way

| Rec. ID | Recommendation | Safety issue(s) addressed |
|---------|---|---------------------------|
| 5-L-1 | Shift stop bar and lane markings back at least 4 ft from the crosswalk. | 5-D |
| 5-L-2 | Consider extending medians to add pedestrian refuge islands on northbound and southbound approaches.. | 5-D, 5-A |
| 5-L-3 | Add new high visibility continental crosswalks on all four legs of the intersection. | 5-D, 5-A |
| 5-L-4 | Consider adding ADA-compliant directional pedestrian ramps on all corners. | 5-D |
| 5-L-5 | Consider reconstructing to tighten curb radii on all four corners. | 5-A, 5-C |

#6 – GAITHER ROAD & PICCARD DRIVE

Existing Conditions

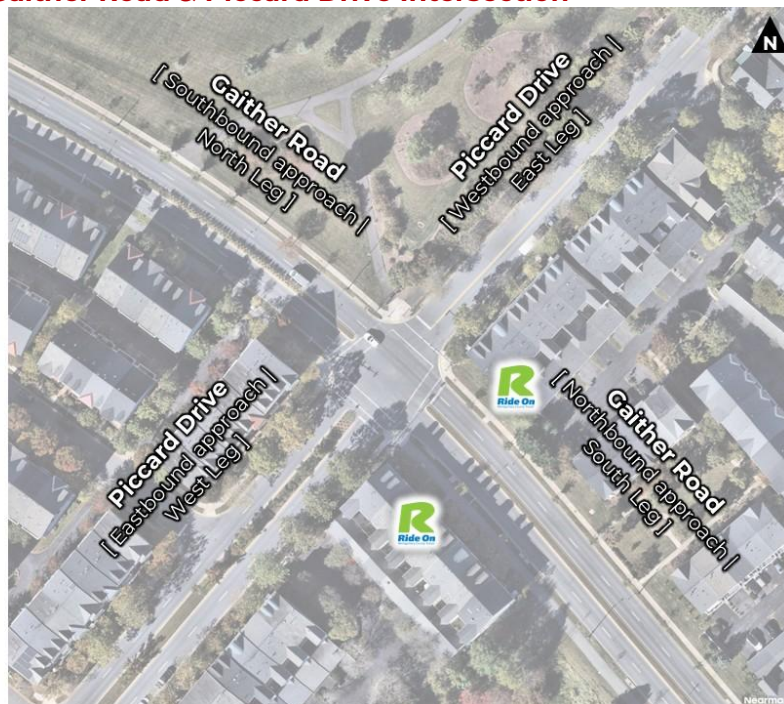
INTERSECTION DESCRIPTION

The intersection of Gaither Road & Piccard Drive is shown in Figure 39. Gaither Road is a four-lane major collector³ with a 30 MPH speed limit and is identified as the northbound (south leg) and southbound (north leg) approaches. Piccard Drive is a two-lane local road with a 25 MPH speed limit and is identified as the eastbound (west leg) and westbound (east leg) approaches. The intersection is signalized, with permissive left turns on all approaches.

According to the Rockville Comprehensive Land Use Policy Map,² land uses adjacent to the intersection are “residential attached” and “Public Park”. There are two RideOn bus stops at this intersection, serving route 66.

The City of Rockville’s Bikeway Master Plan (2017) includes the intersection of Gaither Road & Piccard Drive. The intersection was called out as part of a shared-use path installation to be built from Shady Grove Road to Gude Drive.

Figure 39. #6 – Gaither Road & Piccard Drive Intersection



SAFETY REVIEW

A total of three (3) crashes were recorded at the intersection during the three-year period from 2022 to 2024. One (1) of the reported crashes involved a pedestrian, while the remaining crashes involved vehicles. A minor injury was reported in the pedestrian-involved crash, whereas the other two (2) crashes resulted in property-damage-only (PDO) outcomes. Table 39 summarizes the crash characteristics, including collision types, lighting conditions, and roadway surface conditions.

Table 39. Summary of Three-Year (2022-24) Crashes at Intersection #6 – Gaither Road & Piccard Drive

| Total Crashes | Total Crashes by Year | | | Total Crashes by User | | |
|---------------|-----------------------|------|------|-----------------------|---------|------------|
| 3 | 2022 | 2023 | 2024 | Auto | Cyclist | Pedestrian |
| | 2 | 0 | 1 | 2 | 0 | 1 |

| Total Crashes by Severity | | | | |
|---------------------------|---------|-------|-----------------|-----------------|
| Fatal | Serious | Minor | Possible Injury | Property Damage |
| 0 | 0 | 1 | 0 | 2 |

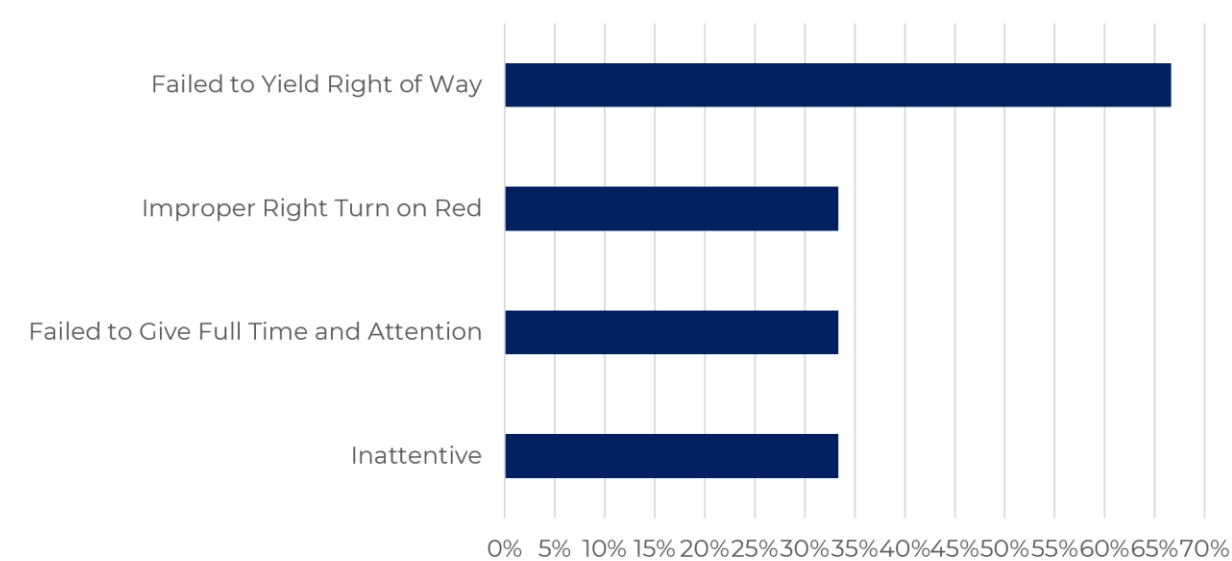
| Total Crashes by Collision Type | |
|---------------------------------|-------|
| Angle | Other |
| 1 | 2 |

| Lighting | | Road Surface |
|----------|----------------|--------------|
| Daylight | Dark Lights On | Dry |
| 2 | 1 | 3 |

Note: Crash summaries are based on the available crash data reviewed for this study. Reported crash totals and locations may vary across source datasets due to differences in reporting methods, geocoding, and intersection buffers.

Figure 40 illustrates the percentage of crashes accounting for each contributing circumstance associated with crashes at the intersection during the 2022–2024 study period. A single crash may involve multiple contributing circumstances, as documented in the crash reports. As shown in the figure, the most frequently reported contributing factor is failure to yield right-of-way, followed by inattentive driving, failure to give full time and attention, and improper right turn on red, each recorded once. These findings indicate that the contributing circumstances are predominantly driver-related, suggesting that driver behavior is the primary contributor to crashes at the intersection.

Figure 40. Percentage of Crashes Accounting for Each Contributing Circumstance at Intersection #6 – Gaither Road & Piccard Drive



NEAR-MISS VIDEO ANALYSIS

Post-Encroachment Time (PET), which measures the temporal separation between two users occupying the same conflict area, was used to assess the severity of these interactions and is calculated only when both users pass through the same conflict point. Based on 24-hour video observations at the intersection, a total of 40 near-miss events were identified, as summarized in Table 40. Of these, 21 involved vehicle-to-vehicle conflicts and 19 involved vehicle-to-pedestrian conflicts, with no vehicle-to-bicyclist conflicts observed. As shown in Table 40, most observed conflicts (34 out of 40) fall within the 2–3-second PET range, while four (4) fall within the 1.5–2-second range and two (2) fall within the 0–1.5-second range, indicating several higher-risk interactions. Notably, all conflicts in the lowest PET range involve pedestrians, highlighting the increased severity and risk to vulnerable road users at the intersection.

Table 40. Summary of Near Misses for a Day (24-hours) at Intersection #6 – Gaither Road & Piccard Drive

| Post Encroachment Time (PET) | Vehicle-Vehicle | Vehicle-Pedestrian | Vehicle-Bicyclist | Total |
|------------------------------|-----------------|--------------------|-------------------|-----------|
| 0.0 - 1.5s | 0 | 2 | 0 | 2 |
| 1.5 - 2.0s | 2 | 2 | 0 | 4 |
| 2.0 - 3.0s | 19 | 15 | 0 | 34 |
| Total | 21 | 19 | 0 | 40 |

Based on video analysis of near-miss events, Table 41 summarizes the most frequent conflict types observed at the intersection. The highest number of conflicts (13) occurred between westbound left-turning vehicles and eastbound through vehicles, indicating that left-turn movements are a primary source of conflict at the intersection. The next most frequent conflicts include interactions between westbound through vehicles and west leg pedestrians

(5 conflicts) and eastbound left-turning vehicles and westbound through vehicles (4 conflicts). These findings suggest that both left-turn movements and pedestrian interactions along the west leg are key contributors to conflicts at the intersection, highlighting areas where targeted safety improvements may be warranted.

Table 41. Top Three Conflict Types by Movements based on Near Miss Video Analysis at Intersection #6 – Gaither Road & Piccard Drive

| Conflict Rank | Movement 1 | Movement 2 | Conflicts |
|---------------|-------------------|---------------------|-----------|
| 1. | Westbound Left | Eastbound Through | 13 |
| 2. | Westbound Through | West Leg Pedestrian | 5 |
| 3. | Eastbound Left | Westbound Through | 4 |

EXISTING TRAFFIC OPERATIONS

Table 42 shows the results of traffic operations analysis for this intersection based on existing lane configurations, peak-hour traffic volumes, and signal timing parameters. Drivers experience minor delays on the east and westbound approaches, while those on the north and southbound approaches experience relatively little delay.

Table 42. Results of Traffic Operation Analysis at Intersection #6 – Gaither Road & Piccard Drive

| Approach | Movement | Weekday AM Peak Hour | | | Weekday PM Peak Hour | | |
|-----------------------------|-------------------------|----------------------|----------|----------------------------|----------------------|----------|----------------------------|
| | | Delay (sec) | LOS | 95th Percentile Queue (ft) | Delay (sec) | LOS | 95th Percentile Queue (ft) |
| Eastbound | Eastbound Through | 20.1 | C | 28 | 22.2 | C | 87 |
| | Eastbound Right | 19.8 | B | 11 | 20.4 | C | 38 |
| | Overall Approach | 19.9 | B | | 21.3 | C | |
| Westbound | Westbound Through | 21.4 | C | 71 | 21.4 | C | 68 |
| | Overall Approach | 21.4 | C | | 21.4 | C | |
| Northbound | Northbound Through | 9.1 | A | 53 | 9.7 | A | 71 |
| | Overall Approach | 9.1 | A | | 9.7 | A | |
| Southbound | Southbound Through | 8.8 | A | 39 | 9.2 | A | 53 |
| | Overall Approach | 8.8 | A | | 9.2 | A | |
| Overall Intersection | | 12.0 | B | | 13.6 | B | |

LOS = Level of Service

= 95th percentile volume exceeds capacity, queue may be longer

SITE VISIT OBSERVATIONS

A site visit was conducted on April 7, 2026, to evaluate pedestrian crossing operations and vehicle behavior at this signalized intersection. Photos and comments are included in Appendix F and in Figure 41 and Figure 42.

Crosswalks are not high visibility, and drivers queued on the minor approaches were observed encroaching into the crosswalk. Pedestrian service is limited by push-button actuation and a short crossing time across Gaither Road relative to the crossing distance.

Driver behavior observations indicate operating speeds above the posted limit, particularly on the southbound approach, which descends downhill toward the intersection. The northwest corner curb radius allows higher-speed right turns that may conflict with people walking. Truck traffic was observed on Piccard Drive despite posted restrictions.

Figure 41. Wide curb radii allow drivers to turn right at high speeds off of Gaither Road at Intersection #6 – Gaither Road & Piccard Drive



Figure 42. Cars on Piccard Drive parked close to Intersection #6 – Gaither Road & Piccard Drive



IDENTIFIED SAFETY ISSUES

Key safety issues and other findings are shown in Table 43 and described below.

Table 43. Key Safety Issues at Intersection #6 – Gaither Road & Piccard Drive

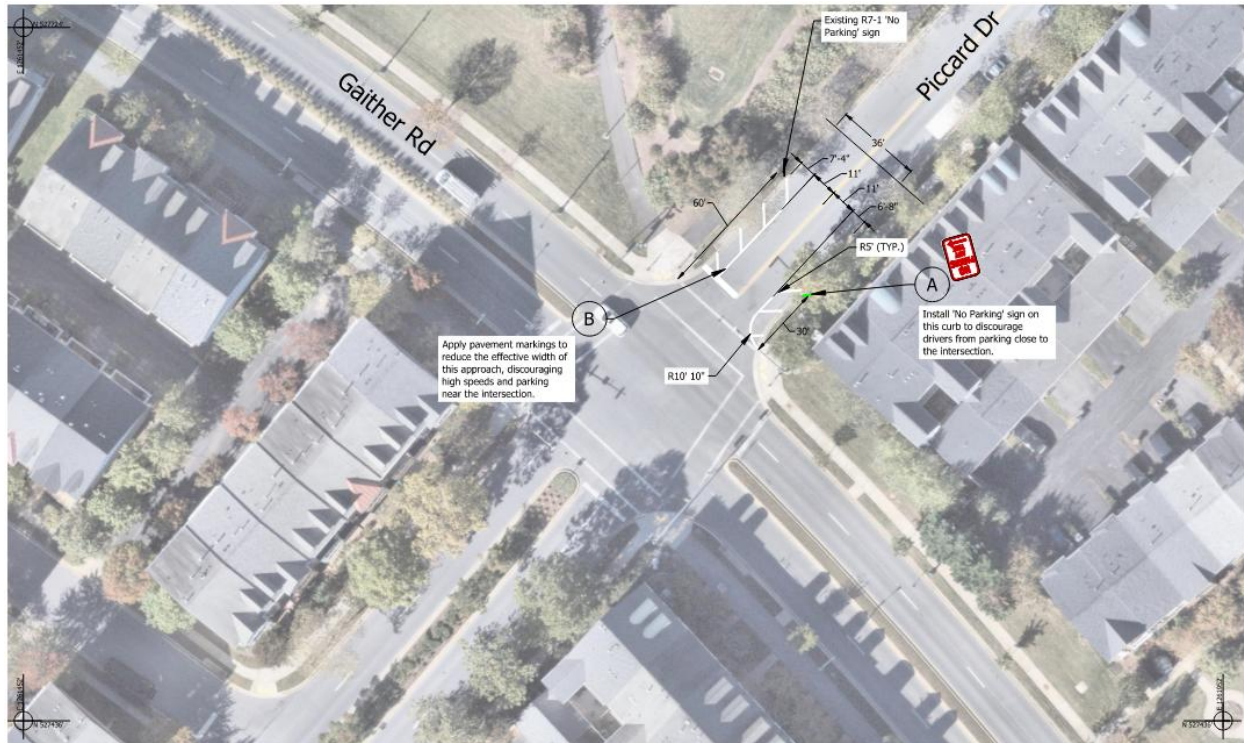
| Issue ID | Safety Issue | Safety Issue Type | Crash Data | Near-Miss Video | Site Visit |
|----------|--|---|------------|-----------------|------------|
| 6-A | Parking regulations near the EB and WB approaches are inconsistent and discrete, allowing cars to park too close to the intersection, sometimes blocking pedestrian visibility. | 2.1 Conflicts Between Users: Drivers Turning and Pedestrians 3.2 Roadway Design: Pedestrian Visibility | ✓ | | ✓ |
| 6-B | Drivers approaching the intersection from the north do so on a downward slope, often at high speeds. Northbound left-turning drivers sometimes struggle to find an acceptable gap in two lanes of high-speed through traffic. | 8.4 Conflict Type: Left Turn | ✓ | ✓ | ✓ |
| 6-C | Pedestrians encounter long crossing distances at this intersection. | 5.1 Pedestrian: Intersection Crossing | | | ✓ |
| 6-D | The curb radii at this intersection is wide, encouraging high-speed right turns from Gaither Rd onto Piccard Dr. | 2.2 Conflicts Between Users: Drivers and Pedestrians | | | ✓ |
| 6-E | The crosswalk pavement markings at this intersection are faded and not high-visibility. | 5.1 Pedestrian: Intersection Crossing | ✓ | | ✓ |
| 6-F | The single lanes on the eastbound and westbound approaches are wide, encouraging drivers to approach the intersection and turn at high speeds. | 1.2 Speeds, Severity, and Compliance: High-Speed Turns | ✓ | | |

Recommendations

SHORT-TERM RECOMMENDATIONS

Figure 43 shows the proposed short-term recommendations, which focus on using pavement markings and flex posts to install median and curb extensions, as well as daylighting areas.

Figure 43. Short-term Recommendations at Intersection #6 – Gaither Road & Piccard Drive



LEGEND

- (A) Proposed R7-1 parking restriction sign (12" x 18")
- (B) 5" white striping pavement marking (see detail B1)

Table 44 shows the key elements of the short-term recommendations, along with the safety issues that they address.

Table 44. Short-term Recommendations at Intersection #6 – Gaither Road & Piccard Drive

| Rec. ID | Recommendation | Safety issue(s) addressed |
|---------|--|---------------------------|
| 6-S-1 | Install 'No Parking' (R7-1) sign on the south curb of the east leg. | 6-A |
| 6-S-2 | Consider adding No Parking zones on the westbound approach to the east leg to implement daylighting. | 6-A, 6-F |

COST ESTIMATE

Table 45 provides a planning-level cost estimate for the short-term recommendations, based on item quantities and recent Maryland SHA price index sheets, and excludes contingency and mobilization.

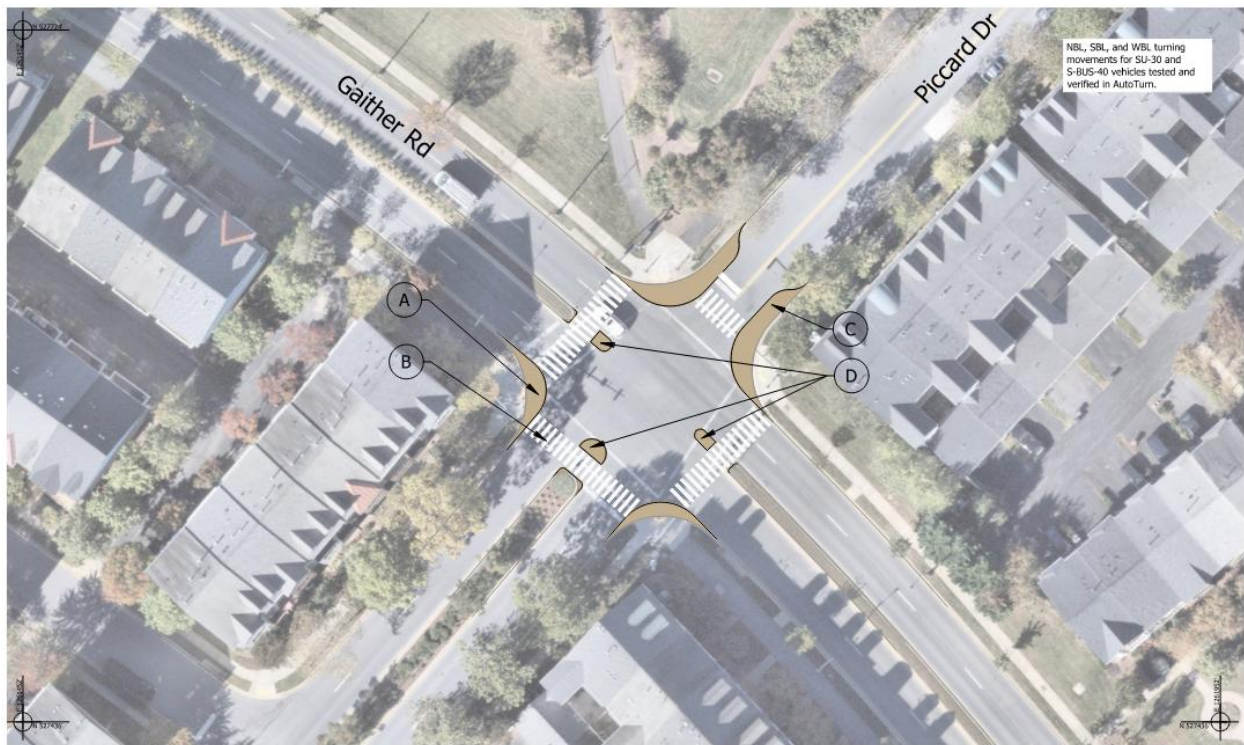
Table 45. Planning-Level Cost Estimate at Intersection #6 – Gaither Road & Piccard Drive

| Item | Description | Unit | Unit Cost | Quantity | Cost |
|------------------|--------------------------------|------|-----------|----------|-------------------|
| Pavement Marking | 24" Stop Bar | LF | \$21.75 | 18.33 | \$398.68 |
| Pavement Marking | 5" solid marking (white) | LF | \$7.00 | 137 | \$959.00 |
| Sign | New sign post | EACH | \$193.76 | 1 | \$193.76 |
| Sign | Parking regulation sign [R7-1] | EACH | \$120.00 | 1 | \$120.00 |
| Total: | | | | | \$1,671.44 |

LONG-TERM RECOMMENDATIONS

Figure 44 shows the proposed long-term recommendations, which focus on installing permanent curb and median extensions, installing directional ADA-compliant pedestrian curb ramps, and exploring automated speed enforcement

Figure 44. Long-term Recommendations at Intersection #6 – Gaither Road & Piccard Drive



LEGEND

- (A)** Tighten curb radii
- (B)** High-visibility continental crosswalk
- (C)** Curb extension
- (D)** Pedestrian refuge island

Table 46 shows the key elements of the long-term recommendations, along with the safety issues that they address.

Table 46. Long-term Recommendations at Intersection #6 – Gaither Road & Piccard Drive

| Rec. ID | Recommendation | Safety issue(s) addressed |
|---------|--|---------------------------|
| 6-L-1 | Consider installing permanent curb extensions on the westbound approach. | 6-A, 6-D |
| 6-L-2 | Explore warrants for automated speed enforcement on this corridor. | 6-B |
| 6-L-3 | Consider adjusting all corners to reduce radii. Add directional ADA-compliant ramps. | 6-D, 6-C |
| 6-L-4 | Apply high-visibility continental crosswalk pavement markings on each approach. | 6-E |
| 6-L-5 | Consider extending medians to provide pedestrians with increased protection. Provide refuge islands if space allows. | 6-C |

#7 – E. JEFFERSON STREET & CONGRESSIONAL LANE

Existing Conditions

INTERSECTION DESCRIPTION

The intersection of E. Jefferson Street & Congressional Lane is shown on Figure 45. E. Jefferson Street & Congressional Lane are classified as major collectors. Both roads have a 25 MPH speed limit. E. Jefferson Street & Congressional Lane are both two-lane roadways. The intersection is All-Way Stop Controlled. In 2024, Annual Average Daily Traffic (AADT) on E. Jefferson St was 16,740, and 10,695 on Congressional Lane.¹

According to the Rockville Comprehensive Land Use Policy Map², land uses adjacent to the intersection are “commercial” to the east of E. Jefferson St, and “residential” to the west of E. Jefferson Street. There is a RideOn Route 26 bus stop located at the northwestbound approach of E. Jefferson Street. There are sidewalks in all directions, and high-visibility crosswalks on E. Jefferson St crossing Congressional Lane.

The Congressional Lane Complete Streets project included the intersection of E. Jefferson Street & Congressional Lane. This project is part of the City of Rockville’s Complete Streets program and recommends high-visibility crosswalks and replacing the existing curb ramps.

Figure 45. #7 – E. Jefferson Street & Congressional Lane Intersection



SAFETY REVIEW

CRASH DATA ANALYSIS

A total of one (1) crash was recorded at the intersection during the three-year period from 2022 to 2024. The reported crashes involved only vehicles and resulted in property-damage-only (PDO) outcomes, with no injuries reported. Table 47 summarizes the crash characteristics, including collision types, lighting conditions, and roadway surface conditions. No contributing circumstances are reported for the one crash at the intersection.

Table 47. Summary of Three-Year (2022-24) Crashes at Intersection #7 – E. Jefferson Street & Congressional Lane

| Total Crashes | Total Crashes by Year | | | Total Crashes by User | | |
|---------------|-----------------------|------|------|-----------------------|---------|------------|
| 1 | 2022 | 2023 | 2024 | Auto | Cyclist | Pedestrian |
| | 0 | 0 | 1 | 1 | 0 | 0 |

| Total Crashes by Severity | | | | |
|---------------------------|---------|-------|-----------------|-----------------|
| Fatal | Serious | Minor | Possible Injury | Property Damage |
| 0 | 0 | 0 | 0 | 1 |

| Total Crashes by Collision Type | | | |
|---------------------------------|-------------------------|----------------|-------|
| Sideswipe, same direction | Same Direction Rear End | Single Vehicle | Other |
| 1 | 0 | 0 | 0 |

| Lighting | | | Road Surface | | | |
|----------|--------------|------|--------------|-----|-----------|---------|
| Daylight | Dark-Lighted | Dawn | Dry | Wet | Ice/Frost | Unknown |
| 1 | 0 | 0 | 1 | 0 | 0 | 0 |

Note: Crash summaries are based on the available crash data reviewed for this study. Reported crash totals and locations may vary across source datasets due to differences in reporting methods, geocoding, and intersection buffers.

NEAR-MISS VIDEO ANALYSIS

Post-Encroachment Time (PET), which measures the temporal separation between two users occupying the same conflict area, was used to assess the severity of these interactions and is calculated only when both users pass through the same conflict point. Based on 24-hour video observations at the intersection, a total of 39 near-miss events were identified, as summarized in Table 48. Of these, none (zero) involved vehicle-to-vehicle conflicts, 37 involved vehicle-to-pedestrian, and two (2) involved vehicle-to-bicyclist. As shown in Table 48, nearly all observed conflicts fall within the 2–3 second PET range, four (4) of the conflicts fall within the 1.5–2 second range, and only one (1) conflict falls within the 0-1.5 second range, indicating generally moderate levels of conflict severity. However, since many of the conflicts involve vulnerable road users (pedestrians or bicyclists), the intersection has significant potential for serious injury or fatal crashes in the future.

Table 48. Summary of Near Misses for a Day (24-hours) at Intersection #7 – E. Jefferson Street & Congressional Lane

| Post Encroachment Time (PET) | Vehicle-Vehicle | Vehicle-Pedestrian | Vehicle-Bicyclist | Total |
|------------------------------|-----------------|--------------------|-------------------|-----------|
| 0.0 - 1.5s | 0 | 1 | 0 | 1 |
| 1.5 - 2.0s | 0 | 4 | 0 | 4 |
| 2.0 - 3.0s | 0 | 32 | 2 | 34 |
| Total | 0 | 37 | 2 | 39 |

Based on video analysis of near-miss events, Table 49 summarizes the most frequent conflict types observed at the intersection. All three top conflict types involve pedestrians, indicating a strong pattern of pedestrian-related interactions at the intersection. Notably, conflicts between westbound through vehicles and pedestrians on both the west leg and east leg account for two of the top three conflict categories. This highlights that pedestrian crossings along the westbound approach are particularly vulnerable and contribute significantly to the overall frequency of conflicts at the intersection.

Table 49. Top Three Conflict Types by Movements based on Near Miss Video Analysis at Intersection #7 – E. Jefferson Street & Congressional Lane

| Conflict Rank | Movement 1 | Movement 2 | Conflicts |
|---------------|---------------------------|---------------------------|-----------|
| 1. | Westbound Through | Westbound Left Pedestrian | 5 |
| 2. | Eastbound Left Pedestrian | Northbound Right | 4 |
| 3. | Westbound Through | Eastbound Left Pedestrian | 3 |

EXISTING TRAFFIC OPERATIONS

Table 50 shows the results of traffic operations analysis for this intersection based on existing lane configurations and peak-hour traffic volumes. Drivers on all approaches currently experience minimal delays during all time periods.

Table 50. Results of Traffic Operation Analysis at Intersection #7 – E. Jefferson Street & Congressional Lane

| Approach | Movement | Weekday AM Peak Hour | | | Weekday PM Peak Hour | | |
|-----------------------------|-------------------------|----------------------|----------|----------------------------|----------------------|----------|----------------------------|
| | | Delay (sec) | LOS | 95th Percentile Queue (ft) | Delay (sec) | LOS | 95th Percentile Queue (ft) |
| Eastbound | Eastbound Through | - | - | - | - | - | - |
| | Overall Approach | 8.2 | A | | 9.1 | A | |
| Westbound | Westbound Through | - | - | - | - | - | - |
| | Overall Approach | 9.9 | A | | 13.3 | B | |
| Northbound | Northbound Through | - | - | - | - | - | - |
| | Overall Approach | 8.8 | A | | 12.0 | B | |
| Southbound | Southbound Through | - | - | - | - | - | - |
| | Overall Approach | 8.6 | A | | 9.0 | A | |
| Overall Intersection | | 9.2 | A | | 12.1 | B | |

LOS = Level of Service
 # = 95th percentile volume exceeds capacity, queue may be longer

SITE VISIT OBSERVATIONS

A site visit was conducted on April 9, 2026, to review the operations of stop-controlled intersections. Crosswalk markings are incomplete, with some approaches lacking transverse markings or solid white lines. ADA-detectable warning surfaces are missing at several corners, despite crosswalks being present on all legs (Figure 46, Figure 47, Figure 48).

Driver behavior observations indicate rolling stops and higher-speed turning movements, supported by wide approach and receiving lanes. Bicycle facilities are limited to a nearby bikeshare station, with no corresponding pavement markings or signage at the intersection.

Photos in Appendix F show crosswalk markings, curb ramp conditions, lane widths, and bikeshare proximity.

Figure 46. Crosswalks missing ADA-compliant detectable warning surfaces, horizontal and transverse solid white line at Intersection #7 – E. Jefferson Street & Congressional Lane



Figure 47. Bicycle route without any bicycle lane or symbol marking along Congressional Lane at Intersection #7 – E. Jefferson Street & Congressional Lane



Figure 48. Bus stop at the southeast corner of the intersection is missing ADA-compliant amenities, bus pad, and parking regulation signage at Intersection #7 – E. Jefferson Street & Congressional Lane



IDENTIFIED SAFETY ISSUES

Key safety issues and other findings are shown in Table 51 and described below.

Table 51. Key Safety Issues for Intersection #7 - E. Jefferson Street & Congressional Lane

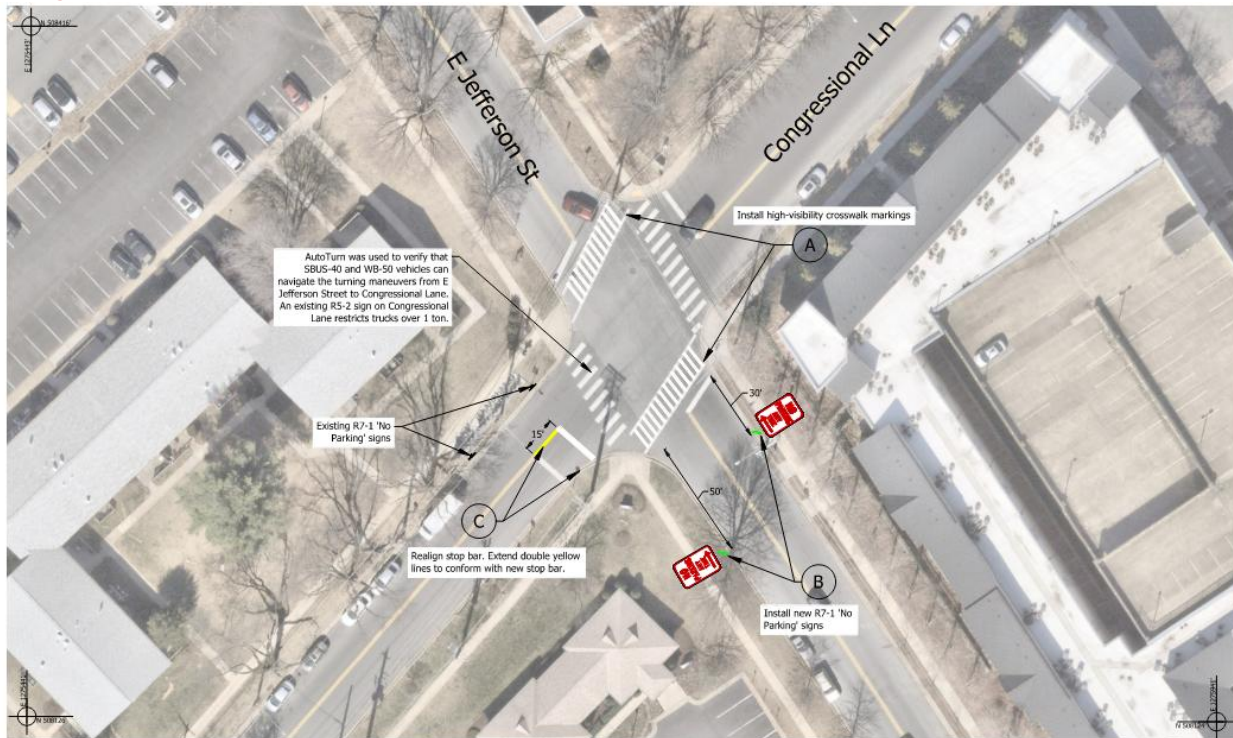
| Issue ID | Safety Issue | Safety Issue Type | Crash Data | Near-Miss Video | Site Visit |
|----------|---|--|------------|-----------------|------------|
| 7-A | Rolling stops observed at stop controlled intersection. | 7.7 User Behavior: Failure to Stop at AWSC/TWSC intersection | | | ✓ |
| 7-B | Drivers feel comfortable to make left/right turns at the intersection (some times in high speeds, as observed) because the wide approaching/receiving lanes | 1.2 Speeds, Severity, and Compliance: High-Speed Turns | | | ✓ |
| 7-C | The intersection has crosswalks on all legs, but ADA detectable warning surface only at one corner. All three corners missing detectable warning surface. | 4.1 Accessibility (ADA): Insufficient Curb Ramps | | | ✓ |
| 7-D | Bike Route without any bike lane pavement marking or bicyclist sign on the pavement. | 6.2 Bicyclist: Insufficient bicycle facilities | | ✓ | ✓ |
| 7-E | There is bus stop near this intersection at southeast corner on E Jefferson Street. Amenities for passengers are provided but could be improved with ADA detectable warning surface, concrete bus pad, and no parking zone signage. | 4.1 Accessibility (ADA): Insufficient Curb Ramps | | | ✓ |
| 7-F | Crosswalks across Congressional Lane do not have horizontal white pavement line and crosswalks across East Jefferson Street to not have transverse pavement marking. | 5.1 Pedestrian: Intersection Crossing | | ✓ | ✓ |

Recommendations

SHORT-TERM RECOMMENDATIONS

Figure 49 shows the planned short-term improvements focus on low-cost, quick-build treatments to enhance visibility, reduce speeds, and better define the intersection geometry. More detailed information can be found in Table 52. These measures rely on pavement markings, flexible delineators, and ADA upgrades to improve safety for pedestrians, bicyclists, and drivers while setting the foundation for future long-term changes.

Figure 49. Short-Term Recommendations for Intersection #7 – E. Jefferson Street & Congressional Lane



LEGEND

- (A) Proposed crosswalk markings. See Detail A.
- (B) Proposed parking restriction signs (R7-1): 12" x 18"
- (C) Realign stop bar

Table 52. Short-Term Recommendations for Intersection #7 – E. Jefferson Street & Congressional Lane

| Rec. ID | Recommendation | Safety issue(s) addressed |
|---------|---|---------------------------|
| 7-S-1 | Install high-visibility crosswalks on E Jefferson Street. | 7-E |
| 7-S-2 | Install No Parking signage (R7-1) for daylighting on East Jefferson Street. | 7-D |

COST ESTIMATE

Table 53 provides a planning-level cost estimate for the short-term recommendations, based on item quantities and recent Maryland SHA price index sheets, and excludes contingency and mobilization.

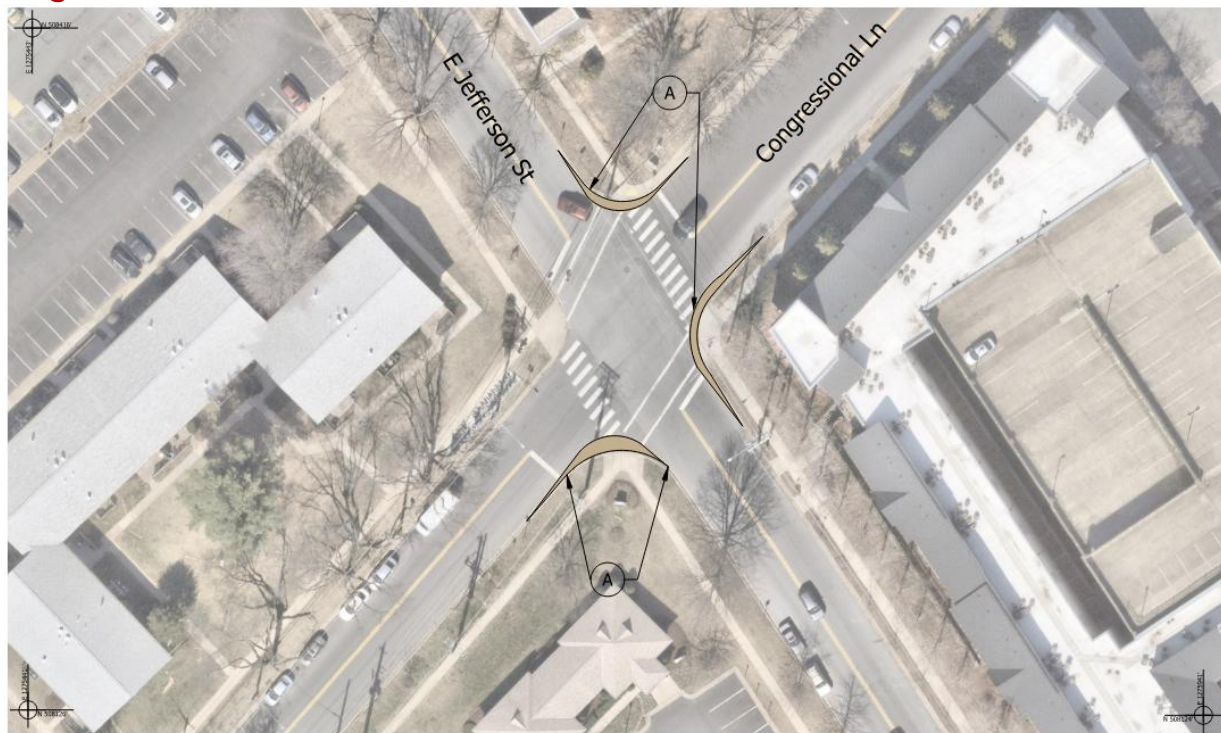
Table 53. Planning-Level Cost Estimate at Intersection #7 – E. Jefferson Street & Congressional Lane

| Item | Description | Unit | Unit Price | Quantity | Item Cost |
|------------------|--------------------------------|------|------------|----------|-------------------|
| Pavement Marking | 12" Crosswalk | LF | \$6.19 | 340 | \$2,103.95 |
| Sign | New sign post | EACH | \$193.76 | 2 | \$387.52 |
| Sign | Parking regulation sign [R7-1] | EACH | \$120.00 | 2 | \$240.00 |
| Total: | | | | | \$2,731.47 |

LONG-TERM RECOMMENDATIONS

Figure 50 shows the planned long-term capital improvements for the intersection of E. Jefferson Street & Congressional Lane. The proposed long-term improvements focus on reallocating roadway space, improving multimodal safety, and reducing vehicle speeds at the intersection. Key strategies include curb extensions, additional bike facilities, on-street parking for traffic calming, and the potential installation of a median to better organize traffic and reduce conflicts for all users.

Figure 50. Long-Term Recommendations for Intersection #7 – E. Jefferson Street & Congressional Lane



LEGEND

- A Proposed concrete curb extension

Table 54 shows the key elements of the long-term recommendations, along with the safety issues that they address.

Table 54. Long-Term Recommendations for Intersection #7 – E. Jefferson Street & Congressional Lane

| Rec. ID | Recommendation | Safety issue(s) addressed |
|---------|--|---------------------------|
| 7-L-1 | Evaluate shared bike lane on west side of Congressional Lane. | 7-D |
| 7-L-2 | Consider installing concrete curb extensions at all approaches. | 7-F |
| 7-L-3 | Evaluate cross-section (48') update: two (2) 11' travel lanes + two (2) 8' parking lanes + two (2) 5' bike lanes | 7-A |
| 7-L-4 | Consider installing a parking lane along both directions of Congressional Lane on the East leg. | 7-A |

#8 – HALPINE ROAD & SHOPPING CENTER ENTRANCE (CONGRESSIONAL PLAZA)

Existing Conditions

INTERSECTION DESCRIPTION

The intersection of Halpine Road & Shopping Center Entrance (Congressional Plaza) is shown on Figure 51. Halpine Road is classified as a local road. The intersection is signal-controlled and includes driveways into Congressional Plaza and the Residences at Congressional Village to the north and south, respectively. Annual Average Daily Traffic (AADT) is not provided for this intersection.

According to the Rockville Comprehensive Land Use Policy Map², land uses adjacent to the intersection are “office commercial residential mix” to the north and south of Halpine Road, including Congressional Plaza, a strip mall, to the north, and the Residences at Congressional Village, an apartment complex, to the south. There is a RideOn Route 5 and Route 6 bus stop located on the southwest-bound receiving lane of Halpine Road. There are sidewalks in all directions and standard crosswalks at all approaches to intersections.

Figure 51. #8 – Halpine Road & Shopping Center Entrance (Congressional Plaza) Intersection



SAFETY REVIEW

CRASH DATA ANALYSIS

A total of seven (7) crashes were recorded at the intersection during the three-year period from 2022 to 2024. One crash included pedestrians; six crashes involved only vehicles; and none involved cyclists. One crash involved minor injuries, one crash involved a possible injury, and five crashes resulted in property-damage-only (PDO). Table 55 summarizes the crash characteristics, including collision types, lighting conditions, and roadway surface conditions.¹

Table 55. Summary of Three-Year (2022-24) Crashes at Intersection #8 – Halpine Road & Shopping Center Entrance (Congressional Plaza)

| Total Crashes | Total Crashes by Year | | | Total Crashes by User | | |
|---------------|-----------------------|------|------|-----------------------|---------|------------|
| 7 | 2022 | 2023 | 2024 | Auto | Cyclist | Pedestrian |
| | 0 | 3 | 4 | 6 | 0 | 1 |

| Total Crashes by Severity | | | | |
|---------------------------|---------|-------|-----------------|-----------------|
| Fatal | Serious | Minor | Possible Injury | Property Damage |
| 0 | 0 | 1 | 1 | 5 |

| Total Crashes by Collision Type | | | |
|---------------------------------|----------------|----------------|-------|
| Angle | Single Vehicle | Front to Front | Other |
| 4 | 1 | 1 | 1 |

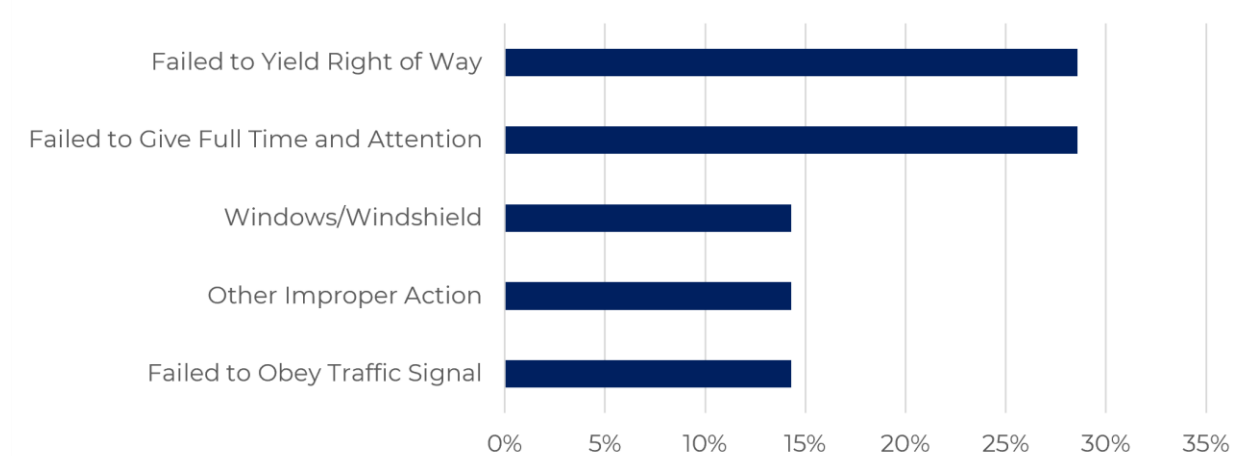
| Lighting | | | Road Surface | | | |
|----------|--------------|------|--------------|-----|-----------|---------|
| Daylight | Dark-Lighted | Dawn | Dry | Wet | Ice/Frost | Unknown |
| 6 | 1 | 0 | 7 | 0 | 0 | 0 |

Note: Crash summaries are based on the available crash data reviewed for this study. Reported crash totals and locations may vary across source datasets due to differences in reporting methods, geocoding, and intersection buffers.

Figure 52 illustrates the percentage of crashes accounting for each contributing circumstance associated with crashes at the intersection during the 2022–2024 study period. A single crash may involve multiple contributing circumstances, as documented in the crash reports. As shown in the figure, the most frequently observed contributing factors are failure to yield right-of-way and failure to give full time and attention, followed by other factors such as inattentive driving, improper actions, windshield-related issues, and failure to obey traffic signals. Overall, the contributing circumstances are predominantly driver-related, indicating that driver behavior is the primary contributor to crashes at the intersection.

¹Crash data from MDSP differs from crash data from MSHA. Total number of crashes shared by MSHA is six (6) in three years. The downloaded crash data from MDSP shows one (1) additional crash. The discrepancies were in 2023 (MSHA reported 4 crashes) and 2024 (MSHA reported 2 crashes). These differences may be attributed to the differences in reporting thresholds and data collection practices between MSHA and MDSP.

Figure 52. Percentage of Crashes Accounting for Each Contributing Circumstance at Intersection #8 – Halpine Road & Shopping Center Entrance (Congressional Plaza)



NEAR-MISS VIDEO ANALYSIS

Post-Encroachment Time (PET), which measures the temporal separation between two users occupying the same conflict area, was used to assess the severity of these interactions and is calculated only when both users pass through the same conflict point. Based on 24-hour video observations at the intersection, a total of 79 near-miss events were identified, as summarized in Table 56. Of these, 31 involved vehicle-to-vehicle conflicts, 47 involved vehicle-to-pedestrian conflicts, and one (1) involved a vehicle-to-bicyclist conflict. The majority of the conflicts fall within the 2-3 second range (70), while nine (9) conflicts fall within the 1.5-2 second range, and none (0) fall within the 0-1.5 second range. This indicates a generally moderate level of conflict severity. However, the high proportion of vehicle-to-pedestrian conflicts indicates that the intersection has significant potential for serious injury or fatal crashes in the future.

Table 56. Summary of Near Misses for a Day (24-hours) at Intersection #8 – Halpine Road & Shopping Center Entrance (Congressional Plaza)

| Post Encroachment Time (PET) | Vehicle-Vehicle | Vehicle-Pedestrian | Vehicle-Bicyclist | Total |
|------------------------------|-----------------|--------------------|-------------------|-----------|
| 0.0 - 1.5s | 0 | 0 | 0 | 0 |
| 1.5 - 2.0s | 1 | 8 | 0 | 9 |
| 2.0 - 3.0s | 30 | 39 | 1 | 70 |
| Total | 31 | 47 | 1 | 79 |

Based on video analysis of near-miss events, Table 57 summarizes the most frequent conflict types observed at the intersection. The highest number of conflicts (16) occurred between southbound left-turning vehicles and northbound through vehicles, followed by conflicts between westbound left-turning vehicles and northbound through vehicles, indicating that left-turn movements are a primary source of interaction and potential risk at the intersection.

Table 57. Top Three Conflict Types by Movements based on Near Miss Video Analysis at Intersection #8 – Halpine Road & Shopping Center Entrance (Congressional Plaza)

| Conflict Rank | Movement 1 | Movement 2 | Conflicts |
|---------------|---------------------|-------------------|-----------|
| 1. | Westbound Left | Eastbound Through | 16 |
| 2. | Eastbound Left | Westbound Through | 15 |
| 3. | East Leg Pedestrian | Southbound Left | 6 |

EXISTING TRAFFIC OPERATIONS

Table 58 shows the results of traffic operations analysis for this intersection based on existing lane configurations, peak-hour traffic volumes, and signal timing parameters. Drivers on all approaches currently experience minimal delays during all time periods.

Table 58. Results of Traffic Operation Analysis at Intersection #8 – Halpine Road & Shopping Center Entrance (Congressional Plaza)

| Approach | Movement | Weekday AM Peak Hour | | | Weekday PM Peak Hour | | |
|-----------------------------|-------------------------|----------------------|----------|----------------------------|----------------------|----------|----------------------------|
| | | Delay (sec) | LOS | 95th Percentile Queue (ft) | Delay (sec) | LOS | 95th Percentile Queue (ft) |
| Eastbound | Eastbound Through | 10.7 | B | 49 | 10.5 | B | 48 |
| | Overall Approach | 10.7 | B | | 10.5 | B | |
| Westbound | Westbound Through | 9.9 | A | 31 | 10.2 | B | 40 |
| | Overall Approach | 9.9 | A | | 10.2 | B | |
| Northbound | Northbound Through | 11.9 | B | 22 | 12.3 | B | 32 |
| | Overall Approach | 11.9 | B | | 12.3 | B | |
| Southbound | Southbound Through | 13.0 | B | 45 | 14.0 | B | 71 |
| | Overall Approach | 13.0 | B | | 14.0 | B | |
| Overall Intersection | | 11.1 | B | | 11.5 | B | |

LOS = Level of Service
 # = 95th percentile volume exceeds capacity, queue may be longer

SITE VISIT OBSERVATIONS

A site visit was conducted on April 9, 2026, to document pedestrian crossing and access conditions at this unsignalized intersection. Crosswalks are marked with parallel lines only and could be upgraded to high-visibility markings. Pedestrian push-button signage for the accessible pedestrian signal was observed to be faded. Photos of site visit observations can be found in Figure 53 and Figure 54.

Although a median exists along Halpine Road, it does not currently provide a pedestrian refuge at the crosswalk. This limits the ability for pedestrians to cross in stages. Sidewalk connections to the shopping center entrance are present but lack additional pedestrian comfort features.

Photos in Appendix F illustrate crosswalk markings, median configuration, pedestrian signal signage, and site access conditions.

Figure 53. Existing crosswalks at all approaches of Intersection #8 - Halpine Road and Congressional Plaza



Figure 54. Figure 55: Existing crosswalk crossing Halpine Road at Intersection #8 - Halpine Road and Congressional Plaza



IDENTIFIED SAFETY ISSUES

Key safety issues and other findings are shown in Table 59 and described below.

Table 59. Key Safety Issues at Intersection #8 – Halpine Road & Shopping Center Entrance (Congressional Plaza)

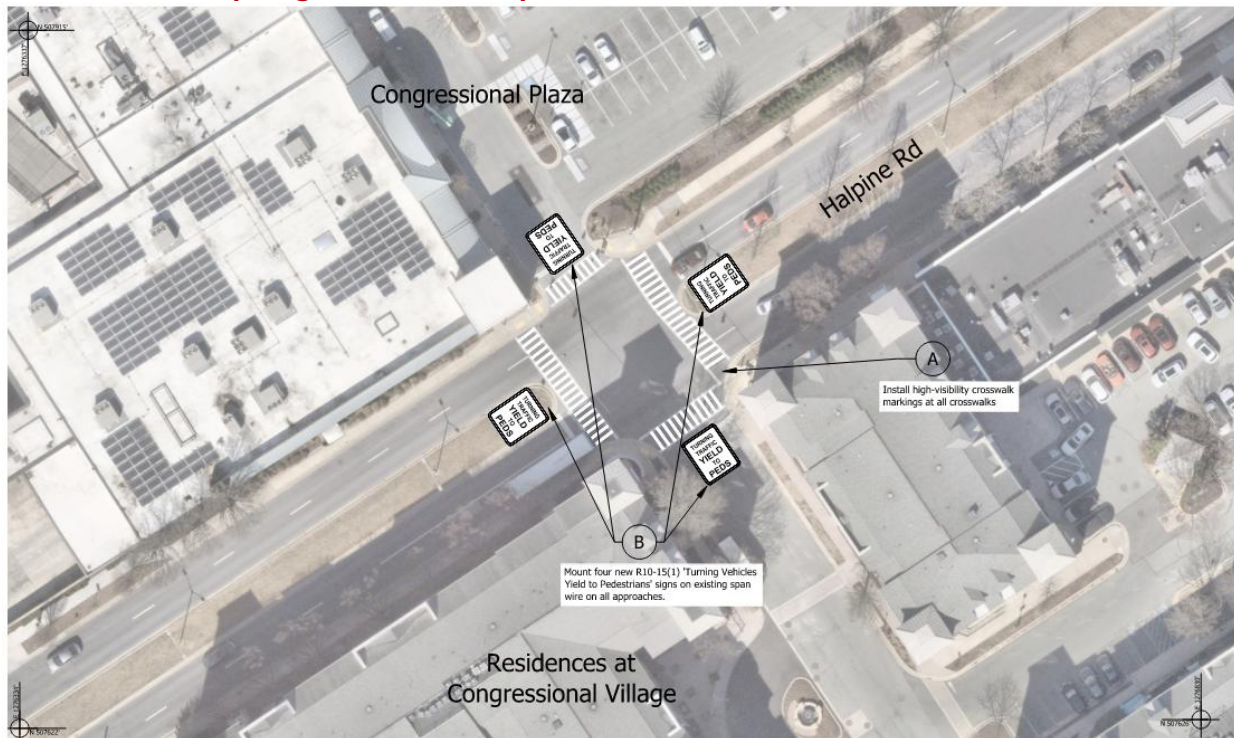
| Issue ID | Safety Issue | Safety Issue Type | Crash Data | Near-Miss Video | Site Visit |
|----------|--|---|------------|-----------------|------------|
| 8-A | No Pedestrian Refuge Island along Halpine Rd crosswalks; there is a median along Halpine Rd which can be extended to have a pedestrian refuge island. | 5.1.1 Pedestrian: Intersection Crossing (Long Crossing) | ✓ | | ✓ |
| 8-B | Crosswalks at all approaches are not high-visibility. | 5.1 Pedestrian: Intersection Crossing | | | ✓ |

Recommendations

SHORT-TERM RECOMMENDATIONS

Figure 55 shows proposed short-term improvements that focus on enhancing visibility, reinforcing pedestrian priority, and refreshing existing traffic control elements at this commercial access point, with Table 60 showing more information. These low-cost treatments aim to improve driver awareness, reduce pedestrian-vehicle conflicts, and clarify intersection operations, particularly in a high-turnover, high-activity shopping center environment.

Figure 55. Short-Term Recommendations for Intersection #8 – Halpine Road & Shopping Center Entrance (Congressional Plaza)



LEGEND

- (A) Proposed crosswalk markings. See Detail A.
- (B) Proposed Yield to Pedestrians R10-15(1) signs: 24" x 30"

Table 60. Short-Term Recommendations for Intersection #8 – Halpine Road & Shopping Center Entrance (Congressional Plaza)

| Rec. ID | Recommendation | Safety issue(s) addressed |
|---------|---|---------------------------|
| 8-S-1 | Install high-visibility crosswalks at all legs of the intersection. | 8-B |
| 8-S-2 | Install Turning Traffic Yield to Pedestrians, R10-15(1), signs at the intersection. | 8-A |

COST ESTIMATE

Table 61 provides a planning-level cost estimate for the short-term recommendations, based on item quantities and recent Maryland SHA price index sheets, and excludes contingency and mobilization.

Table 61. Planning-Level Cost Estimate at Intersection #8 – Halpine Road & Shopping Center Entrance (Congressional Plaza)

| Item | Description | Unit | Unit Price | Quantity | Item Cost |
|------------------|--|------|------------|----------|-------------------|
| Pavement Marking | 12" Crosswalk | LF | \$6.19 | 670 | \$4,146.02 |
| Sign | New sign post | EACH | \$193.76 | 3 | \$581.28 |
| Sign | Turning Traffic Stop to Peds sign [R10-15 (1)] | EACH | \$600.00 | 4 | \$2,400.00 |
| Total: | | | | | \$7,127.30 |

LONG-TERM RECOMMENDATIONS

Figure 56 shows the planned long-term capital improvements for the intersection of Halpine Road & Shopping Center Entrance (Congressional Plaza). The proposed long-term improvements focus on pedestrian safety to extend the existing median island and refuge island to better organize traffic and reduce conflicts for all users (Table 62).

Figure 56. Long-Term Recommendations for Intersection #8 – Halpine Road & Shopping Center Entrance (Congressional Plaza)



LEGEND

- (A)** Evaluate adding pedestrian refuge island
- (B)** Install high-visibility crosswalks

Table 62. Long-Term Recommendations for Intersection #8 – Halpine Road & Shopping Center Entrance (Congressional Plaza)

| Rec. ID | Recommendation | Safety issue(s) addressed |
|---------|---|---------------------------|
| 8-L-1 | Consider installing pedestrian refuge island on east leg crosswalk. | 8-B, 8-A |
| 8-L-2 | Consider adjusting yellow and/or all-red timing. | |

#9 – BALTIMORE ROAD & S. STONESTREET AVENUE

Existing Conditions

INTERSECTION DESCRIPTION

The intersection of Baltimore Road & S. Stonestreet Avenue is shown in Figure 57. Baltimore Road & S. Stonestreet Avenue are classified as major collectors. Both roads have a 25 MPH speed limit. Baltimore Road is a two-lane roadway, while S. Stonestreet Avenue is a two-lane roadway with a southbound left-turn lane. The intersection is stop-controlled at the westbound Baltimore Road approach. In 2024, Annual Average Daily Traffic (AADT) on Baltimore Road was 8,241, and 3,435 on S. Stonestreet Avenue¹.

According to the Rockville Comprehensive Land Use Policy Map², land uses adjacent to the intersection are “commercial” and “industrial” to the west of S. Stonestreet Avenue, and “residential detached” to the east of S. Stonestreet Avenue. There are sidewalks in all directions and standard crosswalks on the east and south side of the intersection, while there is no crosswalk at the north side of the intersection crossing S. Stonestreet Avenue.

Figure 57. #9 – Baltimore Road & S. Stonestreet Avenue Intersection



SAFETY REVIEW

CRASH DATA ANALYSIS

A total of one (1) crash was recorded at the intersection during the three-year period from 2022 to 2024. The crash involved only vehicles and resulted in property damage only (PDO), with no injuries reported. Table 63 summarizes the crash characteristics, including collision types, lighting conditions, and roadway surface conditions. No contributing circumstances are reported for the one crash at the intersection.

Table 63. Summary of Three-Year (2022-24) Crashes at Intersection #9 – Baltimore Road & S. Stonestreet Avenue

| Total Crashes | | Total Crashes by Year | | | Total Crashes by User | | |
|---------------|--|-----------------------|------|------|-----------------------|---------|------------|
| 1 | | 2022 | 2023 | 2024 | Auto | Cyclist | Pedestrian |
| | | 0 | 0 | 1 | 1 | 0 | 0 |

| Total Crashes by Severity | | | | |
|---------------------------|---------|-------|-----------------|-----------------|
| Fatal | Serious | Minor | Possible Injury | Property Damage |
| 0 | 0 | 0 | 0 | 1 |

| Total Crashes by Collision Type | | | |
|---------------------------------|-------------------------|----------------|-------|
| Sideswipe | Same Direction Rear End | Single Vehicle | Other |
| 1 | 0 | 0 | 0 |

| Lighting | | | Road Surface | | | |
|----------|--------------|------|--------------|-----|-----------|---------|
| Daylight | Dark-Lighted | Dawn | Dry | Wet | Ice/Frost | Unknown |
| 0 | 1 | | 0 | 1 | 0 | 0 |

Note: Crash summaries are based on the available crash data reviewed for this study. Reported crash totals and locations may vary across source datasets due to differences in reporting methods, geocoding, and intersection buffers.

NEAR-MISS VIDEO ANALYSIS

Post-Encroachment Time (PET), which measures the temporal separation between two users occupying the same conflict area, was used to assess the severity of these interactions and is calculated only when both users pass through the same conflict point. Based on 24-hour video observations at the intersection, a total of 38 near-miss events were identified, as summarized in Table 64. Of these, 17 involved vehicle-to-vehicle conflicts, 20 involved vehicle-to-pedestrian, and one (1) involved vehicle-to-bicyclist. As shown in Table 64, nearly all observed conflicts fall within the 2–3 second PET range; two (2) of the conflicts fall within the 1.5–2 second range, and only one (1) conflict falls within the 0- 1.5 second range, indicating generally moderate levels of conflict severity. However, since many of the conflicts involve vulnerable road users (mainly pedestrians), the intersection has significant potential for serious injury or fatal crashes in the future.

Table 64. Summary of Near Misses for a Day (24-hours) at Intersection #9 – Baltimore Road & S. Stonestreet Avenue

| Post Encroachment Time (PET) | Vehicle-Vehicle | Vehicle-Pedestrian | Vehicle-Bicyclist | Total |
|------------------------------|-----------------|--------------------|-------------------|-----------|
| 0.0 - 1.5s | 0 | 1 | 0 | 1 |
| 1.5 - 2.0s | 0 | 2 | 0 | 2 |
| 2.0 - 3.0s | 17 | 17 | 1 | 35 |
| Total | 17 | 20 | 1 | 38 |

Based on video analysis of near-miss events, Table 65 summarizes the most frequent conflict types observed at the intersection. Two of the top three conflict types involve pedestrians, indicating a strong pattern of pedestrian-related interactions at the intersection. Conflicts between southbound left and northbound through vehicles account for the most conflicts, while westbound right vehicles and pedestrians crossing the north leg, as well as southbound through vehicles and pedestrians crossing the south leg, account for two of the top three conflict categories. This highlights that pedestrian crossings along the north and south legs are particularly vulnerable and contribute significantly to the overall frequency of conflicts at the intersection.

Table 65. Top Three Conflict Types by Movements based on Near Miss Video Analysis at Intersection #9 – Baltimore Road & S. Stonestreet Avenue

| Conflict Rank | Movement 1 | Movement 2 | Conflicts |
|---------------|--------------------|----------------------|-----------|
| 1. | Southbound Left | Northbound Through | 11 |
| 2. | Westbound Right | North Leg Pedestrian | 3 |
| 3. | Southbound Through | South Leg Pedestrian | 3 |

EXISTING TRAFFIC OPERATIONS

Table 66 shows the results of traffic operations analysis for this intersection based on existing lane configurations, peak-hour traffic volumes, and signal timing parameters. Drivers experience minor delays on the eastbound approach, while those on all other approaches experience relatively little delay.

Table 66. Results of Traffic Operation Analysis at Intersection #9 – Baltimore Road & S. Stonestreet Avenue

| Approach | Movement | Weekday AM Peak Hour | | | Weekday PM Peak Hour | | |
|-----------------------------|-------------------------|----------------------|----------|----------------------------|----------------------|----------|----------------------------|
| | | Delay (sec) | LOS | 95th Percentile Queue (ft) | Delay (sec) | LOS | 95th Percentile Queue (ft) |
| Eastbound | Eastbound Through | 15.6 | C | - | 22.5 | C | - |
| | Overall Approach | 15.6 | C | | 22.5 | C | |
| Westbound | Westbound Through | 10.8 | B | - | 10.6 | B | - |
| | Overall Approach | 10.8 | B | | 10.6 | B | |
| Northbound | Northbound Through | 0.2 | A | - | 0.2 | A | - |
| | Overall Approach | 0.2 | - | | 0.2 | - | |
| Southbound | Southbound Left | 7.7 | A | - | 8.2 | A | - |
| | Southbound Through | 0.0 | - | - | 0.0 | - | - |
| | Overall Approach | 4.2 | - | | 5.8 | - | |
| Overall Intersection | | 6.6 | A | | 6.3 | A | |

LOS = Level of Service
 # = 95th percentile volume exceeds capacity, queue may be longer

SITE VISIT OBSERVATIONS

A site visit was conducted on April 9, 2026, to assess pedestrian and vehicle operations at this stop controlled intersection. Crosswalk markings across Baltimore Road are faded and stop bar placement is inconsistent with stop sign locations. Bus turning movements were observed to create tight turning paths and potential conflicts. Photos of the site visit observations can be found in Figure 58, Figure 59, and Figure 60.

Bicycle conditions could be improved, as bike lane markings are discontinuous and rely primarily on roadside signage. Pavement markings related to daylighting and turning movements are limited.

Photos in Appendix F document faded markings, stop control placement, turning paths, and curbside conditions.

Figure 58. Faded crosswalks and stop bar near the stop sign at Baltimore Road at Intersection #9 – Baltimore Road & S. Stonestreet Avenue



Figure 59. A bus making a right turn to S. Stonestreet Avenue from Baltimore Road at Intersection #9 – Baltimore Road & S. Stonestreet Avenue



Figure 60. A bus making a left turn to Baltimore Road from S. Stonestreet Avenue at Intersection #9 – Baltimore Road & S. Stonestreet Avenue



IDENTIFIED SAFETY ISSUES

Key safety issues and other findings are shown in Table 67 and described below.

Table 67. Key Safety Issues at Intersection #9 – Baltimore Road & S. Stonestreet Avenue

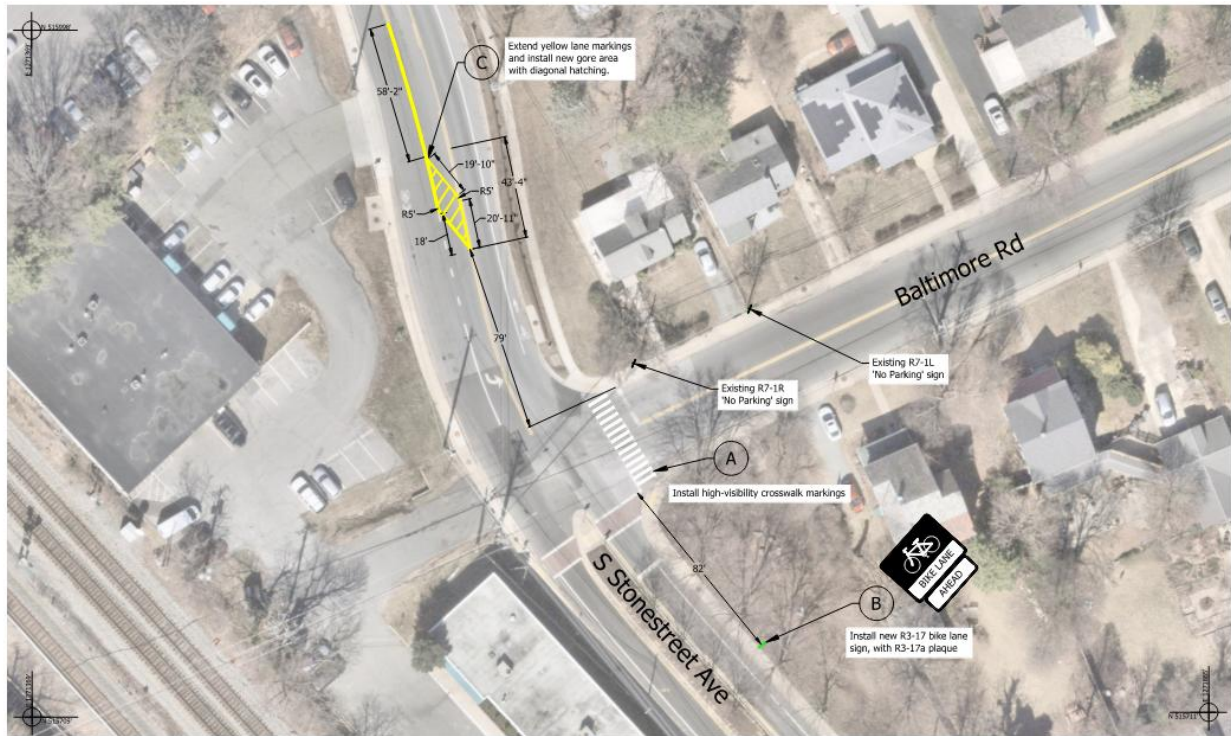
| Issue ID | Safety Issue | Safety Issue Type | Crash Data | Near-Miss Video | Site Visit |
|----------|---|--|------------|-----------------|------------|
| 9-A | High volume turning movement across the intersections makes it difficult for pedestrians to cross. | 2.1 Conflicts Between Users: Drivers Turning and Pedestrians | | | ✓ |
| 9-B | No gore area marking for daylighting near the stop sign along Baltimore Road. | 3.2 Roadway Design: Pedestrian Visibility | | | ✓ |
| 9-C | There are no bike lane markings on Baltimore Rd. | 6.2 Bicyclist: Insufficient bicycle facilities | | | ✓ |
| 9-D | Bus makes a hard left/right turns between Baltimore Rd and S Stonestreet Ave | 9.1 Vehicle Movements: Bus Movement/Merge Operations | | ✓ | ✓ |

Recommendations

SHORT-TERM RECOMMENDATIONS

Figure 61 shows the short-term improvements focus on quick-build measures to better define the intersection geometry, reduce speeds, and enhance multimodal safety along this curved and complex intersection. Further information can be found in Table 68. The proposed treatments emphasize lane channelization, visibility enhancements, and pedestrian/bicycle accommodations, while reinforcing safer turning movements and improving driver expectancy.

Figure 61. Short-Term Recommendations for Intersection #9 – Baltimore Road & S. Stonestreet Avenue



LEGEND

- (A) Proposed crosswalk markings. See Detail A.
- (B) Proposed bike lane sign (R3-17): 24" x 18" and Ahead plaque (R3-17a): 24" x 8"
- (C) Proposed pavement markings and hatching

Table 68. Short-Term Recommendations for Intersection #9 – Baltimore Road & S. Stonestreet Avenue

| Rec. ID | Recommendation | Safety issue(s) addressed |
|---------|--|---------------------------|
| 9-S-1 | Install high-visibility crosswalk at the intersection. | 9-A |
| 9-S-2 | Extend the unfinished yellow lane markings and install gore area with diagonal hatching lines in the median at north side of S Stonestreet Avenue. | 9-B |
| 9-S-3 | Install appropriate bike lane signs near the intersection at northbound approach of S Stonestreet Avenue. | 9-B |

COST ESTIMATE

Table 69 provides a planning-level cost estimate for the short-term recommendations, based on item quantities and recent Maryland SHA price index sheets, and excludes contingency and mobilization.

Table 69. Planning-Level Cost Estimate at Intersection #9 – Baltimore Road & S. Stonestreet Avenue

| Item | Description | Unit | Unit Cost | Quantity | Cost |
|------------------|---|------|-----------|----------|-------------------|
| Pavement Marking | 12" Crosswalk | LF | \$6.19 | 160 | \$990.09 |
| Pavement Marking | 5" solid marking (yellow) | LF | \$7.00 | 218 | \$1,526.00 |
| Sign | New sign post | EACH | \$193.76 | 2 | \$387.52 |
| Sign | Remove sign post | EACH | \$79.54 | 1 | \$79.54 |
| Sign | Bicycle Lane sign [R3-17] | EACH | \$400.00 | 1 | \$400.00 |
| Sign | 'Ahead' plaque (under bicycle lane sign) [R3-17a] | EACH | \$200.00 | 1 | \$200.00 |
| Total: | | | | | \$3,583.15 |

LONG-TERM RECOMMENDATIONS

Figure 62 shows the planned long-term capital improvements for the intersection of Baltimore Road & S. Stonestreet Avenue. The proposed long-term improvements focus on reconfiguring the roadway to better organize traffic flow, reduce speeds, and minimize conflict points along this curved corridor near the intersection. Key strategies include installing a concrete median and refining lane configuration, which together improve lane discipline, reduce turning conflicts, and enhance overall safety for all users (Table 70).

Figure 62. Long-Term Recommendations for Intersection #9 – Baltimore Road & S. Stonestreet Avenue



LEGEND

- (A) Install concrete median

Table 70. Long-Term Recommendations for Intersection #9 – Baltimore Road & S. Stonestreet Avenue

| Rec. ID | Recommendation | Safety issue(s) addressed |
|---------|--|---------------------------|
| 9-L-1 | At southbound S Stonestreet Avenue approach, narrow travel lanes to 11'1/2' and widen left-turn lane to 10'. | 9-A |
| 9-L-2 | Install shared bike lane markings on Baltimore Road | 9-C |
| 9-L-3 | Consider installing a concrete median for lane configuration and narrow travel lanes to 11'1/2' and shift the left-turn lane at southbound approach of S Stonestreet Avenue. | 9-A |
| 9-L-4 | Consider ensuring and improving lane configuration and centerline usage at the north side of Stonestreet Avenue. | 9-A |
| 9-L-5 | Install shared bike lane markings on southbound S Stonestreet Avenue. | 9-B |

#10 – WOODLAND ROAD & N. HORNERS LANE

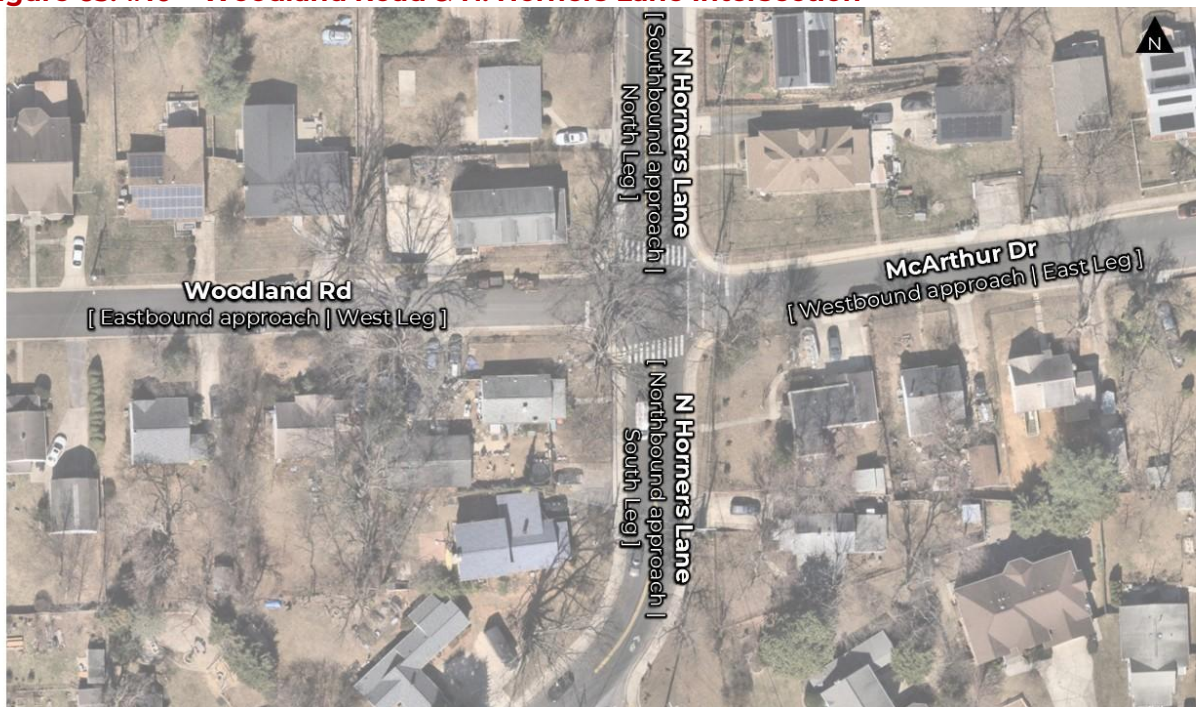
Existing Conditions

INTERSECTION DESCRIPTION

The intersection of Woodland Road & N. Horners Lane is shown in Figure 63. N. Horners Lane is classified as a major collector, while Woodland Road/McArthur Drive is classified as a local. N. Horners Lane has a 20 MPH speed limit, and Woodland Road/McArthur Drive has a 25 MPH speed limit. They are both one-lane roadways, and Woodland Road/McArthur Drive is stop-controlled. N. Horners Lane is free-flowing. In 2024, Annual Average Daily Traffic (AADT) on N. Horners Lane was 8,015, while Woodland Road/McArthur Drive does not have a reported AADT¹.

According to the Rockville Comprehensive Land Use Policy Map², land uses adjacent to the intersection are “residential.” There are sidewalks in all directions, and high-visibility crosswalks at the Woodland Road/McArthur Drive crossing of N. Horners Lane. There is a standard crosswalk on the east leg of the intersection crossing McArthur Drive.

Figure 63. #10 – Woodland Road & N. Horners Lane Intersection



SAFETY REVIEW

CRASH DATA ANALYSIS

A total of two (2) crashes were recorded at the intersection during the three-year period from 2022 to 2024. The reported crashes involved only vehicles and resulted in one (1) possible injury and one (1) property-damage-only (PDO) crash. Table 71 summarizes the crash characteristics, including collision types, lighting conditions, and roadway surface conditions. No contributing circumstances have been reported for the two crashes at the intersection.

Table 71. Summary of Three-Year (2022-24) Crashes at Intersection #10 – Woodland Road & N. Horners Lane

| Total Crashes | Total Crashes by Year | | | Total Crashes by User | | |
|---------------|-----------------------|------|------|-----------------------|---------|------------|
| 2 | 2022 | 2023 | 2024 | Auto | Cyclist | Pedestrian |
| | 0 | 0 | 2 | 2 | 0 | 0 |

| Total Crashes by Severity | | | | |
|---------------------------|---------|-------|-----------------|-----------------|
| Fatal | Serious | Minor | Possible Injury | Property Damage |
| 0 | 0 | 0 | 1 | 1 |

| Total Crashes by Collision Type | | | |
|---------------------------------|---------------------------|----------------|-------|
| Angle | Sideswipe, Same Direction | Single Vehicle | Other |
| 1 | 1 | 0 | 0 |

| Lighting | | | Road Surface | | | |
|----------|--------------|------|--------------|-----|-----------|---------|
| Daylight | Dark-Lighted | Dawn | Dry | Wet | Ice/Frost | Unknown |
| 2 | 0 | 0 | 2 | 0 | 0 | 0 |

Note: Crash summaries are based on the available crash data reviewed for this study. Reported crash totals and locations may vary across source datasets due to differences in reporting methods, geocoding, and intersection buffers.

NEAR-MISS VIDEO ANALYSIS

Post-Encroachment Time (PET), which measures the temporal separation between two users occupying the same conflict area, was used to assess the severity of these interactions and is calculated only when both users pass through the same conflict point. Based on 24-hour video observations at the intersection, a total of 21 near-miss events were identified, as summarized in Table 72. Of these, seven (7) involved vehicle-to-vehicle conflicts, 14 involved vehicle-to-pedestrian, and none (0) involved vehicle-to-bicyclist. As shown in Table 72, the majority of observed conflicts fall within the 2-3-second PET range (19). An additional two (2) conflicts fall within the 1.5-2 second range, both of which were vehicle-to-pedestrian conflicts. None of the observed conflicts fell within the 0-1.5 second PET range. However, since the majority of the conflicts included pedestrians, the intersection has significant potential for serious injury or fatal crashes in the future.

Table 72. Summary of Near Misses for a Day (24-hours) at Intersection #10 – Woodland Road & N. Horners Lane

| Post Encroachment Time (PET) | Vehicle-Vehicle | Vehicle-Pedestrian | Vehicle-Bicyclist | Total |
|------------------------------|-----------------|--------------------|-------------------|-----------|
| 0.0 - 1.5s | 0 | 0 | 0 | 0 |
| 1.5 - 2.0s | 0 | 2 | 0 | 2 |
| 2.0 - 3.0s | 7 | 12 | 0 | 19 |
| Total | 7 | 14 | 0 | 21 |

Based on video analysis of near-miss events, Table 73 summarizes the most frequent conflict types observed at the intersection. Two of the top three conflict types involve pedestrians, indicating a strong pattern of pedestrian-related interactions at the intersection. The top conflict included westbound left and northbound through vehicles. In addition, there were four (4) conflicts between southbound through vehicles and south leg pedestrians and three (4) conflicts between southbound through vehicles and north leg pedestrians. This highlights that pedestrians crossing both the north and south legs of the intersection are vulnerable to crashes from southbound through traffic.

Table 73. Top Three Conflict Types by Movements based on Near Miss Video Analysis at Intersection #10 – Woodland Road & N. Horners Lane

| Conflict Rank | Movement 1 | Movement 2 | Conflicts |
|---------------|--------------------|----------------------|-----------|
| 1. | Westbound Left | Northbound Through | 4 |
| 2. | Southbound Through | South Leg Pedestrian | 4 |
| 3. | Southbound Through | North Leg Pedestrian | 3 |

EXISTING TRAFFIC OPERATIONS

Table 74 shows the results of traffic operations analysis for this intersection based on existing lane configurations, peak-hour traffic volumes, and signal timing parameters. Drivers experience minor delays on the westbound approach, while those on all other approaches experience relatively little delay.

Table 74. Results of Traffic Operation Analysis at Intersection #10 – Woodland Road & N. Horners Lane

| Approach | Movement | Weekday AM Peak Hour | | | Weekday PM Peak Hour | | |
|-----------------------------|-------------------------|----------------------|----------|----------------------------|----------------------|----------|----------------------------|
| | | Delay (sec) | LOS | 95th Percentile Queue (ft) | Delay (sec) | LOS | 95th Percentile Queue (ft) |
| Eastbound | Eastbound Through | 15.0 | B | - | 13.9 | B | - |
| | Overall Approach | 15.0 | B | | 13.9 | B | |
| Westbound | Westbound Through | 13.2 | B | - | 17.1 | C | - |
| | Overall Approach | 13.2 | B | | 17.1 | C | |
| Northbound | Northbound Through | 0.1 | A | - | 0.1 | A | - |
| | Overall Approach | 0.1 | - | | 0.1 | - | |
| Southbound | Southbound Through | 0.1 | A | - | 0.1 | A | - |
| | Overall Approach | 0.1 | - | | 0.1 | - | |
| Overall Intersection | | 0.9 | A | | 0.5 | A | |

LOS = Level of Service

= 95th percentile volume exceeds capacity, queue may be longer

SITE VISIT OBSERVATIONS

A site visit was conducted on April 9, 2026, to review pedestrian and traffic control conditions at this stop controlled intersection. Several crosswalks are faded or missing entirely, including the west leg crossing. Stop bars are faded or inconsistently placed, and parking is permitted close to the intersection, reducing sight distance. Photos of the site visit observations can be found in Figure 64, Figure 65, and Figure 66.

Signage could be improved to clarify stop control responsibilities, including the potential use of supplemental plaques. Pavement markings for daylighting and parking management are limited.

Photos in Appendix F show crosswalk gaps, stop bar conditions, signage, and curbside parking proximity.

Figure 64. Faded crosswalk marking with missing transverse white marking across westbound approach of Woodland Road at Intersection #10 – Woodland Road & N. Horners Lane



Figure 65. A pedestrian using an unmarked crosswalk across Woodland Road at Intersection #10 – Woodland Road & N. Horners Lane



Figure 66. Faded stop bar and crosswalk markings at westbound Baltimore Road at Intersection #10 – Woodland Road & N. Horners Lane



IDENTIFIED SAFETY ISSUES

Key safety issues and other findings are shown in Table 75 and described below.

Table 75. Key Safety Issues at Intersection #10 – Woodland Road & N. Horners Lane

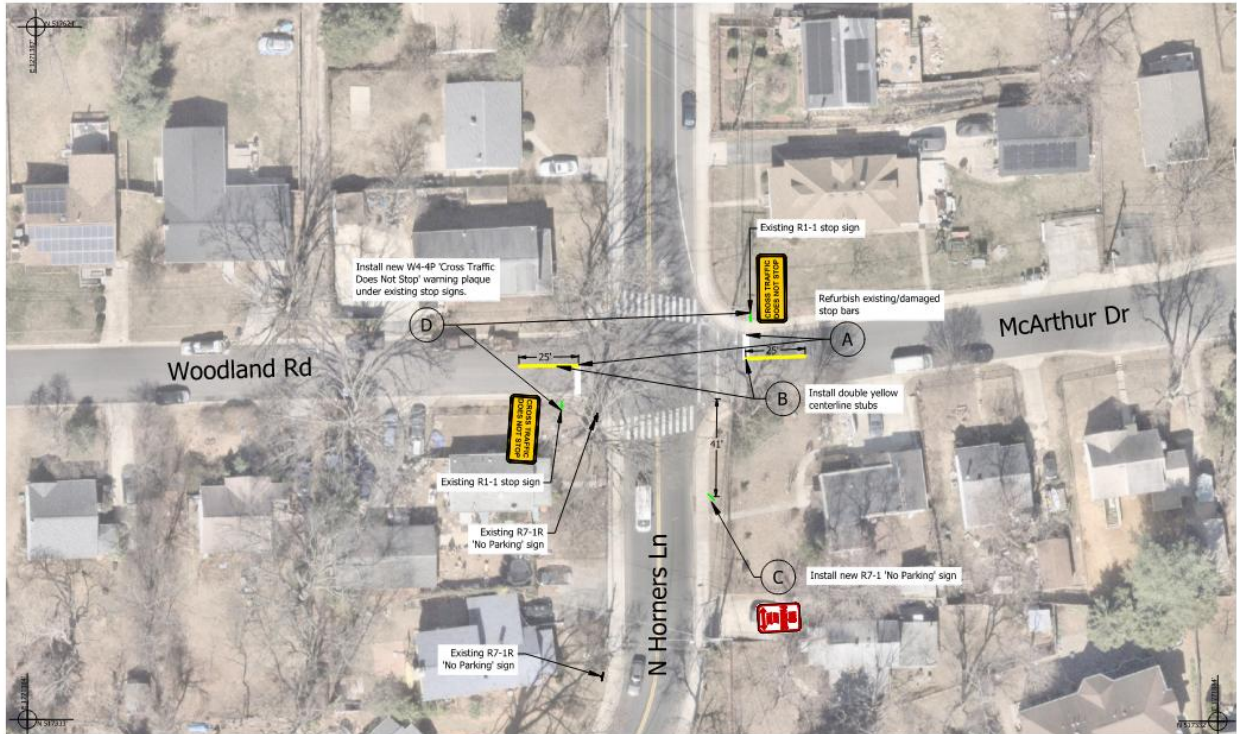
| Issue ID | Safety Issue | Safety Issue Type | Crash Data | Near-Miss Video | Site Visit |
|----------|--|--|------------|-----------------|------------|
| 10-A | Rolling stops repeatedly observed at stop controlled intersection. | 7.7 User Behavior: Failure to Stop at AWSC/TWSC intersection | | ✓ | ✓ |
| 10-B | No parking boxes marking along Woodland Drive westbound/eastbound approaches. Reduced visibility for vehicles turning. | 3.2 Roadway Design: Pedestrian Visibility | | | ✓ |

Recommendations

SHORT-TERM RECOMMENDATIONS

Figure 67 shows the proposed short-term, quick-build improvements focus on low-cost, quick-build treatments to enhance visibility, reduce speeds, and better define the intersection geometry. Table 76 provides further detail on improvements. These measures rely on pavement markings and pedestrian facility upgrades to improve safety for pedestrians and drivers while setting the foundation for future long-term changes.

Figure 67. Short-Term Recommendations for Intersection #10 – Woodland Road & N. Horners Lane



LEGEND

- (A) Refurbish existing pavement markings
- (B) Proposed centerline pavement markings
- (C) Proposed parking restriction sign (R7-1): 12" x 18"
- (D) Proposed 'Cross Traffic Does Not Stop' (W4-4P): 24" x 12"

Table 76. Short-Term Recommendations for Intersection #10 – Woodland Road & N. Horners Lane

| Rec. ID | Recommendation | Safety issue(s) addressed |
|---------|--|---------------------------|
| 10-S-1 | Install double-yellow centerline stub on east leg and west leg. | 10-B |
| 10-S-2 | Install parking regulation signs (R7-1) for intersection clearance on south leg. | 10-B |
| 10-S-3 | Add (W4-4P) 'Cross-Traffic Does Not Stop' warning plaque on east leg and west leg. | 10-A |

COST ESTIMATE

Table 77 provides a planning-level cost estimate for the short-term recommendations, based on item quantities and recent Maryland SHA price index sheets, and excludes contingency and mobilization.

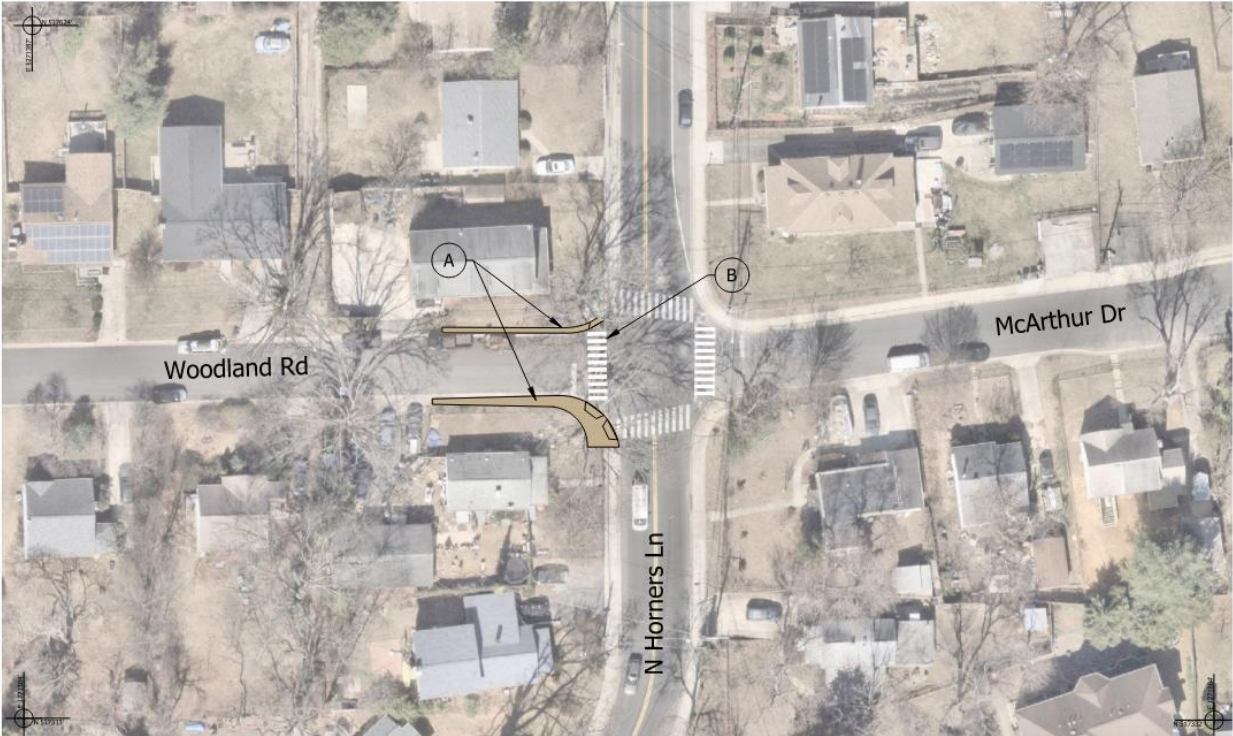
Table 77. Planning-Level Cost Estimate at Intersection #10 – Woodland Road & N. Horners Lane

| Item | Description | Unit | Unit Cost | Quantity | Cost |
|------------------|---|------|-----------|----------|-------------------|
| Pavement Marking | 24" Stop Bar | LF | \$21.75 | 20 | \$435.00 |
| Pavement Marking | 5" double yellow marking | LF | \$4.60 | 50 | \$230.00 |
| Sign | New sign post | EACH | \$193.76 | 1 | \$193.76 |
| Sign | Parking regulation sign [R7-1] | EACH | \$120.00 | 1 | \$120.00 |
| Sign | Cross Traffic Does Not Stop' sign [W4-4P] | EACH | \$160.00 | 2 | \$320.00 |
| Total: | | | | | \$1,298.76 |

LONG-TERM RECOMMENDATIONS

Figure 68 illustrates the planned long-term capital improvements for the intersection of Woodland Road & N. Horners Lane. The proposed long-term improvements focus on enhancing pedestrian infrastructure and accessibility at this residential intersection. Key strategies include installing continuous sidewalks, upgrading crossings and improving ADA compliance, and creating a safer, more connected environment for pedestrians while maintaining neighborhood traffic operations (Table 78).

Figure 68. Long-Term Recommendations for Intersection #10 – Woodland Road & N. Horners Lane



LEGEND

- (A)** Install concrete curb with sidewalk
- (B)** Install high-visibility crosswalks with ADA-curb ramps

Table 78. Long-Term Recommendations for Intersection #10 – Woodland Road & N. Horners Lane

| Rec. ID | Recommendation | Safety issue(s) addressed |
|---------|--|---------------------------|
| 10-L-1 | Install high-visibility crosswalks with ADA-curb ramps for the west leg of the intersection. | 10-A |
| 10-L-2 | Consider installing a sidewalk along Woodland Road. | 10-B |
| 10-L-3 | Realign crossing markings at east leg of McArthur Drive. | 10-A |

#11 - ROCKVILLE PIKE (MD 355) & EDMONSTON DRIVE

DRIVE

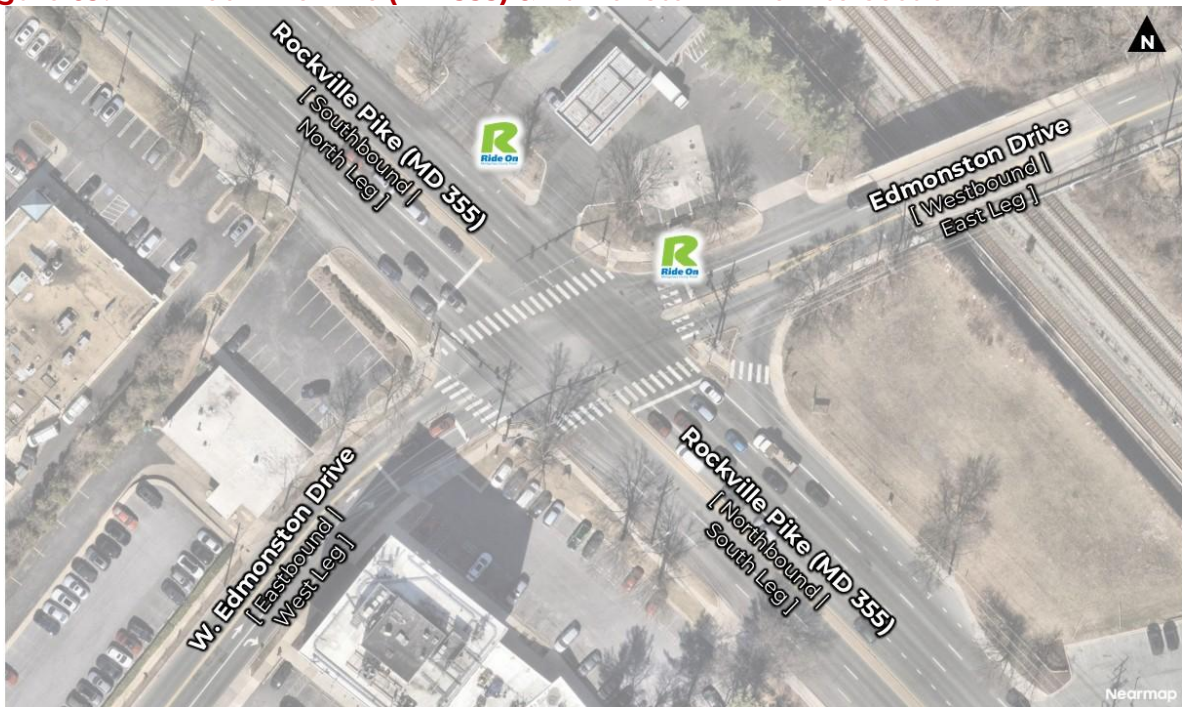
Existing Conditions

INTERSECTION DESCRIPTION

The intersection of Rockville Pike (MD 355) & Edmonston Drive is shown in Figure 69. Rockville Pike is a six-lane principal arterial with a 35 MPH speed limit and is identified as the northbound (south) and southbound (north) approaches. Edmonston Drive is a two-lane major collector with a 25 MPH speed limit and is identified as the eastbound (west) and westbound (east) approaches. Edmonston Drive changes names at the intersection and is referred to as W. Edmonston Drive west of the intersection. The intersection is signalized, with protected-permissive left turns on the Rockville Pike approaches and left turns restricted on the Edmonston Drive approaches.

According to the Rockville Comprehensive Land Use Policy Map,² land uses adjacent to the intersection are “office, commercial, and residential mix” in the immediate vicinity, with “residential detached” land use just across the railroad tracks to the east. There are two RideOn bus stops at this intersection, serving routes 44, 46, and 101.

Figure 69. #11 - Rockville Pike (MD 355) & Edmonston Drive Intersection



SAFETY REVIEW

CRASH DATA ANALYSIS

A total of 45 crashes were recorded at the intersection during the three-year period from 2022 to 2024. Most crashes (41) involved vehicles only, while four (4) crashes involved vulnerable road users, including two (2) bicyclists and two (2) pedestrians. All crashes involving vulnerable road users resulted in minor injuries. Overall, most crashes (28) were classified as property-damage-only (PDO), with the remaining crashes resulting in minor or possible injuries. Table 79 summarizes the crash characteristics, including collision types, lighting conditions, and roadway surface conditions.

Table 79. Summary of Three-Year (2022-24) Crashes at Intersection #11 - Rockville Pike (MD 355) & Edmonston Drive

| Total Crashes | Total Crashes by Year | | | Total Crashes by User | | |
|---------------|-----------------------|------|------|-----------------------|---------|------------|
| | 2022 | 2023 | 2024 | Auto | Cyclist | Pedestrian |
| 45 | 11 | 18 | 16 | 41 | 2 | 2 |

| Total Crashes by Severity | | | | |
|---------------------------|---------|-------|-----------------|-----------------|
| Fatal | Serious | Minor | Possible Injury | Property Damage |
| 0 | 0 | 10 | 7 | 28 |

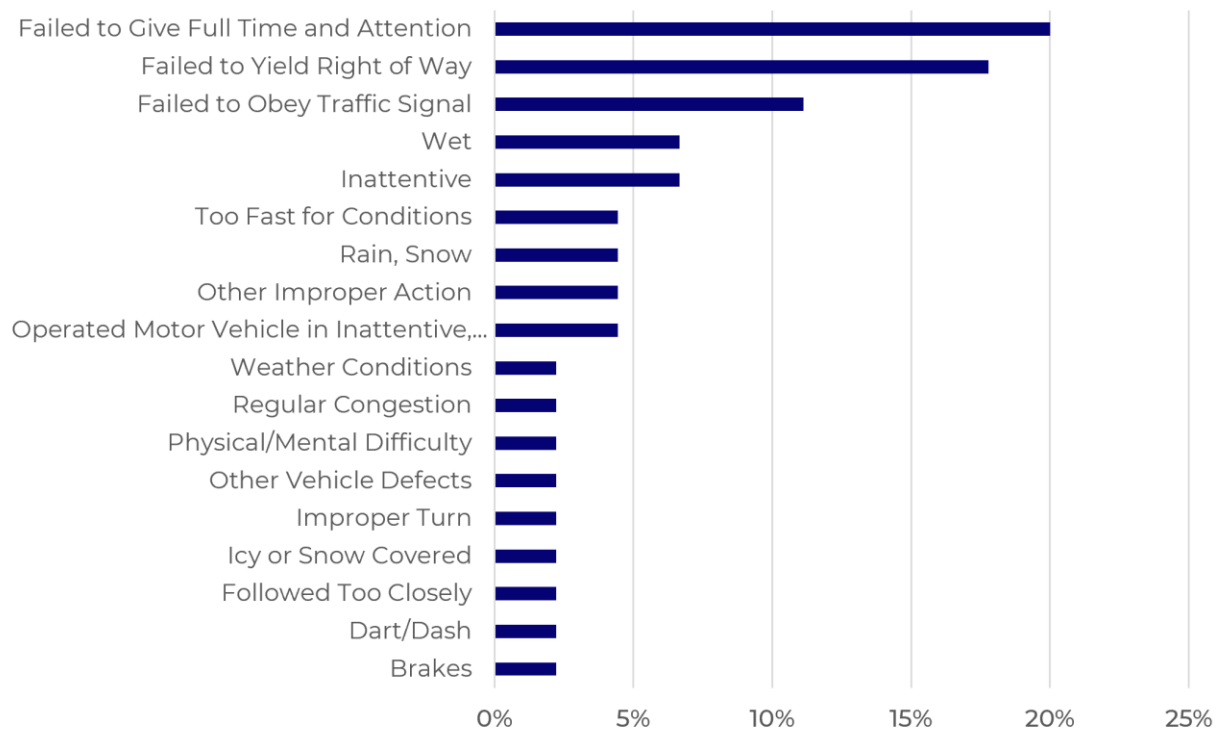
| Total Crashes by Collision Type | | | | | | |
|---------------------------------|-------|-----------|----------------|-------------------|---------------------------|-------|
| Rear End | Angle | Sideswipe | Single Vehicle | Head On Left Turn | Same Direction Right Turn | Other |
| 14 | 12 | 5 | 3 | 2 | 2 | 7 |

| Lighting | | | Road Surface | | | |
|----------|--------------|------|--------------|-----|------|---------|
| Daylight | Dark-Lighted | Dusk | Dry | Wet | Snow | Unknown |
| 28 | 16 | 1 | 36 | 7 | 1 | 1 |

Note: Crash summaries are based on the available crash data reviewed for this study. Reported crash totals and locations may vary across source datasets due to differences in reporting methods, geocoding, and intersection buffers.

Figure 70 illustrates the percentage of crashes accounting for each contributing circumstance associated with crashes at the intersection during the 2022–2024 study period. A single crash may involve multiple contributing circumstances, as documented in the crash reports. As shown in the figure below, the top contributing circumstances involved driver behavior, such as failing to yield the right-of-way, failing to give full attention, or failing to obey traffic signals.

Figure 70. Percentage of Crashes Accounting for Each Contributing Circumstance at Intersection #11 - Rockville Pike (MD 355) & Edmonston Drive



NEAR-MISS VIDEO ANALYSIS

Based on 24-hour video observations at the intersection, a total of 153 near-miss events were identified, as summarized in Table 80. Of these, 50 involved vehicle-to-vehicle conflicts, 86 involved vehicle-to-pedestrian conflicts, and 17 involved vehicle-to-bicyclist conflicts, indicating that pedestrians were the most affected group. Post-Encroachment Time (PET), which measures the temporal separation between two users occupying the same conflict area, was used to assess the severity of these interactions and is calculated only when both users pass through the same conflict point. As shown in the Table below, most (130) observed conflicts fall within the 2–3 second PET range. A PET of less than 2 seconds is generally considered indicative of higher-risk interactions; 23 conflicts fall within this range at the intersection. Notably, most of these higher-risk conflicts (19 out of 23) involved pedestrians or bicyclists, indicating elevated conflict severity for vulnerable road users at the intersection.

Table 80. Summary of Near Misses for a Day (24-hours) at Intersection #11 - Rockville Pike (MD 355) & Edmonston Drive

| Post Encroachment Time (PET) | Vehicle-Vehicle | Vehicle-Pedestrian | Vehicle-Bicyclist | Total |
|------------------------------|-----------------|--------------------|-------------------|------------|
| 0.0 - 1.5s | 1 | 9 | 0 | 10 |
| 1.5 - 2.0s | 3 | 7 | 3 | 13 |
| 2.0 - 3.0s | 46 | 70 | 14 | 130 |
| Total | 50 | 86 | 17 | 153 |

Based on video analysis of near-miss events, Table 81 summarizes the most frequent conflict types observed at the intersection. The highest number of conflicts (38) occurred between westbound left-turning vehicles and eastbound through vehicles. The next most frequent conflicts involved pedestrians on the north and south legs interacting with eastbound and westbound right-turning vehicles. When combined, pedestrian-related conflicts account for more than half of the top conflict pairs, indicating a heightened risk for pedestrians at the intersection.

Table 81. Top Three Conflict Types by Movements based on Near Miss Video Analysis at Intersection #11 - Rockville Pike (MD 355) & Edmonston Drive

| Conflict Rank | Movement 1 | Movement 2 | Conflicts |
|---------------|----------------------|-------------------|-----------|
| 1. | Westbound Left | Eastbound Through | 38 |
| 2. | North Leg Pedestrian | Westbound Right | 23 |
| 3. | South Leg Pedestrian | Eastbound Right | 17 |

EXISTING TRAFFIC OPERATIONS

Table 82 shows the results of traffic operations analysis for this intersection based on existing lane configurations, peak-hour traffic volumes, and signal timing parameters. Drivers experience relatively high delays, particularly during the AM peak hour. Drivers on the eastbound approach experience the highest delays, particularly those making right turns.

Table 82. Results of Traffic Operation Analysis at Intersection #11 - Rockville Pike (MD 355) & Edmonston Drive

| Approach | Movement | Weekday AM Peak Hour | | | Weekday PM Peak Hour | | |
|-----------------------------|-------------------------|----------------------|----------|----------------------------|----------------------|----------|----------------------------|
| | | Delay (sec) | LOS | 95th Percentile Queue (ft) | Delay (sec) | LOS | 95th Percentile Queue (ft) |
| Eastbound | Eastbound Through | 66.2 | E | #336 | 80.5 | F | #524 |
| | Eastbound Right | 226.8 | F | #850 | 48.5 | D | 94 |
| | Overall Approach | 165.7 | F | | 67.4 | E | |
| Westbound | Westbound Left | 55.9 | E | 209 | 68.1 | E | 146 |
| | Westbound Through | 55.1 | E | 489 | 43.1 | D | 306 |
| | Overall Approach | 55.3 | E | | 50.9 | D | |
| Northbound | Northbound Left | 75.7 | E | #206 | 81.2 | F | #373 |
| | Northbound Through | 22.5 | C | 260 | 36.8 | D | 584 |
| | Northbound Right | 19.0 | B | 7 | 29.4 | C | 188 |
| | Overall Approach | 28.4 | C | | 40.9 | D | |
| Southbound | Southbound Left | 75.1 | E | 110 | 76.7 | E | 256 |
| | Southbound Through | 35.8 | D | 668 | 38.7 | D | 513 |
| | Overall Approach | 37.1 | D | | 43.0 | D | |
| Overall Intersection | | 56.2 | E | | 46.0 | D | |

LOS = Level of Service

= 95th percentile volume exceeds capacity, queue may be longer

SITE VISIT OBSERVATIONS

A site visit was performed on April 1, 2026. All comments and photos from the visit are included in Appendix F and in Figure 71, Figure 72, and Figure 73.

During the site visit, the project team observed that this intersection presents challenges for people walking and bicycling, particularly due to long crossing distances, high turning volumes, and complex right-turn geometry. Pedestrians and bicyclists experienced long delays crossing Rockville Pike, and several drivers were observed encroaching on crosswalks while pedestrians had the right of way. A key concern is the crosswalk connection to the channelizing island at the southeast corner. This crossing is yield-controlled and yield-controlled, and pedestrians were observed encountering large volumes of high-speed, conflicting right-turn traffic. Drivers turning left onto Edmonston Drive were observed waiting for a gap in three lanes of conflicting through traffic, which can contribute to risky turning behavior and delays.

Figure 71. Bicyclists and Pedestrians Experience Long Crossing Distances and Delays at Intersection #11 - Rockville Pike (MD 355) & Edmonston Drive



Figure 72. Channelizing Island on the Southeast Corner of Intersection #11 - Rockville Pike (MD 355) & Edmonston Drive



Figure 73. Visibility and queuing concerns on the westbound approach near the railroad crossing at Intersection #11 - Rockville Pike (MD 355) & Edmonston Drive



IDENTIFIED SAFETY ISSUES

Key safety issues and other findings are shown in Table 83 and described below.

Table 83. Key Safety Issues for intersection #11 - Rockville Pike (MD 355) & Edmonston Drive

| Issue ID | Safety Issue | Safety Issue Type | Crash Data | Near-Miss Video | Site Visit |
|----------|---|---|------------|-----------------|------------|
| 11-A | Right- and left-turning drivers regularly encroach on crossing pedestrians. | 2.1 Conflicts Between Users, Drivers Turning and Pedestrians 3.2 Roadway Design, Pedestrian Visibility 5.1.1 Pedestrian, Intersection Crossing (Long Crossing) 7.4 User Behavior, Driver Yielding | ✓ | ✓ | ✓ |
| 11-B | Drivers execute high-speed right turns via the slip lane in the southeast corner, increasing the risk of crashes for crossing pedestrians. | 1.2 Speeds, Severity, and Compliance, High-Speed Turns 2.1 Conflicts Between Users, Drivers Turning and Pedestrians 3.1 Roadway Design, Inadequate Sight Distance (Lack of Driver Visibility) 3.2 Roadway Design, Pedestrian Visibility 5.1 Pedestrian, Intersection Crossing 7.4 User Behavior, Driver Yielding | | | ✓ |
| 11-C | There are driveways in close proximity to this intersection that often require high-risk turning movements to access. | 1.4 Speeds, Severity, and Compliance, Multiple-Threat Crashes 3.5 Roadway Design, Access Management 8.4 Conflict Type, Left Turn | | | ✓ |
| 11-D | Pedestrians encounter long crossing distances at this intersection. | 5.1.1 Pedestrian, Intersection Crossing (Long Crossing) | | | ✓ |
| 11-E | Drivers sometimes make prohibited eastbound left turns at this intersection. | 7 User Behavior 7.5 User Behavior, Unpredictable Behavior | | ✓ | |

| Issue ID | Safety Issue | Safety Issue Type | Crash Data | Near-Miss Video | Site Visit |
|----------|---|---|------------|-----------------|------------|
| 11-F | Vehicles regularly overtrack onto curbs, islands, and medians at this intersection. | 1.5 Speeds, Severity, and Compliance, Large Vehicles 3 Roadway Design 8.7 Conflict Type, Fixed Object | | | ✓ |

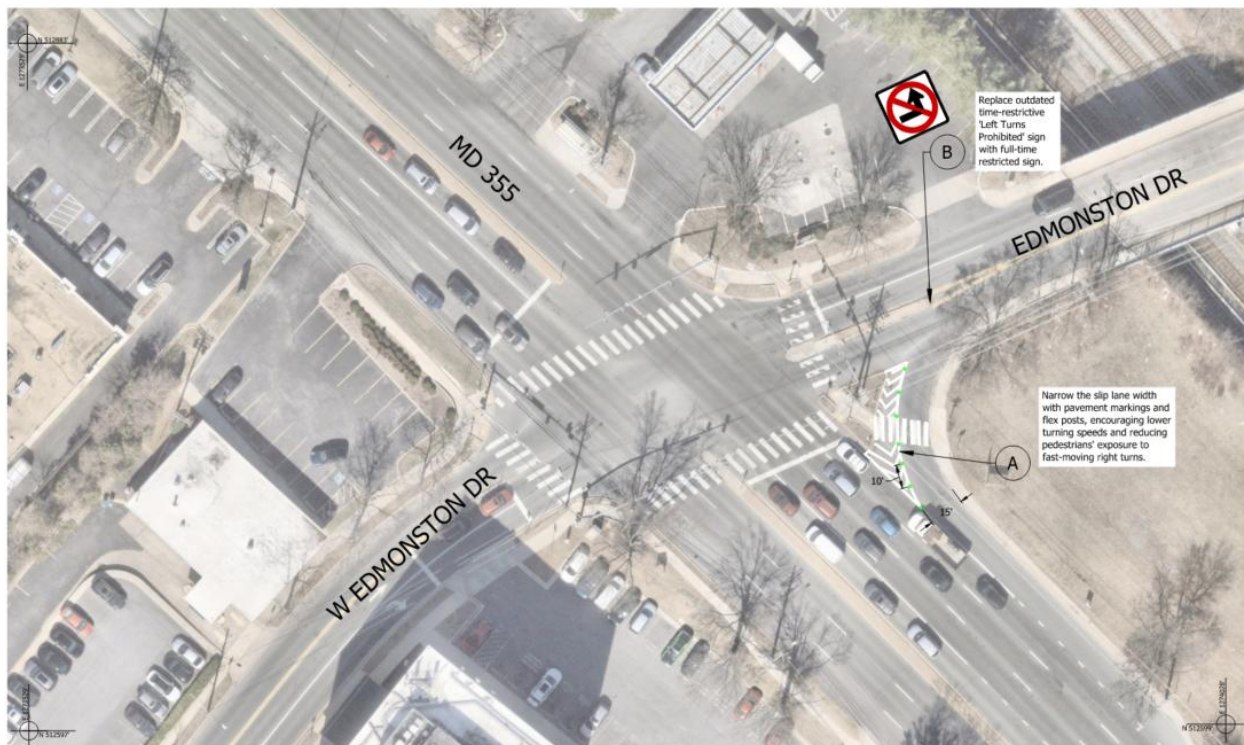
Bold indicates a priority safety issue.

Recommendations

SHORT-TERM RECOMMENDATIONS

Figure 74 illustrates the proposed short-term, quick-build improvements for the Rockville Pike (MD 355) & Edmonston Drive intersection. These near-term changes focus on improving pedestrian visibility and protection, reducing high-speed right turns at the slip lane at the southeast corner, and strengthening signage and markings to reduce confusion and discourage prohibited turning movements near the adjacent gas station driveway.

Figure 74. Short-Term Recommendations for Intersection #11 - Rockville Pike (MD 355) & Edmonston Drive



LEGEND

- A** Curb extension with white pavement markings and flex posts (see detail B2)
- B** R3-2 Left Turns Prohibited Sign (36" x 36")

Key elements of the short-term recommendations are included in Table 84.

Table 84. Key Elements; short-term recommendations for #11 - Rockville Pike (MD 355) & Edmonston Drive

| Rec. ID | Recommendation | Safety issue(s) addressed |
|---------|---|---------------------------|
| 11-S-1 | Use pavement markings and flexible posts to narrow the slip lane width, encouraging lower turning speeds and reducing pedestrians' exposure to fast-moving right turns. | 11-A, 11-D |
| 11-S-2 | Prohibit eastbound left turns into the gas station and replace the outdated, time-restricted sign so the restriction is clear and consistent to drivers. | 11-B |
| 11-S-3 | Adjust the left-turn signal timing for the SBL movement to be protected-only, removing the permissive phase. | 11-A |

COST ESTIMATE

Table 85 provides a planning-level cost estimate for the short-term recommendations, based on item quantities and recent Maryland SHA price index sheets, and excludes contingency and mobilization.

Table 85. Planning-Level Cost Estimate at Intersection #11 - Rockville Pike (MD 355) & Edmonston Drive

| Item | Description | Unit | Unit Cost | Quantity | Cost |
|------------------|-----------------------------------|------|-----------|----------|-------------------|
| Pavement Marking | 12" Crosswalk | LF | \$6.19 | 80 | \$495.05 |
| Pavement Marking | 5" solid marking (white) | LF | \$7.00 | 137.72 | \$964.04 |
| Sign | Left turns prohibited sign [R3-2] | EACH | \$320.00 | 1 | \$320.00 |
| Other | Flex Post | EACH | \$39.67 | 7 | \$277.70 |
| Total: | | | | | \$2,056.79 |

TRAFFIC IMPACT ANALYSIS

It was recommended that the left-turn signal timing for the southbound left movement to be adjusted to be protected-only, removing the permissive phase. Included below is the anticipated increase in delay (in seconds) for the southbound left-turn movement. The delays do not increase substantially.

- AM Peak: 75.1 → 79.7
- PM Peak: 76.7 → 88.6

LONG-TERM RECOMMENDATIONS

Figure 75 shows a set of long-term improvements designed to make the Rockville Pike & Edmonston Drive intersection safer and more comfortable for people walking, riding transit, and driving. The primary change is a capital reconstruction of the southeast corner that closes the existing slip lane and removes the exclusive right-turn lane, intended to reduce high-speed turning movements and simplify vehicle movement through the corner. The long-term concept also adds pedestrian refuge islands to break up long crossings, and

reconstructs and extends medians to slow turning vehicles and physically discourage prohibited turning movements.

To reduce conflicts created by nearby driveway activity, the plan calls for working with adjacent property owners, especially the gas station near the intersection, to explore consolidating driveways and converting select access points to right-in/right-out operation. The concept also includes tools to improve driver awareness and compliance: illuminated LED blank-out signs are proposed to reinforce turn restrictions, and signal louvers (optical programming) are proposed so that drivers see green indications only after descending the railroad crossing bridge, reducing the likelihood of speeding downhill to “catch” a green light. Finally, the plan proposes a bus shelter to improve comfort for people waiting at the bus stop.

Figure 75. Long-Term Recommendations for Intersection #11 - Rockville Pike (MD 355) & Edmonston Drive



LEGEND

- A** Median extension and pedestrian refuge island
- B** High-visibility continental crosswalk
- C** Close slip lane and remove channelizing island

Key elements of the long-term recommendations are included in Table 86.

Table 86. Key Elements; long-term recommendations for #11 - Rockville Pike (MD 355) & Edmonston Drive

| Rec. ID | Recommendation | Safety issue(s) addressed |
|---------|--|---------------------------|
| 11-L-1 | Consider extending the medians on the northbound and southbound approaches to provide pedestrians with additional protection while crossing. | 11-A |
| 11-L-2 | Explore adjusting the medians at this intersection to better manage turning movements. Median changes are intended to reduce turning speeds—particularly where wide geometry encourages faster turns—and physically discourage prohibited left-turn movements that can create unexpected conflicts. | 11-A |
| 11-L-3 | Consider exploring the southeast corner by closing the existing slip lane, removing the exclusive right-turn lane, and adjusting the curb radius while still accommodating necessary heavy-vehicle turning movements. This change is intended to eliminate free-flowing, high-speed right turns and reduce conflicts with pedestrians crossing adjacent legs of the intersection. | 11-A, 11-D |
| 11-L-4 | Coordinate with adjacent property owners, particularly the gas station near the intersection, to explore consolidating driveways and converting access points to right-in/right-out operation (meaning vehicles may enter or exit by right turns only). These access changes reduce the number of conflict points close to the intersection and help limit complex turning maneuvers in a high-traffic area. | 11-B |
| 11-L-5 | Explore the feasibility of adding pedestrian refuge islands to provide a protected space partway across the roadway. This allows people walking to cross in two shorter stages rather than one long movement, improving comfort and reducing exposure time in the traveled way. | 11-C |
| 11-L-6 | Install signal louvers or apply optical programming on select signal heads so that drivers see green indications only after they have descended the railroad crossing bridge. This is intended to reduce the incentive for drivers to accelerate downhill to “catch” a green light. | 11-F |
| 11-L-7 | Install LED blank-out 'No Left Turn' signs to further discourage illegal westbound left turns. | 11-F |

#12 - HUNGERFORD DRIVE (MD 355) & N. WASHINGTON STREET

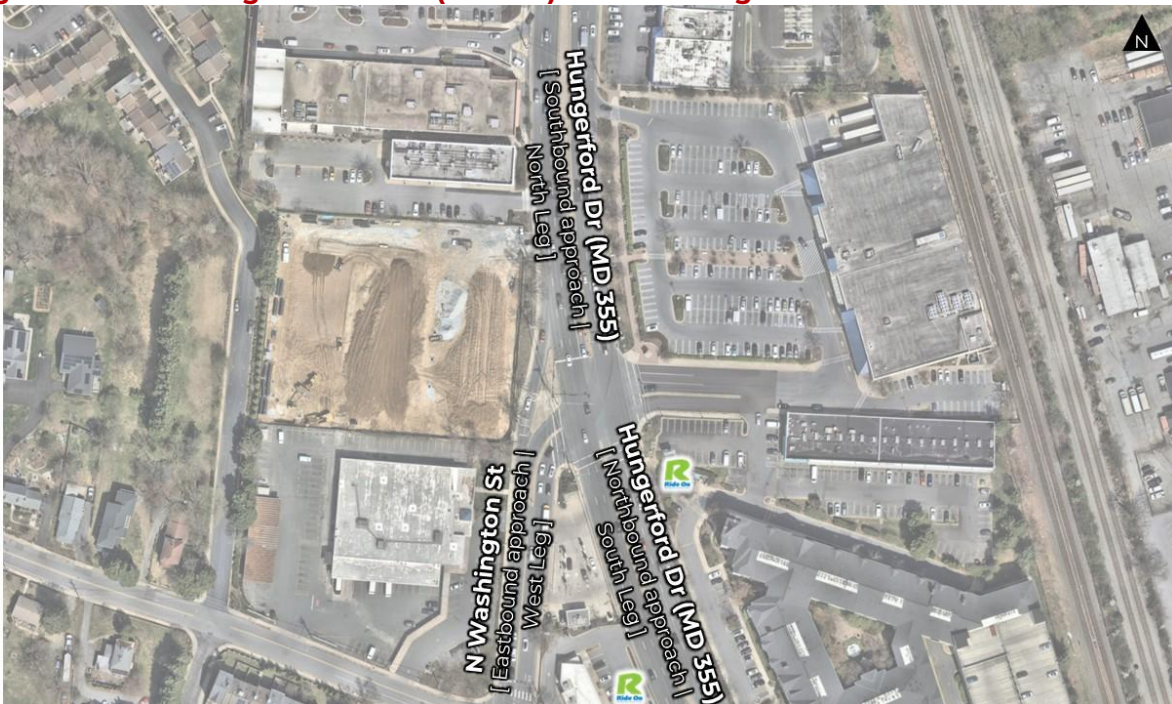
Existing Conditions

INTERSECTION DESCRIPTION

The intersection of Hungerford Drive (MD 355) & N. Washington Street is shown in Figure 76. Hungerford Drive is classified as a major arterial with a speed limit of 35 MPH and six lanes in addition to a southbound slip lane and designated southbound and northbound left-turn lanes. North Washington Street is classified as a minor arterial to the west of the intersection and a local to the east of the intersection with a speed limit of 25 MPH. On the eastbound approach, North Washington has two eastbound lanes and one westbound lane, and on the westbound approach, it has three westbound lanes and one eastbound lane. The intersection is signalized. In 2024, Annual Average Daily Traffic (AADT) was 39,320 on Hungerford Drive and 12,680 on North Washington Street¹.

According to the Rockville Comprehensive Land Use Policy Map², land uses adjacent to the intersection are “Office, Commercial and Residential Mix”. To the northeast of the intersection is a commercial shopping center, and to the northwest is a multi-family residential development under construction. There are RideOn Route 40 northbound and southbound bus stops located on the south leg of the intersection, as well as a bus stop on the west leg of the intersection serving Route 45, 46, and 55 Southbound. There are sidewalks on all sides with crosswalks on the Hungerford Drive southbound approach slip lane, west leg, south leg, and east leg. There is no crosswalk on the north leg of Hungerford Drive.

Figure 76. #12 - Hungerford Drive (MD 355) & N. Washington Street Intersection



SAFETY REVIEW

Table 87 summarizes the crash characteristics, including collision types, lighting conditions, and roadway surface conditions. A total of 26 crashes were recorded at the intersection during the three-year period from 2022 to 2024. The reported crashes primarily involved automobiles, with only one (1) pedestrian-related crash and zero (0) cyclist involvement. Most of the crashes resulted in property-damage-only (PDO) outcomes, with six (6) minor injury crashes reported over the study period.

Table 87. Summary of Three-Year (2022-24) Crashes at Intersection #12 - Hungerford Drive (MD 355) & N. Washington Street

| Total Crashes | Total Crashes by Year | | | Total Crashes by User | | |
|---------------|-----------------------|------|------|-----------------------|---------|------------|
| 26 | 2022 | 2023 | 2024 | Auto | Cyclist | Pedestrian |
| | 13 | 5 | 8 | 25 | 0 | 1 |

| Total Crashes by Severity | | | | |
|---------------------------|---------|-------|-----------------|-----------------|
| Fatal | Serious | Minor | Possible Injury | Property Damage |
| 0 | 0 | 6 | 0 | 20 |

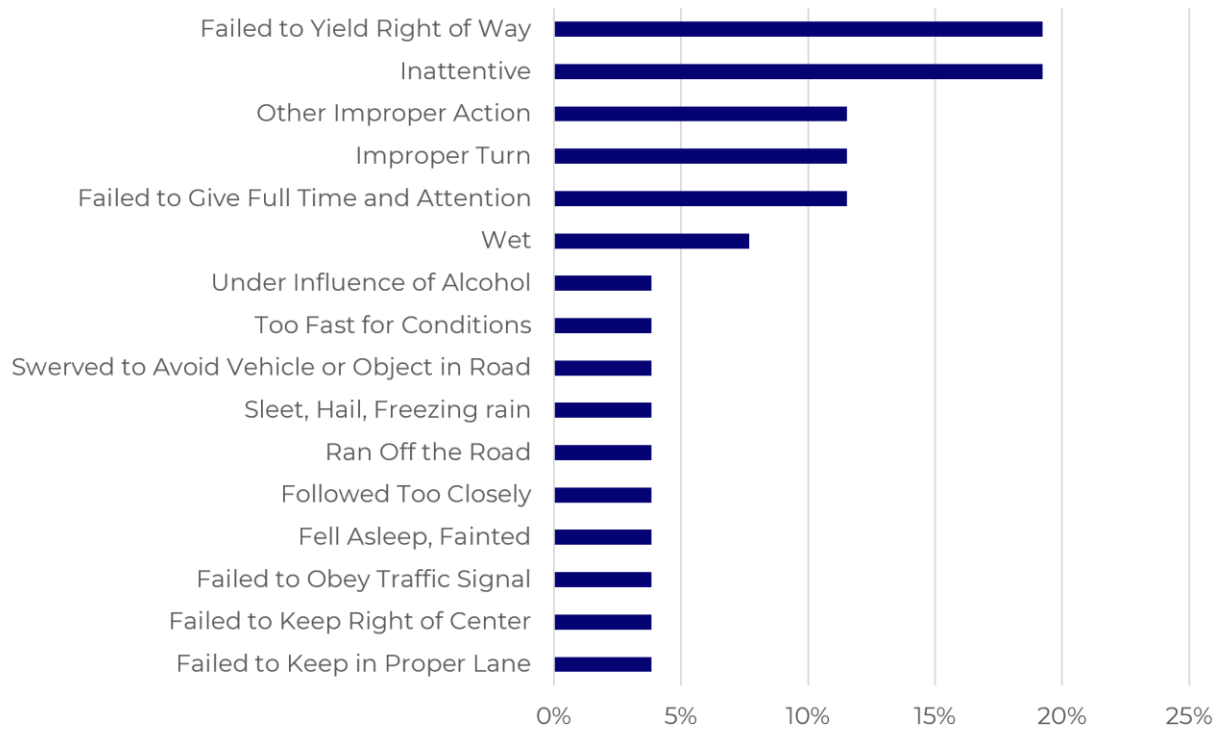
| Total Crashes by Collision Type | | | | | | |
|---------------------------------|----------------|--------------------------|--------------|-------------------|-------|-------------------------|
| Angle | Single Vehicle | Same Direction Sideswipe | Rear To Side | Head On Left Turn | Other | Same Direction Rear End |
| 7 | 6 | 4 | 3 | 2 | 2 | 2 |

| Lighting | | | Road Surface | | |
|----------|----------------|------|--------------|-----|---------|
| Daylight | Dark - Lighted | Dusk | Dry | Wet | Unknown |
| 14 | 10 | 2 | 18 | 4 | 4 |

Note: Crash summaries are based on the available crash data reviewed for this study. Reported crash totals and locations may vary across source datasets due to differences in reporting methods, geocoding, and intersection buffers.

Figure 77 illustrates the percentage of crashes accounting for each contributing circumstance associated with crashes at the intersection during the 2022–2024 study period. A single crash may involve multiple contributing circumstances, as documented in the crash reports. As shown in the figure, the most common contributing circumstances were related to driver behavior, including failure to yield right-of-way and inattentiveness, followed by other improper actions, improper turning movements, and failure to give full time and attention.

Figure 77. Percentage of Crashes Accounting for Each Contributing Circumstance at Intersection #12 - Hungerford Drive (MD 355) & N. Washington Street



NEAR-MISS VIDEO ANALYSIS

Post-Encroachment Time (PET), which measures the temporal separation between two users occupying the same conflict area, was used to assess the severity of these interactions and is calculated only when both users pass through the same conflict point. Based on 24-hour video observations at the Hungerford Drive (MD 355) & N. Washington Street intersection, a total of 89 near-miss events were identified, as summarized in Table 88. Of these, 40 involved vehicle-to-vehicle conflicts, 40 involved vehicle-to-pedestrian conflicts, and nine (9) involved vehicle-to-bicyclist conflicts, indicating that both vehicles and pedestrians were equally affected groups. As shown in the table, most (71) observed conflicts fall within the 2–3 second PET range. A PET of less than 2 seconds is generally considered indicative of higher-risk interactions; 18 conflicts fall within this range at the intersection. Notably, most of these higher-risk conflicts (14 out of 18) involved pedestrians or bicyclists, indicating elevated conflict severity for vulnerable road users at the intersection.

Table 88. Summary of Near Misses for a Day (24-hours) at Intersection #12 - Hungerford Drive (MD 355) & N. Washington Street

| Post Encroachment Time (PET) | Vehicle-Vehicle | Vehicle-Pedestrian | Vehicle-Bicyclist | Total |
|------------------------------|-----------------|--------------------|-------------------|-----------|
| 0.0 - 1.5s | 0 | 5 | 0 | 5 |
| 1.5 - 2.0s | 4 | 6 | 3 | 13 |
| 2.0 - 3.0s | 36 | 29 | 6 | 71 |
| Total | 40 | 40 | 9 | 89 |

Based on video analysis of near-miss events, Table 89 summarizes the most frequent conflict types observed at the intersection. The highest number of conflicts (27) occurred between southbound left-turning vehicles and northbound through vehicles. The next most frequent conflicts involved northbound left-turning vehicles interacting with southbound through-traffic, followed by pedestrian-related conflicts on the south leg involving eastbound right-turning vehicles. While vehicle-to-vehicle conflicts involving left turns dominate the top rankings, the presence of pedestrian-related conflicts highlights potential safety concerns for vulnerable road users at the intersection.

Table 89. Top Three Conflict Types by Movements based on Near Miss Video Analysis at Intersection #12 - Hungerford Drive (MD 355) & N. Washington Street.

| Conflict Rank | Movement 1 | Movement 2 | Conflicts |
|---------------|----------------------|--------------------|-----------|
| 1. | Southbound Left | Northbound Through | 27 |
| 2. | Northbound Left | Southbound Through | 13 |
| 3. | South Leg Pedestrian | Eastbound Right | 11 |

EXISTING TRAFFIC OPERATIONS

Table 90 shows the results of traffic operations analysis for this intersection based on existing lane configurations, peak-hour traffic volumes, and signal timing parameters. Drivers on the eastbound and westbound approaches experience moderate delays during both the AM and PM peak hours.

Table 90. Results of Traffic Operation Analysis at Intersection #12 - Hungerford Drive (MD 355) & N. Washington Street

| Approach | Movement | Weekday AM Peak Hour | | | Weekday PM Peak Hour | | |
|-----------------------------|-------------------------|----------------------|----------|----------------------------|----------------------|----------|----------------------------|
| | | Delay (sec) | LOS | 95th Percentile Queue (ft) | Delay (sec) | LOS | 95th Percentile Queue (ft) |
| Eastbound | Eastbound Left | 71.9 | E | 133 | 74.8 | E | 264 |
| | Eastbound Through | 71.5 | E | 127 | 74.9 | E | 261 |
| | Overall Approach | 71.7 | E | | 74.9 | E | |
| Westbound | Westbound Left | 70.2 | E | 50 | 70.3 | E | 95 |
| | Westbound Through | 69.4 | E | 41 | 70.2 | E | 100 |
| | Westbound Right | 67.9 | E | 0 | 65.9 | E | 2 |
| | Overall Approach | 69.4 | E | | 68.7 | E | |
| Northbound | Northbound Left | 7.8 | A | 25 | 11.9 | B | 47 |
| | Northbound Through | 9.9 | A | 172 | 20.9 | C | 498 |
| | Overall Approach | 9.8 | A | | 20.5 | C | |
| Southbound | Southbound Left | 6.4 | A | 17 | 15.2 | B | 72 |
| | Southbound Through | 12.3 | B | 348 | 16.9 | B | 302 |
| | Southbound Right | 10.3 | B | 131 | 15.8 | B | 157 |
| | Overall Approach | 11.9 | B | | 16.6 | B | |
| Overall Intersection | | 14.8 | B | | 26.4 | C | |

LOS = Level of Service

= 95th percentile volume exceeds capacity, queue may be longer

SITE VISIT OBSERVATIONS

The project team conducted a site visit on Friday, May 1, 2026. Key findings from the site visit included steady queuing from all approaches, with a moderate volume of RideOn buses observed from the southbound, northbound, and eastbound approaches. Left turns were observed in all directions, and multiple U-turns were observed on both northbound and southbound approaches. The team also observed pedestrians crossing the southbound slip lane, west leg, south leg, and east leg on crosswalks, with multiple pedestrians using the south leg crosswalk to enter and exit the shopping center on the east side of the intersection.

Of note, the team observed low visibility of northbound through vehicles from the westbound approach due to a curve on the northbound approach and trees next to the roadway. The team noted “No Turn on Red” overhead signs on the eastbound and northbound approach, but none on the westbound approach. Additionally, the intersection lacked a crosswalk on the north leg, letter and arrow lane control pavement markings, puppy track markings, and an object marker on the north leg median.

Photos in Appendix F and in Figure 78, Figure 79, and Figure 80 document site visit observations.

Figure 78. Faded high visibility crosswalk and pedestrian crossing signs on southbound approach slip lane #12 - Hungerford Drive (MD 355) & N. Washington Street



Figure 79. Long crosswalk frequently used by pedestrians lacking high visibility pattern on south leg #12 - Hungerford Drive (MD 355) & N. Washington Street



Figure 80. Lack of puppy tracks in intersection, particularly for eastbound left-turn movement, with frequent RideOn bus traffic #12 - Hungerford Drive (MD 355) & N. Washington Street



IDENTIFIED SAFETY ISSUES

Key safety issues and other findings are shown in Table 91 and described below.

Table 91. Key Safety Issues for Intersection #12 - Hungerford Drive (MD 355) & N. Washington Street

| Issue ID | Safety Issue | Safety Issue Type | Crash Data | Near-Miss Video | Site Visit |
|----------|--|---|------------|-----------------|------------|
| 12-A | A curve on the northbound approach obscures sight distance. | 3.1 Roadway Design: Inadequate Sight Distance (Lack of Driver Visibility) | | | ✓ |
| 12-B | There is a slip lane at the northwest corner that allows southbound drivers to make high-speed right turns into N. Washington Street, which conflicts with crossing pedestrians. | 3 Roadway Design | | | ✓ |
| 12-C | The westbound, northbound, and eastbound approach crosswalks lack a high-visibility design. | 5.1 Pedestrian: Intersection Crossing | | | ✓ |
| 12-D | Most frequent near-miss conflict types were southbound left-turn vehicles with northbound through vehicles (27 conflicts between 2022 and 2024) and northbound left-turn vehicles with southbound through vehicles (13 conflicts between 2022 and 2024). | 8.4 Conflict Type: Left Turn | | ✓ | |
| 12-E | Four instances of sideswipe with vehicles traveling in the same direction between 2022 and 2024. | 8.3 Conflict Type: Sideswipe | ✓ | | |
| 12-F | Eleven near misses between eastbound right-turn vehicles and pedestrians crossing the south leg between 2022 and 2024 | 2.2 Conflicts Between Users: Drivers and Pedestrians | | ✓ | |
| 12-G | Seven instances of angle crashes between 2022 and 2024. | 8.5 Conflict Type: Angle | ✓ | | |
| 12-H | Lacking object marker on North leg median | 3.4 Roadway Design: Night Time Visibility | | | ✓ |

Bold indicates a priority safety issue.

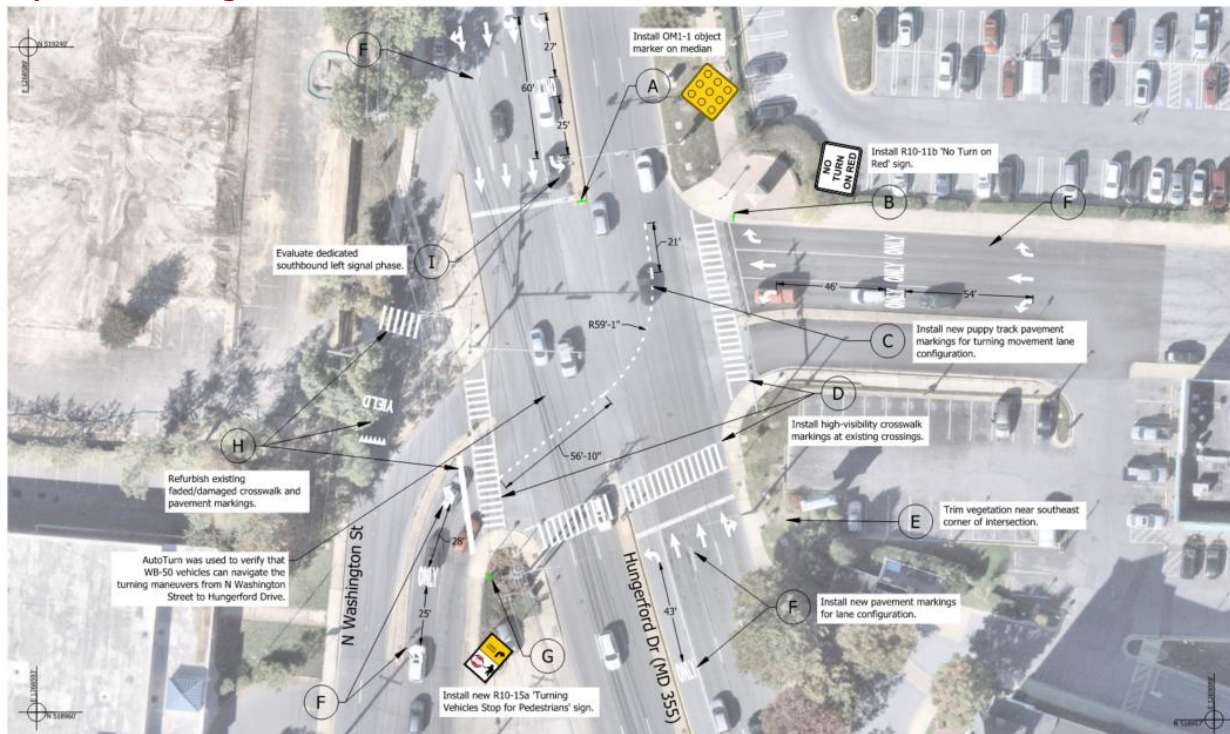
Recommendations

SHORT-TERM RECOMMENDATIONS

Figure 81 illustrates the proposed short-term, quick-build improvements for the Hungerford Drive (MD 355) & N. Washington Street intersection, with additional detail provided in Table 92. The short-term concept focuses on

These recommendations rely on low-cost, implementable treatments (signing, striping, and delineation) to reduce driver uncertainty, improve yielding compliance, and make pedestrian crossings more visible and predictable.

Figure 81. Short-Term Recommendations for Intersection #12 - Hungerford Drive (MD 355) & N. Washington Street



LEGEND

- | | | |
|---|--|---|
| (A) Proposed object marker (OM1-1): 18" x 18" | (D) Proposed crosswalk markings. See Detail A. | (G) Proposed regulatory sign (R10-15a): 24" x 30" |
| (B) Proposed regulatory sign (R10-11b): 24" x 30" | (E) Vegetation maintenance for sight distance | (H) Refurbish existing pavement markings |
| (C) Proposed turning pavement guide | (F) Proposed lane configuration markings | (I) Proposed dedicated SBL signal phase |

Table 92. Short-Term Recommendations for Intersection #12 - Hungerford Drive (MD 355) & N. Washington Street

| Rec. ID | Recommendation | Safety issue(s) addressed |
|---------|---|---------------------------|
| 12-S-1 | Refurbish faded/damaged crosswalks and pavement markings on southbound slip lane and west leg | 12-C |
| 12-S-2 | Trim vegetation near southeast corner to provide more sight distance | 12-A |
| 12-S-3 | Install No Turn on Red (NTOR) sign for westbound right-turn traffic | 12-A, 12-G |
| 12-S-4 | Upgrade existing crosswalks to high visibility | 12-C |
| 12-S-5 | Evaluate signal phasing to allow for dedicated southbound left turn | 12-D |
| 12-S-6 | Install arrow and letter pavement markings for lane configuration on northbound and southbound approach | 12-E |
| 12-S-7 | Install Turning Vehicles Stop for Pedestrians sign at southwest corner | 12-F |
| 12-S-8 | Install puppy tracks for eastbound left-turn traffic to MD 355 northbound receiving lane | 12-E |
| 12-S-9 | Install Object Marker (OM1-3) on the northbound receiving lane median | 12-H |

COST ESTIMATE

Table 93 provides a planning-level cost estimate for the short-term recommendations, based on item quantities and recent Maryland SHA price index sheets, and excludes contingency and mobilization.

Table 93. Planning-Level Cost Estimate at Intersection #12 - Hungerford Drive (MD 355) & N. Washington Street

| Item | Description | Unit | Unit Cost | Quantity | Cost |
|------------------|--|------|-----------|-------------|--------------------|
| Pavement Marking | 24" Stop Bar | LF | \$21.75 | 40 | \$870.00 |
| Pavement Marking | 12" Crosswalk | LF | \$6.19 | 826.6666667 | \$5,115.49 |
| Pavement Marking | Yield (sharks teeth) marking | LF | \$60.49 | 12 | \$725.83 |
| Pavement Marking | Puppy track turn guidance marking (white) | LF | \$1.15 | 46.66666667 | \$53.67 |
| Pavement Marking | Straight arrow marking | EACH | \$157.85 | 9 | \$1,420.64 |
| Pavement Marking | Turn arrow marking | EACH | \$395.15 | 9 | \$3,556.34 |
| Pavement Marking | Shared through-turn arrow marking | EACH | \$395.15 | 2 | \$790.30 |
| Pavement Marking | YIELD' marking (letter) | EACH | \$375.23 | 1 | \$375.23 |
| Pavement Marking | ONLY' marking (letter) | EACH | \$375.23 | 6 | \$2,251.39 |
| Sign | New sign post | EACH | \$193.76 | 3 | \$581.28 |
| Sign | Turning Traffic Stop to Peds sign [R10-15 (1)] | EACH | \$600.00 | 1 | \$600.00 |
| Sign | Object marker sign [OM1-3] | EACH | \$180.00 | 1 | \$180.00 |
| Sign | 'No Turn On Red' sign [R10-11b] | EACH | \$320.00 | 1 | \$320.00 |
| Total: | | | | | \$16,840.16 |

LONG-TERM RECOMMENDATIONS

Figure 82 illustrates the proposed long-term capital improvements for the Hungerford Drive (MD 355) & N. Washington Street intersection. The long-term concept focuses on redesigning the intersection to simplify vehicle movements while improving pedestrian safety. They emphasize removing complex turning features and adding or enhancing median refuge areas and highly visible crosswalks to make crossings safer.

Figure 82. Long-Term Recommendations for Intersection #12 - Hungerford Drive (MD 355) & N. Washington Street



LEGEND

- A** Extend median to have pedestrian refuge island
- B** Reconstruct intersection corner by removing median and slip lane, and making a regular right turn lane
- C** Add high-visibility crosswalk, paired with an extended median for pedestrian refuge island

Key elements of the long-term recommendations are included in Table 94.

Table 94. Long-Term Recommendations for Intersection #12 - Hungerford Drive (MD 355) & N. Washington Street

| Rec. ID | Recommendation | Safety issue(s) addressed |
|---------|---|---------------------------|
| 12-L-1 | Consider reconstructing northwest intersection corner, removing the median, closing the existing slip lane, and making a regular right-turn lane, | 12-B |
| 12-L-2 | Consider extending the median for a pedestrian refuge island on the south leg, | 12-F |
| 12-L-3 | Consider adding a high-visibility crosswalk on the north leg with extended median for pedestrian refuge island. | 12-C |

#13 - FREDERICK ROAD (MD 355) & WATKINS POND BOULEVARD

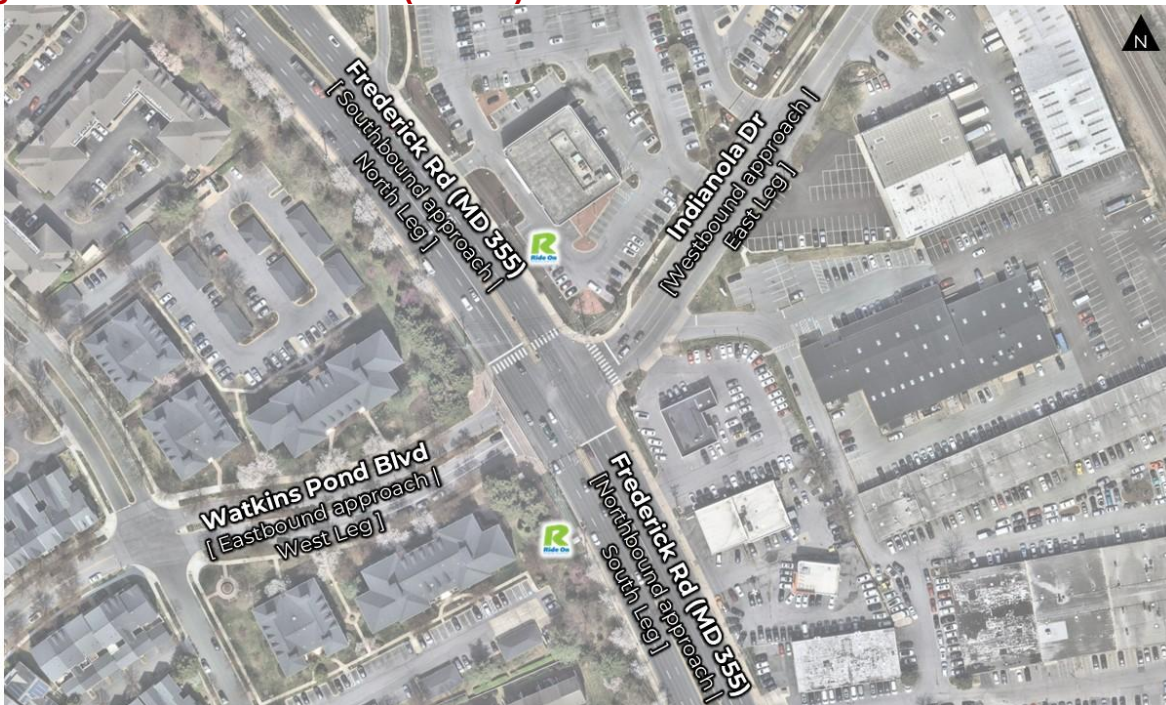
Existing Conditions

INTERSECTION DESCRIPTION

The intersection of Frederick Road (MD 355) & Watkins Pond Boulevard is shown in Figure 83. Frederick Road is classified as a major arterial with a speed limit of 40 MPH and six lanes in addition to designated southbound and northbound left-turn lanes, and Watkins Pond Boulevard is classified as a minor arterial with a speed limit of 25 MPH³. On the eastbound approach, Watkins Pond Boulevard has three eastbound lanes and one westbound lane, and on the westbound approach (Indianola Drive) there are three westbound lanes and one eastbound lane. The intersection is signalized. In 2024, Annual Average Daily Traffic (AADT) on Frederick Road was 39,320¹.

According to the Rockville Comprehensive Land Use Policy Map², land uses to the west of the intersection are “Residential Multiple Unit” and to the east of the intersection are “Service Industrial and Residential Mix”. There are RideOn Route 55 northbound and southbound bus stops located on the south and north legs of the intersection. There are sidewalks on all sides with crosswalks on the north leg, west leg, and east leg. There is not a crosswalk on the south leg.

Figure 83. #13 - Frederick Road (MD 355) & Watkins Pond Boulevard Intersection



SAFETY REVIEW

Table 95 summarizes the crash characteristics, including collision types, lighting conditions, and roadway surface conditions. A total of 15 crashes were recorded at the intersection during the three-year period from 2022 to 2024. The reported crashes primarily involved automobiles, with only one (1) pedestrian-related crash and zero (0) cyclist involvement. Most of the crashes resulted in property-damage-only (PDO) outcomes, with six (6) minor injury crashes reported over the study period.

It is important to note that a fatal crash occurred at this location outside the three-year crash analysis period. On June 18th 2025 a motorist struck a pedestrian just north of the intersection and the pedestrian died at the scene. The City Department of Public Works complete a post-crash inspection and documented the results in a memorandum on July 10, 2025, and is available in the Appendix.

Table 95. Summary of Three-Year (2022-24) Crashes at Intersection #13 - Frederick Road (MD 355) & Watkins Pond Boulevard

| Total Crashes | Total Crashes by Year | | | Total Crashes by User | | |
|---------------|-----------------------|------|------|-----------------------|---------|------------|
| 15 | 2022 | 2023 | 2024 | Auto | Cyclist | Pedestrian |
| | 4 | 5 | 6 | 14 | 0 | 1 |

| Total Crashes by Severity | | | | |
|---------------------------|---------|-------|-----------------|-----------------|
| Fatal | Serious | Minor | Possible Injury | Property Damage |
| 0 | 0 | 6 | 0 | 9 |

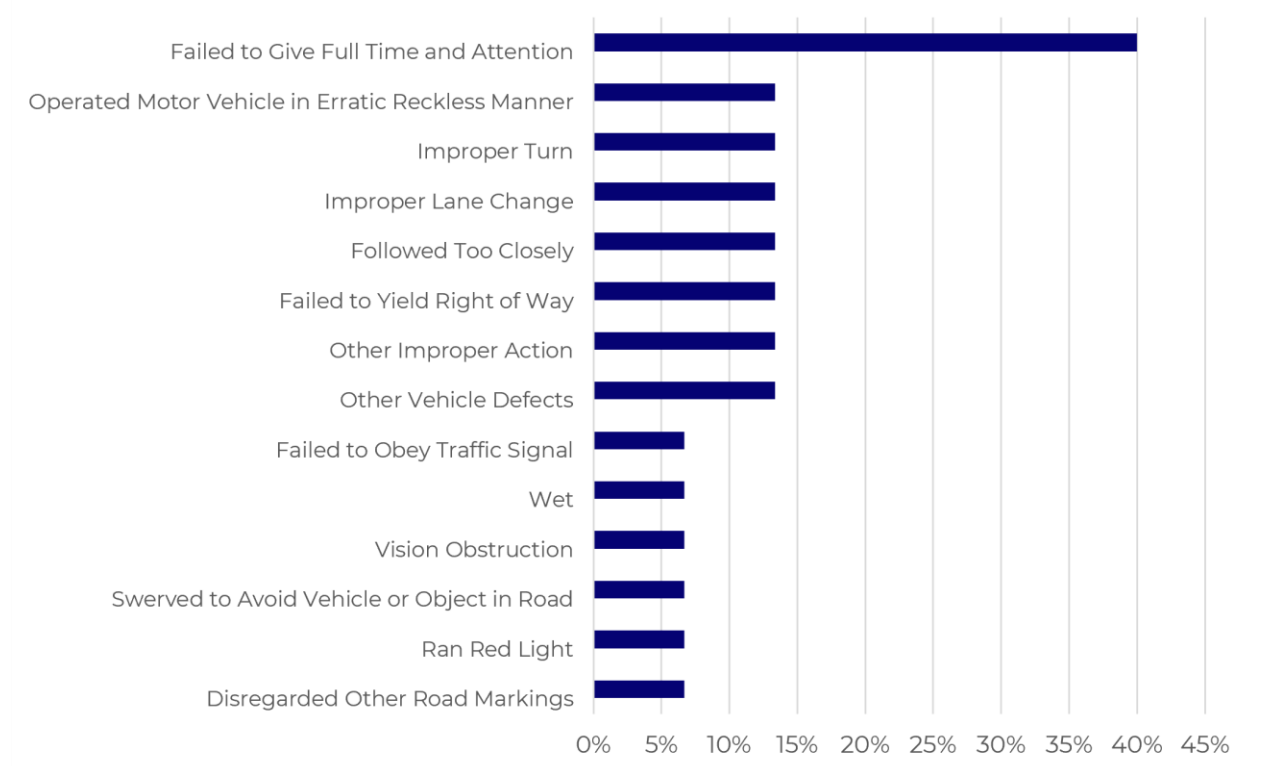
| Total Crashes by Collision Type | | | |
|---------------------------------|-------------------------|--------------------------|-------|
| Angle | Same Direction Rear End | Same Direction Sideswipe | Other |
| 5 | 5 | 4 | 1 |

| Lighting | | | Road Surface | | |
|----------|----------------|------|--------------|-----|---------|
| Daylight | Dark Lights On | Dusk | Dry | Wet | Unknown |
| 11 | 3 | 1 | 12 | 2 | 1 |

Note: Crash summaries are based on the available crash data reviewed for this study. Reported crash totals and locations may vary across source datasets due to differences in reporting methods, geocoding, and intersection buffers.

Figure 84 illustrates the percentage of crashes accounting for each contributing circumstance associated with crashes at the intersection during the 2022–2024 study period. A single crash may involve multiple contributing circumstances, as documented in the crash reports. As shown in the figure, the most common contributing circumstance was failure to give full time and attention, followed by operating a motor vehicle in an erratic or reckless manner, improper turning movements, and improper lane changes. Other contributing factors included following too closely, failure to yield right-of-way, and other improper actions.

Figure 84. Percentage of Crashes Accounting for Each Contributing Circumstance at Intersection #13 - Frederick Road (MD 355) & Watkins Pond Boulevard



NEAR-MISS VIDEO ANALYSIS

Post-Encroachment Time (PET), which measures the temporal separation between two users occupying the same conflict area, was used to assess the severity of these interactions and is calculated only when both users pass through the same conflict point. Based on 24-hour video observations at the Frederick Road (MD 355) & Watkins Pond Boulevard intersection, a total of 70 near-miss events were identified, as summarized in Table 96. Of these, 52 involved vehicle-to-vehicle conflicts, 17 involved vehicle-to-pedestrian conflicts, and one (1) involved vehicle-to-bicyclist conflicts, indicating that vehicles were the most affected group. As shown in the table, most (59) observed conflicts fall within the 2–3 second PET range. A PET of less than 2 seconds is generally considered indicative of higher-risk interactions; 11 conflicts fall within this range at the intersection. Notably, three (3) out of 11 higher-risk conflicts involved pedestrians or bicyclists, indicating moderate risk for vulnerable road users at the intersection.

Table 96. Summary of Near Misses for a Day (24-hours) at Intersection #13 - Frederick Road (MD 355) & Watkins Pond Boulevard

| Post Encroachment Time (PET) | Vehicle-Vehicle | Vehicle-Pedestrian | Vehicle-Bicyclist | Total |
|------------------------------|-----------------|--------------------|-------------------|-----------|
| 0.0 - 1.5s | 1 | 3 | 0 | 4 |
| 1.5 - 2.0s | 7 | 0 | 0 | 7 |
| 2.0 - 3.0s | 44 | 14 | 1 | 59 |
| Total | 52 | 17 | 1 | 70 |

Based on video analysis of near-miss events, Table 97 summarizes the most frequent conflict types observed at the intersection. The highest number of conflicts (42) occurred between southbound left-turning vehicles and northbound through vehicles. The next most frequent conflicts involved northbound left-turning vehicles interacting with southbound through vehicles, followed by conflicts between westbound right-turning vehicles and pedestrians on the north leg. While vehicle-to-vehicle conflicts involving left turns are the most common conflicts, the presence of pedestrian-related conflicts highlights potential safety concerns for vulnerable road users at the intersection.

Table 97. Top Three Conflict Types by Movements based on Near Miss Video Analysis at Intersection #13 - Frederick Road (MD 355) & Watkins Pond Boulevard.

| Conflict Rank | Movement 1 | Movement 2 | Conflicts |
|---------------|-----------------|----------------------|-----------|
| 1. | Southbound Left | Northbound Through | 42 |
| 2. | Northbound Left | Southbound Through | 9 |
| 3. | Westbound Right | North Leg Pedestrian | 4 |

EXISTING TRAFFIC OPERATIONS

Table 98 shows the results of the traffic operations analysis at the Frederick Road (MD 355) & Watkins Pond Boulevard intersection based on existing lane configurations, peak-hour traffic volumes, and signal timing parameters. Drivers on the eastbound and westbound approaches experience moderate delays during both the AM and PM peak hours.

Table 98. Results of Traffic Operation Analysis at Intersection #13 - Frederick Road (MD 355) & Watkins Pond Boulevard

| Approach | Movement | Weekday AM Peak Hour | | | Weekday PM Peak Hour | | |
|-----------------------------|-------------------------|----------------------|----------|----------------------------|----------------------|----------|----------------------------|
| | | Delay (sec) | LOS | 95th Percentile Queue (ft) | Delay (sec) | LOS | 95th Percentile Queue (ft) |
| Eastbound | Eastbound Left | 72.3 | E | 31 | 70.1 | E | 47 |
| | Eastbound Through | 74.2 | E | 47 | 69.3 | E | 38 |
| | Eastbound Right | 64.5 | E | 31 | 60.9 | E | 23 |
| | Overall Approach | 67.2 | E | | 64.1 | E | |
| Westbound | Westbound Left | 73.3 | E | 223 | 72.3 | E | 153 |
| | Westbound Through | 74.1 | E | 234 | 72.0 | E | 154 |
| | Westbound Right | 57.9 | E | 26 | 62.9 | E | 68 |
| | Overall Approach | 70.4 | E | | 68.1 | E | |
| Northbound | Northbound Left | 12.8 | B | 29 | 9.0 | A | 51 |
| | Northbound Through | 14.4 | B | 242 | 18.6 | B | 591 |
| | Overall Approach | 14.3 | B | | 18.2 | B | |
| Southbound | Southbound Left | 8.5 | A | 106 | 25.5 | C | 114 |
| | Southbound Through | 17.1 | B | 559 | 12.4 | B | 242 |
| | Overall Approach | 16.3 | B | | 13.7 | B | |
| Overall Intersection | | 23.0 | C | | 22.2 | C | |

LOS = Level of Service

= 95th percentile volume exceeds capacity, queue may be longer

SITE VISIT OBSERVATIONS

The project team conducted a site visit on Friday, May 1, 2026. Key findings from the site visit included steady queuing from all approaches, with a moderate volume of left-turn vehicles from the northbound and southbound approaches, as well as several U-turns from the southbound approach. The team observed pedestrians boarding and deboarding RideOn buses at the stops on the north and south legs, with one pedestrian observed deboarding a southbound RideOn bus, crossing the south leg of Frederick Road without a crosswalk, and continuing south on Frederick Road. Additionally, several bicyclists were observed traveling southbound.

The team witnessed one near miss between a right-turn vehicle from the westbound approach and a pedestrian crossing the north leg of Frederick Road. A memorial to a pedestrian fatal crash was observed at the northeast corner of the intersection, dated June 2025. At this corner, vegetation on Indianola Drive obscured visibility of the north leg crosswalk. The team observed several curb ramps, detectable warning surfaces, and the brick crosswalk in need of repair, and one faded advanced lane control sign in need of replacement. The team observed the intersection lacked a crosswalk on the south leg, letter and arrow lane control pavement markings, and object markers on all concrete medians.

Photos in Appendix F and Figure 85, Figure 86, and Figure 87 document site visit observations.

Figure 85. Low visibility of pedestrians crossing the north leg for drivers turning right from the westbound approach #13 - Frederick Road (MD 355) & Watkins Pond Boulevard



Figure 86. Deteriorated crosswalk pavement markings and detectable warning surfaces #13 - Frederick Road (MD 355) & Watkins Pond Boulevard



Figure 87. Damaged curb ramps and brick crosswalk on east leg #13 - Frederick Road (MD 355) & Watkins Pond Boulevard



IDENTIFIED SAFETY ISSUES

Key safety issues and other findings are shown in Table 99 and described below.

Table 99. Key Safety Issues for Intersection #13 - Frederick Road (MD 355) & Watkins Pond Boulevard

| Issue ID | Safety Issue | Safety Issue Type | Crash Data | Near-Miss Video | Site Visit |
|-------------|---|---|------------|-----------------|------------|
| 13-A | A near miss observed between a westbound right-turn vehicle and a pedestrian crossing the north leg (a memorial was placed on the northeast corner indicating a fatal crash occurred in June 2025) | 2.1 Conflicts Between Users: Drivers Turning and Pedestrians | | ✓ | ✓ |
| 13-B | Four instances of sideswipes with vehicles traveling in the same direction between 2022 and 2024 | 8.3 Conflict Type: Sideswipe | ✓ | | |
| 13-C | Four instances of near miss conflicts between westbound right-turn vehicles and pedestrians crossing the north leg crosswalk | 2.1 Conflicts Between Users: Drivers Turning and Pedestrians | | ✓ | |
| 13-D | Brick pedestrian crosswalk is damaged and lacks a high-visibility design | 5.1 Pedestrian: Intersection Crossing | | | ✓ |
| 13-E | Detectable warning surfaces are damaged | 4.2 Accessibility (ADA): Insufficient surface for pedestrians with disabilities (provides a flat surface) | | | ✓ |
| 13-F | Curb ramps are damaged | 4.1 Accessibility (ADA): Insufficient Curb Ramps | | | ✓ |
| 13-G | Pedestrians observed crossing the south leg without a crosswalk | 5.1 Pedestrian: Intersection Crossing | | | ✓ |
| 13-H | Five instances of angle crashes between 2022 and 2024 | 8.5 Conflict Type: Angle | ✓ | | |
| 13-I | High visibility crosswalk on north leg and east leg lack transverse line | 5.1 Pedestrian: Intersection Crossing | | | ✓ |
| 13-J | Lacking object marker on northbound, southbound, and westbound receiving lane median | 3.4 Roadway Design: Night Time Visibility | | | ✓ |
| 13-K | Advance Intersection Lane Control sign for eastbound traffic is faded | 7.1 User Behavior: Failure to Drive in Lane | | | |

Bold indicates a priority safety issue.

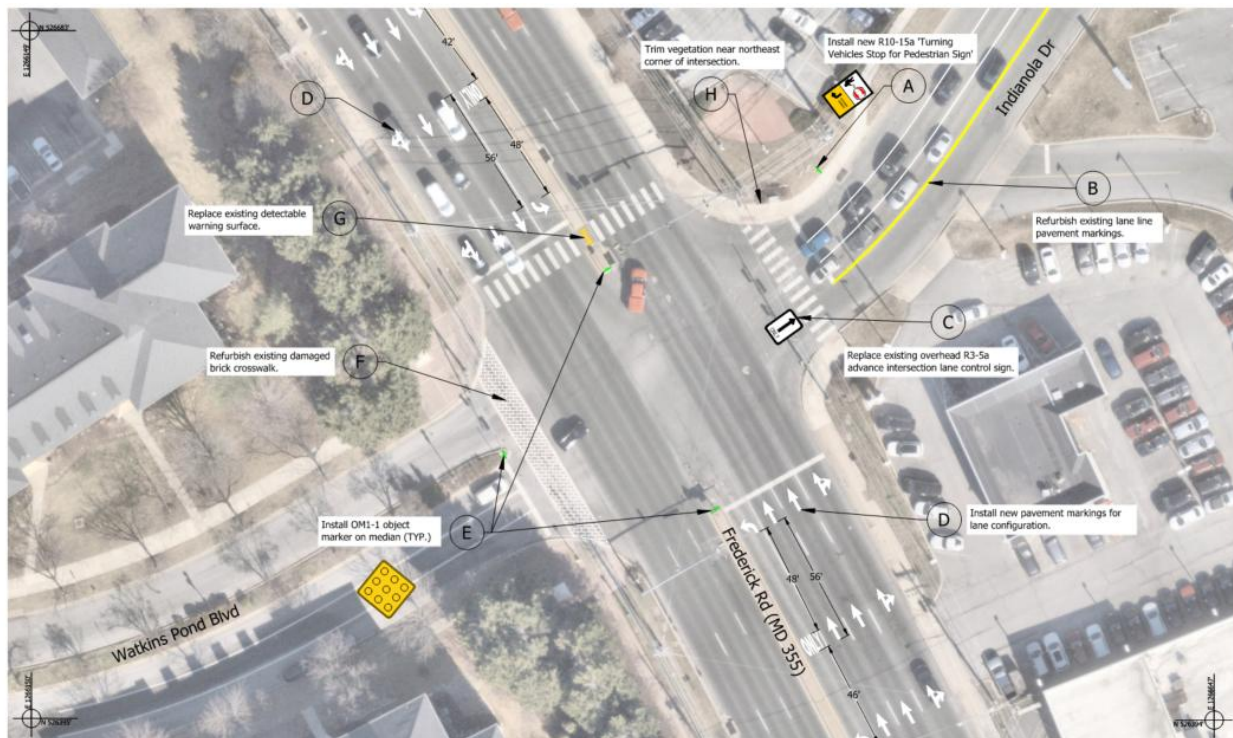
Recommendations

SHORT-TERM RECOMMENDATIONS

Figure 88 illustrates the proposed short-term, quick-build improvements for the Frederick Road (MD 355) & Watkins Pond Boulevard intersection, with additional detail provided in Table 100. The short-term concept focuses on

These recommendations rely on low-cost, implementable treatments (signing, striping, and delineation) to reduce driver uncertainty, improve yielding compliance, and make pedestrian crossings more visible and predictable.

Figure 88. Short-Term Recommendations for Intersection #13 - Frederick Road (MD 355) & Watkins Pond Boulevard



LEGEND

- | | | |
|--|---|--|
| (A) Proposed Yield to Pedestrians R10-15(1) sign: 24" x 30" | (D) Proposed lane configuration markings | (G) Replace ADA detectable warning surface |
| (B) Refurbish existing lane line markings | (E) Proposed object markers (OM1-1): 18" x 18" | (H) Vegetation maintenance for sight distance |
| (C) Replace existing lane control sign (R3-5a): 30" x 36" | (F) Refurbish existing brick crosswalk | |

Table 100. Short-Term Recommendations for Intersection #13 - Frederick Road (MD 355) & Watkins Pond Boulevard

| Rec. ID | Recommendation | Safety issue(s) addressed |
|---------|---|---------------------------|
| 13-S-1 | Replace damaged detectable warning surfaces | 13-E |
| 13-S-2 | Trim vegetation near northeast corner to provide more sight distance | 13-A, 13-C |
| 13-S-3 | Install a Turning Vehicles Stop for Pedestrians sign at the northeast corner | 13-A, 13-C |
| 13-S-4 | Install arrow and letter pavement markings for lane configuration on northbound and southbound approach | 13-B |
| 13-S-5 | Update existing crosswalks with high visibility markings | 13-I |
| 13-S-6 | Install object markers on northbound, southbound, and westbound receiving lane median | 13-J |
| 13-S-7 | Refurbish the damaged bricks on the decorative crosswalk on the west leg. | 13-D |
| 13-S-8 | Replace the faded Advance Intersection Lane Control sign for eastbound traffic | 13-K |

COST ESTIMATE

Table 101 provides a planning-level cost estimate for the short-term recommendations, based on item quantities and recent Maryland SHA price index sheets, and excludes contingency and mobilization.

Table 101. Planning-Level Cost Estimate at Intersection #13 - Frederick Road (MD 355) & Watkins Pond Boulevard

| Item | Description | Unit | Unit Cost | Quantity | Cost |
|------------------|--|------|-----------|----------|--------------------|
| Pavement Marking | 5" double yellow marking | LF | \$4.60 | 200 | \$920.00 |
| Pavement Marking | 5" solid marking (white) | LF | \$7.00 | 305 | \$2,135.00 |
| Pavement Marking | Straight arrow marking | EACH | \$157.85 | 12 | \$1,894.18 |
| Pavement Marking | Turn arrow marking | EACH | \$395.15 | 4 | \$1,580.60 |
| Pavement Marking | Shared through-turn arrow marking | EACH | \$395.15 | 6 | \$2,370.89 |
| Pavement Marking | ONLY' marking (letter) | EACH | \$375.23 | 2 | \$750.46 |
| Sign | New sign post | EACH | \$193.76 | 4 | \$775.04 |
| Sign | Advanced lane control sign (single lane) [R3-5a] | EACH | \$600.00 | 1 | \$600.00 |
| Sign | Turning Traffic Stop to Peds sign [R10-15 (1)] | EACH | \$600.00 | 1 | \$600.00 |
| Sign | Object marker sign [OM1-3] | EACH | \$180.00 | 3 | \$540.00 |
| Other | Detectable warning surfaces for curb ramps | SF | \$71.50 | 16 | \$1,144.00 |
| Total: | | | | | \$13,310.17 |

LONG-TERM RECOMMENDATIONS

Figure 89 illustrates the proposed long-term capital improvements for the Frederick Road (MD 355) & Watkins Pond Boulevard intersection. The long-term concept focuses on improving pedestrian visibility and safety by upgrading the crosswalk and enhancing median space for a refuge island. They aim to make crossings more visible and provide safer waiting areas for pedestrians.

Figure 89. Long-Term Recommendations for Intersection #13 - Frederick Road (MD 355) & Watkins Pond Boulevard



LEGEND

- A** Extend median for a pedestrian refuge island
- B** Replace brick crosswalk with high-visibility type

Key elements of the long-term recommendations are included in Table 102.

Table 102. Long-Term Recommendations for Intersection #13 - Frederick Road (MD 355) & Watkins Pond Boulevard

| Rec. ID | Recommendation | Safety issue(s) addressed |
|---------|---|---------------------------|
| 13-L-1 | Consider replacing brick crosswalk on west leg with high visibility crosswalk. | 13-D |
| 13-L-2 | Consider adding high visibility crosswalk and extending the median for a pedestrian refuge island on the south leg. | 13-G |

#14 - HUNGERFORD DRIVE (MD 355) & MANNAKEE STREET

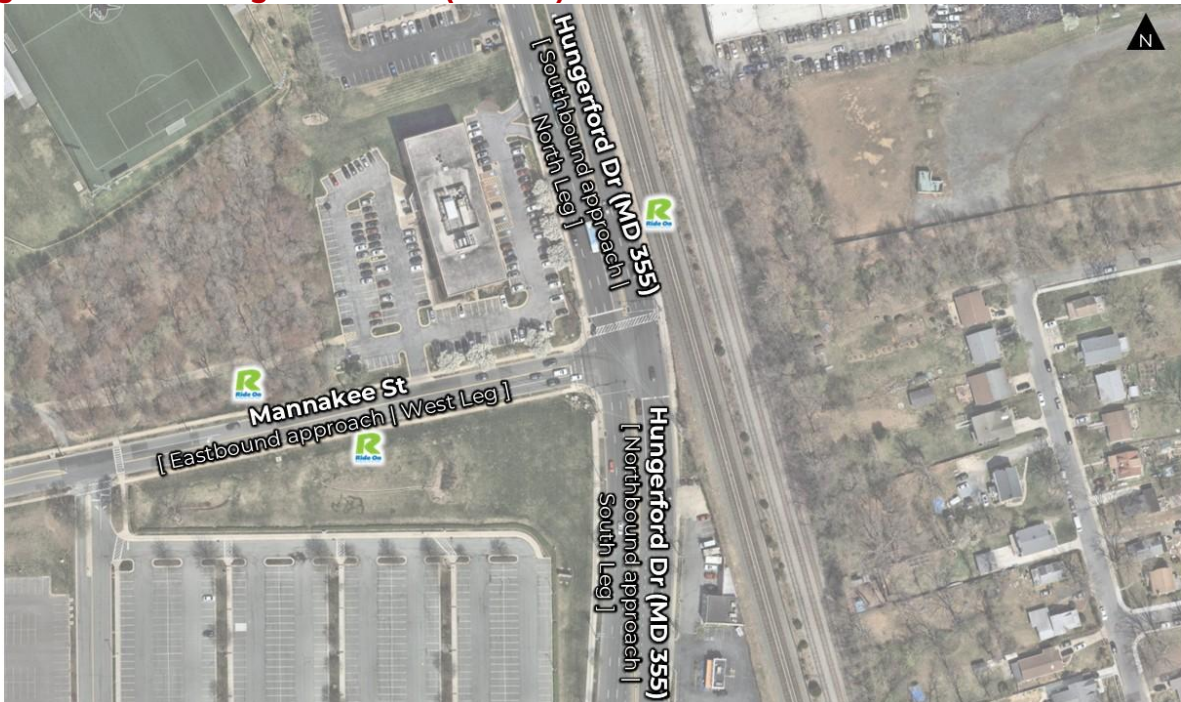
Existing Conditions

INTERSECTION DESCRIPTION

The intersection of Hungerford Drive (MD 355) & Mannakee Street is shown in Figure 90. Hungerford Drive is classified as a major arterial with a speed limit of 35 MPH and six lanes in addition to designated southbound and northbound left-turn lanes, and Mannakee Street is classified as a minor collector with a speed limit of 25 MPH³. On the eastbound approach, Mannakee Street has one left-turn lane and one right-turn lane. The intersection is signalized. In 2024, Annual Average Daily Traffic (AADT) on Frederick Road was 39,320 and 9,095 on Mannakee Street¹.

According to the Rockville Comprehensive Land Use Policy Map, land uses to the west of the intersection are “Exempt Commercial” and to the southeast are “Commercial”². There are RideOn Route 45 and 55 northbound and southbound bus stops located on the north leg of the intersection and RideOn Route 46 and 55 eastbound and westbound bus stops on the west leg. There are sidewalks on all sides with crosswalks on the north leg and west leg. There is no crosswalk on the south leg.

Figure 90. #14 - Hungerford Drive (MD 355) & Mannakee Street Intersection



SAFETY REVIEW

Table 103 summarizes the crash characteristics, including collision types, lighting conditions, and roadway surface conditions. A total of 15 crashes were recorded at the intersection during the three-year period from 2022 to 2024. All reported crashes involved only automobiles. Most of the crashes resulted in property-damage-only (PDO) outcomes, with four (4) minor injury crashes and two (2) possible injury crashes reported over the study period.

Table 103. Summary of Three-Year (2022-24) Crashes at Intersection #14 - Hungerford Drive (MD 355) & Mannakee Street

| Total Crashes | Total Crashes by Year | | | Total Crashes by User | | |
|---------------|-----------------------|------|------|-----------------------|---------|------------|
| 15 | 2022 | 2023 | 2024 | Auto | Cyclist | Pedestrian |
| | 4 | 5 | 6 | 15 | 0 | 0 |

| Total Crashes by Severity | | | | |
|---------------------------|---------|-------|-----------------|-----------------|
| Fatal | Serious | Minor | Possible Injury | Property Damage |
| 0 | 0 | 4 | 2 | 9 |

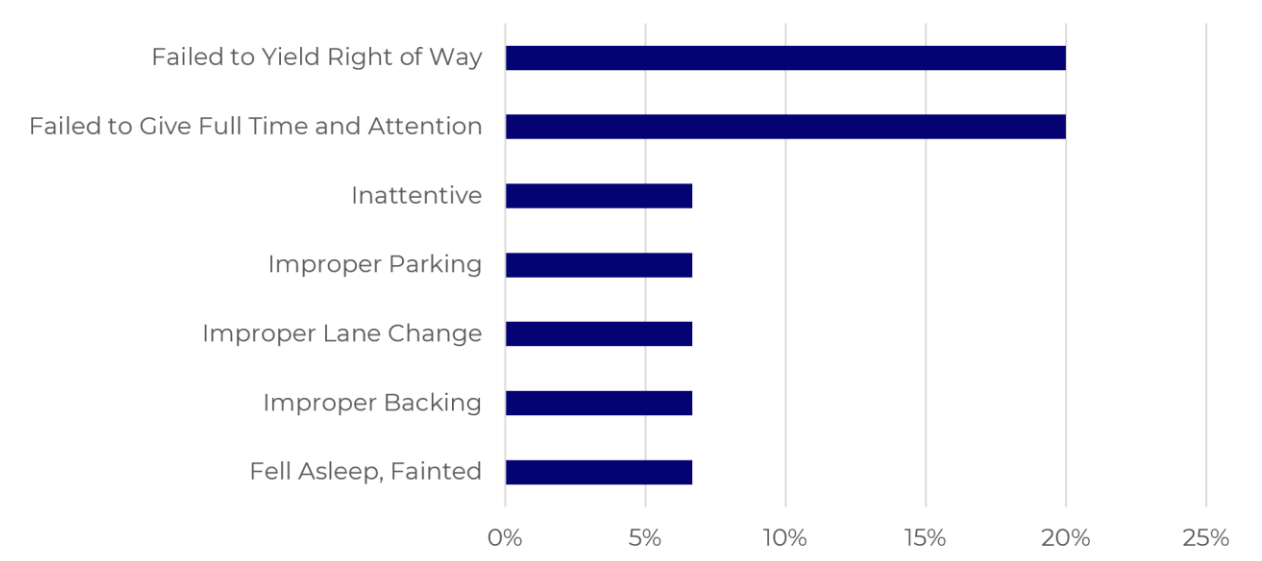
| Total Crashes by Collision Type | | | | | | |
|---------------------------------|-------------------------|-------|--------------|---------------------------|--------------------------|----------------|
| Angle | Same Direction Rear End | Other | Rear To Side | Same Direction Right Turn | Same Direction Sideswipe | Single Vehicle |
| 5 | 3 | 3 | 1 | 1 | 1 | 1 |

| Lighting | | | Road Surface | | |
|----------|----------------|------|--------------|-----|---------|
| Daylight | Dark Lights On | Dusk | Dry | Wet | Unknown |
| 9 | 5 | 1 | 11 | 1 | 3 |

Note: Crash summaries are based on the available crash data reviewed for this study. Reported crash totals and locations may vary across source datasets due to differences in reporting methods, geocoding, and intersection buffers.

Figure 91 illustrates the percentage of crashes accounting for each contributing circumstance associated with crashes at the intersection during the 2022–2024 study period. A single crash may involve multiple contributing circumstances, as documented in the crash reports. As shown in the figure, most contributing circumstances were related to driver behavior, with the most common being failure to yield right-of-way and failure to give full time and attention, followed by inattentiveness. Other contributing factors included improper parking, improper lane changes, improper backing, and driver fatigue-related conditions.

Figure 91. Percentage of Crashes Accounting for Each Contributing Circumstance at Intersection #14 - Hungerford Drive (MD 355) & Mannakee Street



NEAR-MISS VIDEO ANALYSIS

Post-Encroachment Time (PET), which measures the temporal separation between two users occupying the same conflict area, was used to assess the severity of these interactions and is calculated only when both users pass through the same conflict point. Based on 24-hour video observations at the Hungerford Drive (MD 355) & Mannakee Street intersection, a total of 91 near-miss events were identified, as summarized in Table 104. Of these, 61 involved vehicle-to-vehicle conflicts, 22 involved vehicle-to-pedestrian conflicts, and eight (8) involved vehicle-to-bicyclist conflicts, indicating that vehicles were the most affected group. As shown in the table, most (79) observed conflicts fall within the 2–3 second PET range. A PET of less than 2 seconds is generally considered indicative of higher-risk interactions; 12 conflicts fall within this range at the intersection. Notably, four (4) of these higher-risk conflicts involved pedestrians or bicyclists, indicating moderate risk for vulnerable road users at the intersection.

Table 104. Summary of Near Misses for a Day (24-hours) at Intersection #14 - Hungerford Drive (MD 355) & Mannakee Street

| Post Encroachment Time (PET) | Vehicle-Vehicle | Vehicle-Pedestrian | Vehicle-Bicyclist | Total |
|------------------------------|-----------------|--------------------|-------------------|-----------|
| 0.0 - 1.5s | 2 | 2 | 0 | 4 |
| 1.5 - 2.0s | 6 | 1 | 1 | 8 |
| 2.0 - 3.0s | 53 | 19 | 7 | 79 |
| Total | 61 | 22 | 8 | 91 |

Based on video analysis of near-miss events, Table 105 summarizes the most frequent conflict types observed at the intersection. The highest number of conflicts (61) occurred between northbound left-turning vehicles and southbound through vehicles. The next most frequent conflicts involved eastbound left-turning vehicles interacting with pedestrians on the north leg, followed by northbound left-turning vehicles interacting with pedestrians on the west leg. When combined, these pedestrian-related conflicts account for eight (8) conflicts, which is notably lower than the most common vehicle-to-vehicle conflict. However, their presence suggests that pedestrians in the crosswalks on the north and west legs may be the most vulnerable.

Table 105. Top Three Conflict Types by Movements based on Near Miss Video Analysis at Intersection #14 - Hungerford Drive (MD 355) & Mannakee Street.

| Conflict Rank | Movement 1 | Movement 2 | Conflicts |
|---------------|-----------------|----------------------|-----------|
| 1. | Northbound Left | Southbound Through | 61 |
| 2. | Eastbound Left | North Leg Pedestrian | 4 |
| 3. | Northbound Left | West Leg Pedestrian | 4 |

EXISTING TRAFFIC OPERATIONS

Table 106 shows the results of the traffic operations analysis at the Hungerford Drive (MD 355) & Mannakee Street intersection based on existing lane configurations, peak-hour traffic volumes, and signal timing parameters. Drivers on the eastbound approach experience moderate delays during both the AM and PM peak hours.

Table 106. Results of Traffic Operation Analysis at Intersection #14 - Hungerford Drive (MD 355) & Mannakee Street

| Approach | Movement | Weekday AM Peak Hour | | | Weekday PM Peak Hour | | |
|-----------------------------|-------------------------|----------------------|----------|----------------------------|----------------------|----------|----------------------------|
| | | Delay (sec) | LOS | 95th Percentile Queue (ft) | Delay (sec) | LOS | 95th Percentile Queue (ft) |
| Eastbound | Eastbound Left | 73.8 | E | 172 | 74.3 | E | 241 |
| | Eastbound Right | 62.0 | E | 74 | 57.3 | E | 68 |
| | Overall Approach | 66.8 | E | | 66.1 | E | |
| Northbound | Northbound Left | 45.5 | D | 264 | 6.7 | A | 57 |
| | Northbound Through | 2.8 | A | 89 | 5.1 | A | 233 |
| | Overall Approach | 12.6 | B | | 5.2 | A | |
| Southbound | Southbound Through | 15.5 | B | 511 | 9.8 | A | 296 |
| | Overall Approach | 15.5 | B | | 9.8 | A | |
| Overall Intersection | | 18.3 | B | | 12.4 | B | |

LOS = Level of Service

= 95th percentile volume exceeds capacity, queue may be longer

SITE VISIT OBSERVATIONS

The project team conducted a site visit on Friday, May 1, 2026. Key findings included limited visibility of the west leg crosswalk for southbound approach vehicles, with the associated pedestrian crosswalk sign partially obstructed by trees. Pavement markings for the west leg crosswalk were cracked, faded, and lacked a high-visibility pattern. The north leg crosswalk was also observed to be cracked and faded, with a long crossing distance and no pedestrian refuge.

To access the northbound bus stop, pedestrians were observed crossing the north leg via this long crosswalk against eastbound left-turning vehicles, then traveling a considerable distance north of the intersection to reach the stop. Additionally, the team observed several instances of southbound drivers stopped at the red signal beyond the stop bar.

Photos in Appendix F and Figure 92, Figure 93, and Figure 94 document site visit observations.

Figure 92. Pedestrian crosswalk on the west leg with deteriorated pavement marking lacking a high-visibility pattern #14 - Hungerford Drive (MD 355) & Mannakee Street



Figure 93. Long pedestrian crosswalk on north leg with deteriorated pavement marking #14 - Hungerford Drive (MD 355) & Mannakee Street



Figure 94. Low visibility of west leg pedestrian crosswalk from southbound approach and several near misses between northbound left-turn-vehicles and pedestrians on west leg crosswalk #14 - Hungerford Drive (MD 355) & Mannakee Street



IDENTIFIED SAFETY ISSUES

Key safety issues and other findings are shown in Table 107 and described below.

Table 107. Key Safety Issues for Intersection #14 - Hungerford Drive (MD 355) & Mannakee Street

| Issue ID | Safety Issue | Safety Issue Type | Crash Data | Near-Miss Video | Site Visit |
|----------|---|---|------------|-----------------|------------|
| 14-A | Four near miss conflicts reported between eastbound left turn vehicles and pedestrians crossing the north leg | 2.2 Conflicts Between Users: Drivers and Pedestrians | | ✓ | |
| 14-B | Four near miss conflicts reported between northbound left turn vehicles and pedestrians crossing the west leg | 2.2 Conflicts Between Users: Drivers and Pedestrians | | ✓ | |
| 14-C | Low visibility of west leg crosswalk for southbound approach traffic | 3.2 Roadway Design: Pedestrian Visibility | | | ✓ |
| 14-D | Curb ramps and detectable warning surfaces are damaged | 4.2 Accessibility (ADA): Insufficient surface for pedestrians with disabilities (provides a flat surface) | | | ✓ |
| 14-E | Parking regulation sign is faded on south leg | 3.4 Roadway Design: Night Time Visibility | | | ✓ |
| 14-F | Pedestrian crosswalk on west leg lacks high visibility design | 5.1 Pedestrian: Intersection Crossing | | | ✓ |
| 14-G | Five instances of angle crashes between 2022 and 2024 | 8.5 Conflict Type: Angle | ✓ | | |
| 14-H | Lacking object marker on northbound and southbound receiving lane medians | 3.4 Roadway Design: Night Time Visibility | | | ✓ |
| 14-I | North leg crosswalk cracked and faded; long distance and lacks pedestrian refuge | 5.1.1 Pedestrian: Intersection Crossing (Long Crossing) | | | ✓ |
| 14-J | One instance of same direction sideswipe crash and one instance of same direction right turn crash from 2022 to 2024. | 8.3 Conflict Type: Sideswipe | ✓ | | |
| 14-K | Long term, City has bicycle network plan to add bicycle facilities to Mannakee | 6.2 Bicyclist: Insufficient bicycle facilities | | ✓ | |

Bold indicates a priority safety issue.

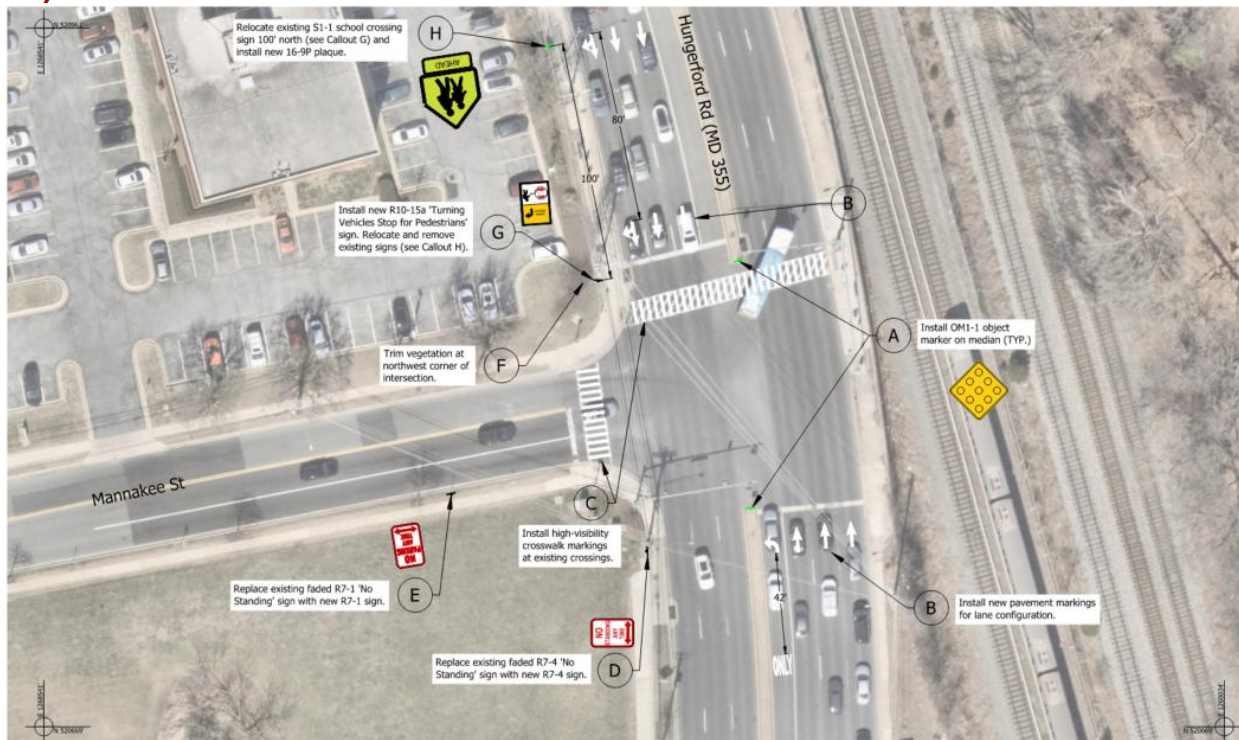
Recommendations

SHORT-TERM RECOMMENDATIONS

Figure 95 illustrates the proposed short-term, quick-build improvements for the Hungerford Drive (MD 355) & Mannakee Street intersection, with additional detail provided in Table 108. The short-term concept focuses on

These recommendations rely on low-cost, implementable treatments (signing, striping, and delineation) to reduce driver uncertainty, improve yielding compliance, and make pedestrian crossings more visible and predictable.

Figure 95. Short-Term Recommendations for Intersection #14 - Hungerford Drive (MD 355) & Mannakee Street



LEGEND

- | | | |
|---|--|--|
| (A) Proposed object markers (OM1-1): 18" x 18" | (D) Replace existing 'No Standing' sign (R7-4): 12" x 30" | (G) Proposed regulatory sign (R10-15a): 24" x 30" |
| (B) Proposed lane configuration markings | (E) Replace existing 'No Parking' sign (R7-1): 12" x 30" | (H) Relocate existing school crossing sign (S1-1): 36" x 36" and add Ahead plaque (W16-9P): 24" x 12" |
| (C) Proposed crosswalk markings. See Detail A. | (F) Vegetation maintenance for sight distance | |

Table 108. Short-Term Recommendations for Intersection #14 - Hungerford Drive (MD 355) & Mannakee Street

| Rec. ID | Recommendation | Safety issue(s) addressed |
|---------|--|---------------------------|
| 14-S-1 | Install arrow and letter pavement markings for lane configuration on northbound and southbound approach | 14-J |
| 14-S-2 | Trim vegetation near northwest corner obscuring pedestrian sign | 14-C |
| 14-S-3 | Install Turning Vehicles Stop for Pedestrians sign for southbound right-turn traffic and relocate/remove the pedestrian sign | 14-C |
| 14-S-4 | Update and restripe existing north leg crosswalk | 14-I |
| 14-S-5 | Add high-visibility design to existing west leg crosswalk | 14-F |
| 14-S-6 | Install Object Markers on the northbound and southbound receiving lane medians | 14-H |
| 14-S-7 | Replace the faded parking regulation sign on south leg | 14-e |
| 14-S-8 | Relocate existing school crossing (S1-1) sign on north leg 100 feet north and install new W16-9P plaque | 14-C |

COST ESTIMATE

Table 109 provides a planning-level cost estimate for the short-term recommendations, based on item quantities and recent Maryland SHA price index sheets, and excludes contingency and mobilization.

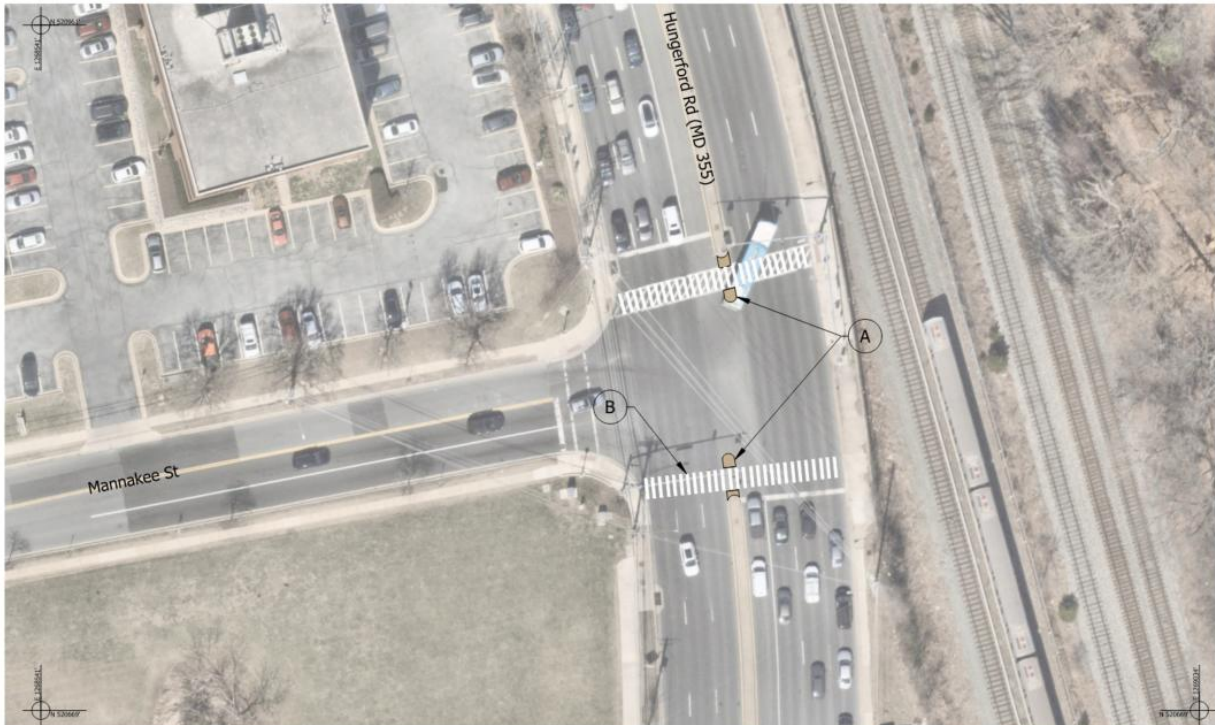
Table 109. Planning-Level Cost Estimate at Intersection #14 - Hungerford Drive (MD 355) & Mannakee Street

| Item | Description | Unit | Unit Cost | Quantity | Cost |
|------------------|--|------|-----------|----------|-------------------|
| Pavement Marking | 12" Crosswalk | LF | \$6.19 | 440 | \$2,722.76 |
| Pavement Marking | Straight arrow marking | EACH | \$157.85 | 7 | \$1,104.94 |
| Pavement Marking | Turn arrow marking | EACH | \$395.15 | 1 | \$395.15 |
| Pavement Marking | Shared through-turn arrow marking | EACH | \$395.15 | 2 | \$790.30 |
| Pavement Marking | ONLY' marking (letter) | EACH | \$375.23 | 1 | \$375.23 |
| Sign | New sign post | EACH | \$193.76 | 3 | \$581.28 |
| Sign | Relocate sign post | EACH | \$79.54 | 1 | \$79.54 |
| Sign | Parking regulation sign [R7-1] | EACH | \$120.00 | 2 | \$240.00 |
| Sign | Turning Traffic Stop to Peds sign [R10-15 (1)] | EACH | \$600.00 | 1 | \$600.00 |
| Sign | 'Ahead' plaque (under school zone sign) [W16-9P] | EACH | \$160.00 | 1 | \$160.00 |
| Sign | Object marker sign [OM1-3] | EACH | \$180.00 | 2 | \$360.00 |
| Total: | | | | | \$7,409.20 |

LONG-TERM RECOMMENDATIONS

Figure 96 illustrates the proposed long-term capital improvements for the Hungerford Drive (MD 355) & Mannakee Street intersection. The long-term concept focuses on enhancing multimodal safety by improving pedestrian refuge areas and adding dedicated infrastructure for pedestrians and cyclists.

Figure 96. Long-Term Recommendations for Intersection #14 - Hungerford Drive (MD 355) & Mannakee Street



LEGEND

- A** Extend median for pedestrian refuge island
- B** Install high-visibility crosswalk on south leg of intersection

Key elements of the long-term recommendations are included in Table 110.

Table 110. Long-Term Recommendations for Intersection #14 - Hungerford Drive (MD 355) & Mannakee Street

| Rec. ID | Recommendation | Safety issue(s) addressed |
|---------|--|---------------------------|
| 14-L-1 | Extend the south leg median for a pedestrian refuge island | 14-H |
| 14-L-2 | Extend the north leg median for a pedestrian refuge island | 14-I |
| 14-L-3 | Consider installing a shared-use path on the south side of west leg. | 14-K |
| 14-L-4 | Consider installing a protected bike lane on west leg. | 14-K |

#15 - VEIRS MILL ROAD (MD 586) & BROADWOOD DRIVE

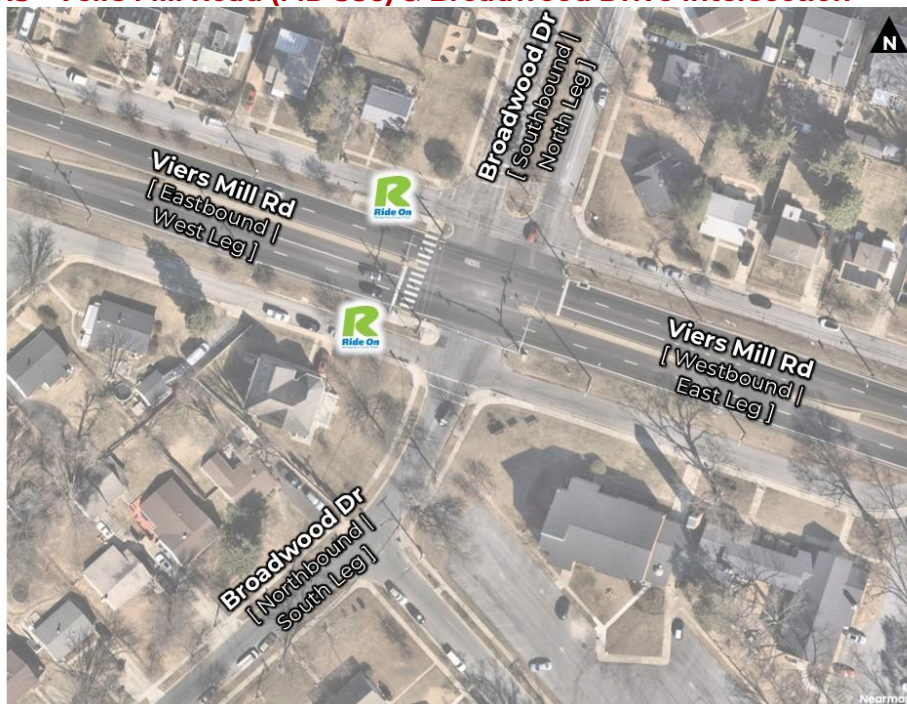
Existing Conditions

INTERSECTION DESCRIPTION

The intersection of Veirs Mill Road (MD 586) & Broadwood Drive is shown in Figure 97. Veirs Mill Road is a four-lane principal arterial with a 35 MPH speed limit and is identified as the eastbound (west) and westbound (east) approaches. Broadwood Drive is a two-lane minor collector with a 25 MPH speed limit and is identified as the northbound (south) and southbound (north) approaches. The intersection is signalized, with protected-permissive left turns on the Veirs Mill Road approaches and permissive left turns from Broadwood Drive.

According to the Rockville Comprehensive Land Use Policy Map,² land uses adjacent to the intersection are “residential, attached” in the immediate vicinity, with “residential detached” in the general area. There are two RideOn bus stops at this intersection, serving route 40.

Figure 97. #15 - Veirs Mill Road (MD 586) & Broadwood Drive Intersection



SAFETY REVIEW

Table 111 summarizes the crash characteristics, including collision types, lighting conditions, and roadway surface conditions. A total of 13 crashes were recorded at the intersection during the three-year period from 2022 to 2024. All reported crashes involved only automobiles. Most of the crashes resulted in property-damage-only (PDO) outcomes, with two (2) minor injury crashes and one (1) possible injury crash reported over the study period.

Table 111. Summary of Three-Year (2022-24) Crashes at Intersection #15 - Veirs Mill Road (MD 586) & Broadwood Drive

| Total Crashes | Total Crashes by Year | | | Total Crashes by User | | |
|---------------|-----------------------|------|------|-----------------------|---------|------------|
| 13 | 2022 | 2023 | 2024 | Auto | Cyclist | Pedestrian |
| | 2 | 8 | 3 | 13 | 0 | 0 |

| Total Crashes by Severity | | | | |
|---------------------------|---------|-------|-----------------|-----------------|
| Fatal | Serious | Minor | Possible Injury | Property Damage |
| 0 | 0 | 2 | 1 | 10 |

| Total Crashes by Collision Type | | | | | |
|---------------------------------|-------------------|-------|-------|----------------|---------------|
| Same Direction Rear End | Head On Left Turn | Angle | Other | Front to Front | Front to Rear |
| 6 | 2 | 2 | 1 | 1 | 1 |

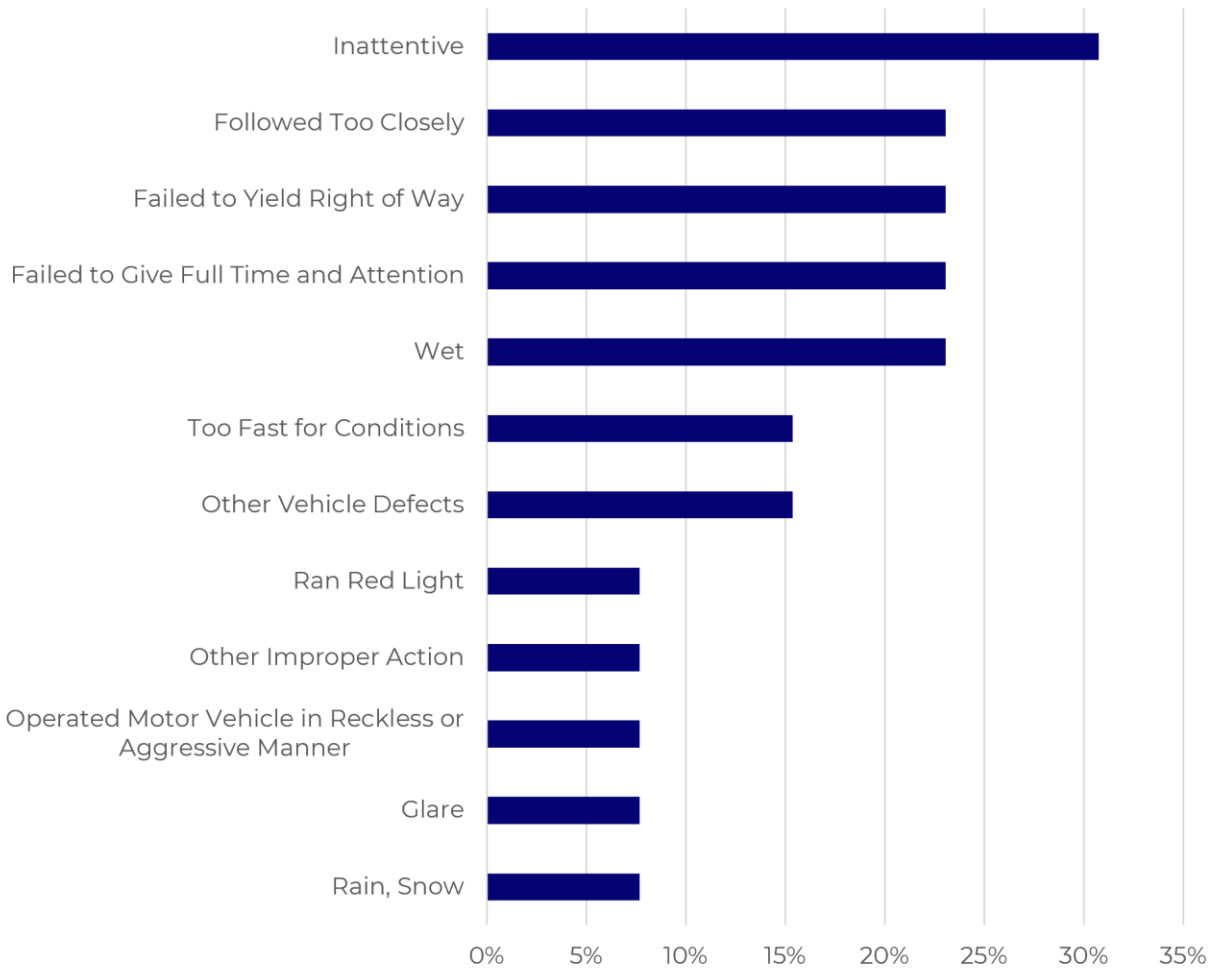
| Lighting | |
|----------|----------------|
| Daylight | Dark Lights On |
| 7 | 6 |

| Road Surface | |
|--------------|-----|
| Dry | Wet |
| 8 | 5 |

Note: Crash summaries are based on the available crash data reviewed for this study. Reported crash totals and locations may vary across source datasets due to differences in reporting methods, geocoding, and intersection buffers.

Figure 98 illustrates the percentage of crashes accounting for each contributing circumstance associated with crashes at the intersection during the 2022–2024 study period. A single crash may involve multiple contributing circumstances, as documented in the crash reports. As shown in the figure, most contributing circumstances were related to driver behavior, with the most common being inattentiveness and following too closely, followed by failure to yield right-of-way. Other contributing factors included failing to give full time and attention, wet conditions, and driving too fast for conditions.

Figure 98. Percentage of Crashes Accounting for Each Contributing Circumstance at Intersection #15 - Veirs Mill Road (MD 586) & Broadwood Drive



NEAR-MISS VIDEO ANALYSIS

Post-Encroachment Time (PET), which measures the temporal separation between two users occupying the same conflict area, was used to assess the severity of these interactions and is calculated only when both users pass through the same conflict point. Based on 24-hour video observations at the Veirs Mill Road (MD 586) & Broadwood Drive intersection, a total of 97 near-miss events were identified, as summarized in Table 112. Of these, 63 involved vehicle-to-vehicle conflicts, 31 involved vehicle-to-pedestrian conflicts, and three (3) involved vehicle-to-bicyclist conflicts, indicating that vehicles were the most affected group. As shown in the table, most (75) observed conflicts fall within the 2–3 second PET range. A PET of less than 2 seconds is generally considered indicative of higher-risk interactions; 22 conflicts fall within this range at the intersection. Notably, most of these higher-risk conflicts (14 out of 22) involved pedestrians or bicyclists, indicating elevated conflict severity for vulnerable road users at the intersection.

Table 112. Summary of Near Misses for a Day (24-hours) at Intersection #15 - Veirs Mill Road (MD 586) & Broadwood Drive

| Post Encroachment Time (PET) | Vehicle-Vehicle | Vehicle-Pedestrian | Vehicle-Bicyclist | Total |
|------------------------------|-----------------|--------------------|-------------------|-----------|
| 0.0 - 1.5s | 1 | 4 | 0 | 5 |
| 1.5 - 2.0s | 7 | 7 | 3 | 17 |
| 2.0 - 3.0s | 55 | 20 | 0 | 75 |
| Total | 63 | 31 | 3 | 97 |

Based on video analysis of near-miss events, Table 113 summarizes the most frequent conflict types observed at the intersection. The highest number of conflicts (38) occurred between eastbound left-turning vehicles and westbound through vehicles. The next most frequent conflicts involved southbound left-turning vehicles interacting with northbound through-traffic, followed by westbound left-turning vehicles interacting with eastbound through-traffic. These results indicate that the predominant conflicts at the intersection involve opposing left-turn and through-vehicle movements.

Table 113. Top Three Conflict Types by Movements based on Near Miss Video Analysis at Intersection #15 - Veirs Mill Road (MD 586) & Broadwood Drive.

| Conflict Rank | Movement 1 | Movement 2 | Conflicts |
|---------------|-----------------|--------------------|-----------|
| 1. | Eastbound Left | Westbound Through | 38 |
| 2. | Southbound Left | Northbound Through | 12 |
| 3. | Westbound Left | Eastbound Through | 10 |

EXISTING TRAFFIC OPERATIONS

Table 114 shows the results of traffic operations analysis for this intersection based on existing lane configurations, peak-hour traffic volumes, and signal timing parameters. The northbound and southbound approaches have relatively low volumes, but do experience heavier delays during the AM and PM peak hours.

Table 114. Results of Traffic Operation Analysis at Intersection #15 - Veirs Mill Road (MD 586) & Broadwood Drive

| Approach | Movement | Weekday AM Peak Hour | | | Weekday PM Peak Hour | | |
|-----------------------------|-------------------------|----------------------|----------|----------------------------|----------------------|----------|----------------------------|
| | | Delay (sec) | LOS | 95th Percentile Queue (ft) | Delay (sec) | LOS | 95th Percentile Queue (ft) |
| Eastbound | Eastbound Left | 9.2 | A | 21 | 9.3 | A | 62 |
| | Eastbound Through | 8.3 | A | 307 | 10.3 | B | 584 |
| | Overall Approach | 8.3 | A | | 10.2 | B | |
| Westbound | Westbound Left | 7.9 | A | 11 | 9.6 | A | 13 |
| | Westbound Through | 11.6 | B | 523 | 10.9 | B | 443 |
| | Overall Approach | 11.6 | B | | 10.8 | B | |
| Northbound | Northbound Through | 60.4 | E | 100 | 80.1 | F | 170 |
| | Overall Approach | 60.4 | E | | 80.1 | F | |
| Southbound | Southbound Through | 71.7 | E | 193 | 68.9 | E | 149 |
| | Overall Approach | 71.7 | E | | 68.9 | E | |
| Overall Intersection | | 15.2 | B | | 15.0 | B | |

LOS = Level of Service
 # = 95th percentile volume exceeds capacity, queue may be longer

SITE VISIT OBSERVATIONS

A site visit was conducted on April 28 to document existing conditions for people walking, people biking, and drivers. Photos of the site visit are in Appendix F and Figure 99, Figure 100, and Figure 101.

During the site visit, it was observed that pedestrians crossing the southbound approach lack push buttons or signal heads. There are also no crosswalks on the frontage roads. Eastbound and westbound left-turning drivers had to find gaps in high-speed traffic during permissive left-turn phases. Drivers on the northbound and southbound approaches were observed to queue within the frontage roads, despite stop bar markings and signs encouraging not to stop in this area.

Figure 99. No pedestrian signal heads or push buttons on the southbound approach at Intersection #15 - Veirs Mill Road (MD 586) & Broadwood Drive



Figure 100. Obstructed signal head at Intersection #15 - Veirs Mill Road (MD 586) & Broadwood Drive



Figure 101. Missing crosswalk on frontage road at Intersection #15 - Veirs Mill Road (MD 586) & Broadwood Drive



IDENTIFIED SAFETY ISSUES

Key safety issues and other findings are shown in Table 115 and described below.

Table 115. Key Safety Issues for Intersection #15 - Veirs Mill Road (MD 586) & Broadwood Drive

| Issue ID | Safety Issue | Safety Issue Type | Crash Data | Near-Miss Video | Site Visit |
|----------|---|---------------------------------------|------------|-----------------|------------|
| 15-A | There are no pedestrian signal heads on the northbound and southbound approaches. | 5.1 Pedestrian: Intersection Crossing | | | ✓ |
| 15-B | There are no lane configuration (e.g., Left Turn Only) pavement markings at this intersection. | 9 Vehicle Movements | | | ✓ |
| 15-C | Eastbound and westbound permissive left-turning vehicles conflict with multiple lanes of high-speed through traffic. | 2 Conflicts Between Users | ✓ | | ✓ |
| 15-D | There is a high frequency of rear-end crashes on the eastbound and westbound approaches. | 8.1 Conflict Type: Rear End | ✓ | | |
| 15-E | The frontage roads do not have crosswalk pavement markings. | 5.1 Pedestrian: Intersection Crossing | | | ✓ |

Bold indicates a priority safety issue.

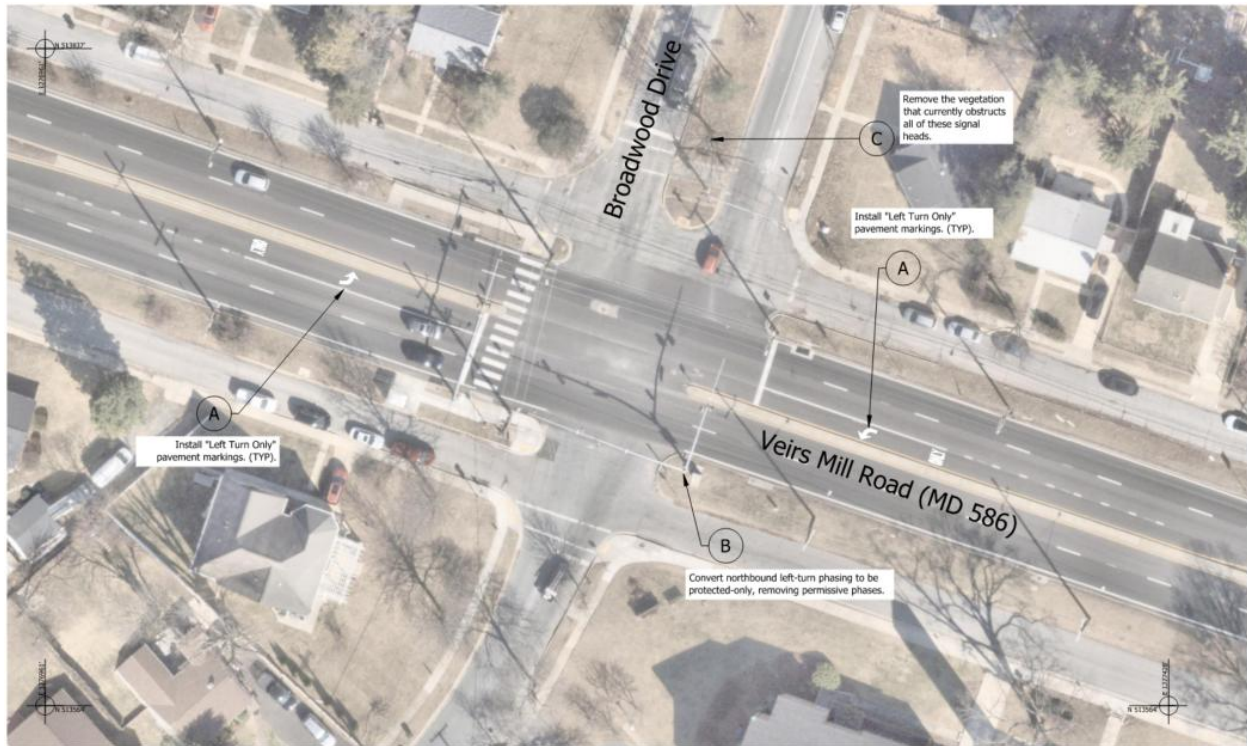
Recommendations

SHORT-TERM RECOMMENDATIONS

Figure 102 illustrates the proposed short-term, quick-build improvements for the Veirs Mill Road (MD 586) & Broadwood Drive intersection, with additional detail provided in Table 116. The short-term concept focuses on improving the left turn lanes on Veirs Mill Road.

These recommendations rely on low-cost, implementable treatments (signing, striping, and delineation) to reduce driver uncertainty, improve yielding compliance, and make pedestrian crossings more visible and predictable.

Figure 102. Short-Term Recommendations for Intersection #15 - Veirs Mill Road (MD 586) & Broadwood Drive



LEGEND

- A Proposed "Left Turn Only" pavement markings.
- B Proposed left-turn phasing to be protected-only, removing permissive phases.
- C Proposed removal of vegetation that obstructs signal heads.

Table 116. Short-Term Recommendations for Intersection #15 - Veirs Mill Road (MD 586) & Broadwood Drive

| Rec. ID | Recommendation | Safety issue(s) addressed |
|---------|--|---------------------------|
| 15-S-1 | Add 'LEFT TURN ONLY' pavement markings to the eastbound and westbound approaches. | 15-D |
| 15-S-2 | Adjust the left-turn signal timing for the WBL movement to be protected-only, removing the permissive phase. | 15-C |

COST ESTIMATE

Table 117 provides a planning-level cost estimate for the short-term recommendations, based on item quantities and recent Maryland SHA price index sheets, and excludes contingency and mobilization.

Table 117. Planning-Level Cost Estimate at Intersection #15 - Veirs Mill Road (MD 586) & Broadwood Drive

| Item | Description | Unit | Unit Cost | Quantity | Cost |
|------------------|------------------------------------|------|-----------|----------|-------------------|
| Pavement Marking | Turn arrow marking | EACH | \$395.15 | 4 | \$1,580.60 |
| Pavement Marking | ONLY ¹ marking (letter) | EACH | \$375.23 | 2 | \$750.46 |
| Other | Adjust signal timing | EACH | \$- | 1 | \$- |
| Other | Vegetation removal | EACH | \$- | 1 | \$- |
| Total: | | | | | \$2,331.06 |

TRAFFIC IMPACT ANALYSIS

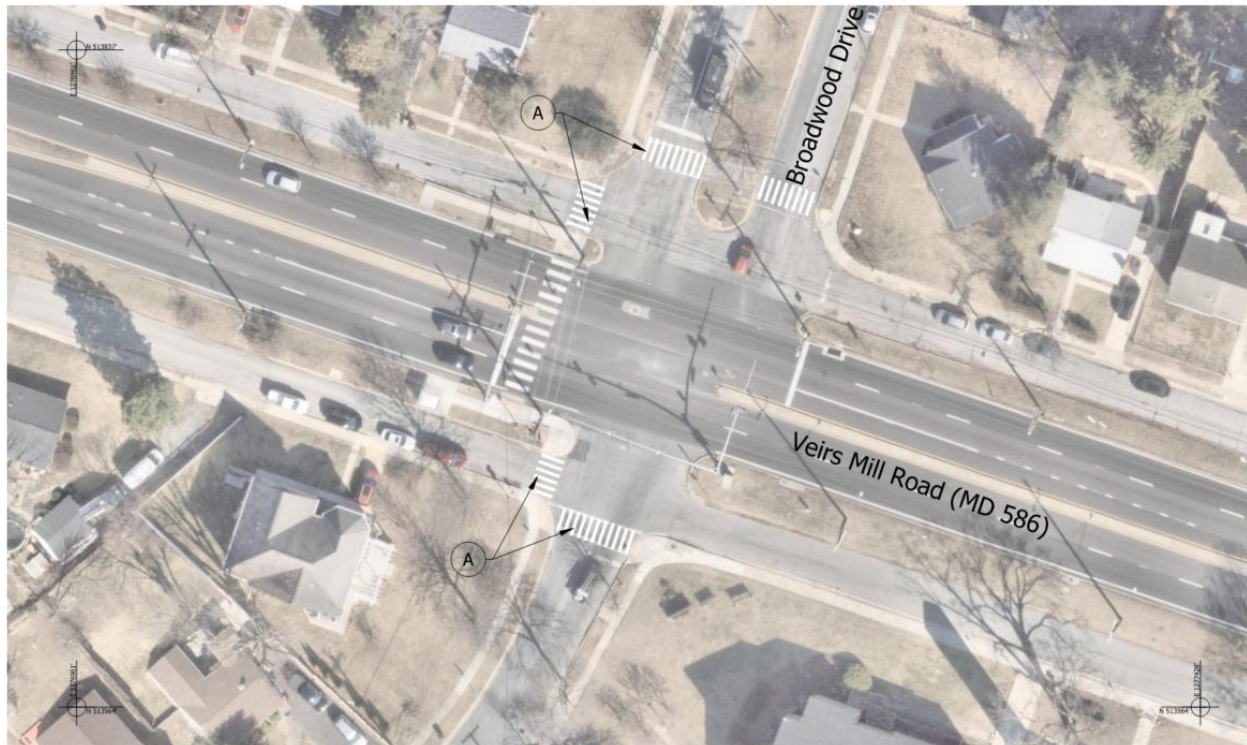
It was recommended that the left-turn signal timing for the westbound left movement to be adjusted to be protected-only, removing the permissive phase. Included below is the anticipated increase in delay (in seconds) for the southbound left-turn movement. While the delays do increase substantially, this adjustment is justifiable considering only 13 and 21 vehicles perform this movement in the AM and PM peaks, respectively.

- AM Peak: 7.9 → 79.8
- PM Peak: 9.6 → 77

LONG-TERM RECOMMENDATIONS

Figure 103 illustrates the proposed long-term capital improvements for the Veirs Mill Road (MD 586) & Broadwood Drive intersection. The long-term concept focuses on installing crosswalks and pedestrian signal heads for people walking and alerting drivers of the upcoming intersection.

Figure 103. Long-Term Recommendations for Intersection #15 - Veirs Mill Road (MD 586) & Broadwood Drive



LEGEND

- A High-visibility continental crosswalk

Key elements of the long-term recommendations are included in Table 118.

Table 118. Long-Term Recommendations for Intersection #15 - Veirs Mill Road (MD 586) & Broadwood Drive

| Rec. ID | Recommendation | Safety issue(s) addressed |
|---------|--|---------------------------|
| 15-L-1 | Install pedestrian signal heads on all approaches. | 15-A |
| 15-L-2 | Explore installing a 'Signal Ahead; Prepare to Stop when Flashing' beacon on the eastbound approach, similar to the beacon already upstream of the westbound approach. | 15-D |
| 15-L-3 | Install crosswalks on the frontage road. | 15-E |

#16 - ROCKVILLE PIKE (MD 355) & FIRST STREET/WOOTTON PARKWAY

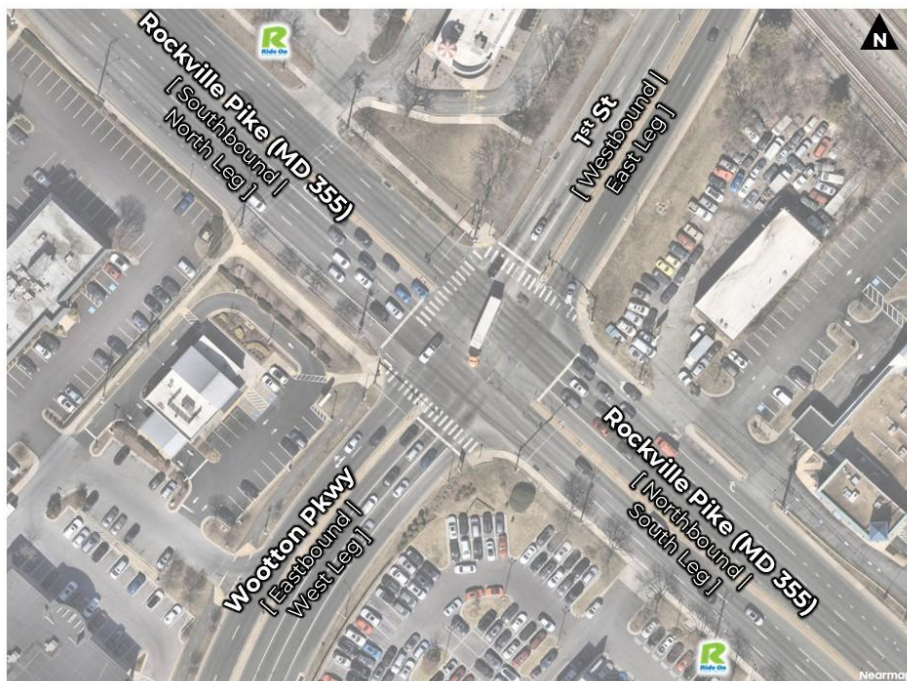
Existing Conditions

INTERSECTION DESCRIPTION

The intersection of Rockville Pike (MD 355) & First Street/Wootton Parkway is shown Figure 104. MD 355 is a six-lane principal arterial with a 35 MPH speed limit and is identified as the northbound (south) and southbound (north) approaches. 1st Street is the southbound approach, and changes to Wootton Parkway, which is the northbound approach. Both roads are four-lane principal arterials is a two-lane minor collector with a 30 MPH speed limit. The intersection is signalized, with protected-permissive left turns on the MD 355 approaches and split protected left turns from Wootton Parkway and 1st Street.

According to the Rockville Comprehensive Land Use Policy Map,² land use adjacent to the intersection is “Residential and/or Office”.

Figure 104. #16 - Rockville Pike (MD 355) & First Street/Wootton Parkway Intersection



SAFETY REVIEW

Table 119 summarizes the crash characteristics, including collision types, lighting conditions, and roadway surface conditions. A total of 28 crashes were recorded at the intersection during the three-year period from 2022 to 2024. The reported crashes primarily involved automobiles, with three (3) pedestrian-related crashes and zero (0) cyclist involvement. Most crashes resulted in property-damage-only (PDO) outcomes, with five (5) minor-injury crashes and five (5) possible-injury crashes reported over the study period.

Table 119. Summary of Three-Year (2022-24) Crashes at Intersection #16 - Rockville Pike (MD 355) & First Street/Wootton Parkway

| Total Crashes | Total Crashes by Year | | | Total Crashes by User | | |
|---------------|-----------------------|------|------|-----------------------|---------|------------|
| | 2022 | 2023 | 2024 | Auto | Cyclist | Pedestrian |
| | 28 | 7 | 10 | 11 | 25 | 0 |

| Total Crashes by Severity | | | | |
|---------------------------|---------|-------|-----------------|-----------------|
| Fatal | Serious | Minor | Possible Injury | Property Damage |
| 0 | 0 | 5 | 5 | 18 |

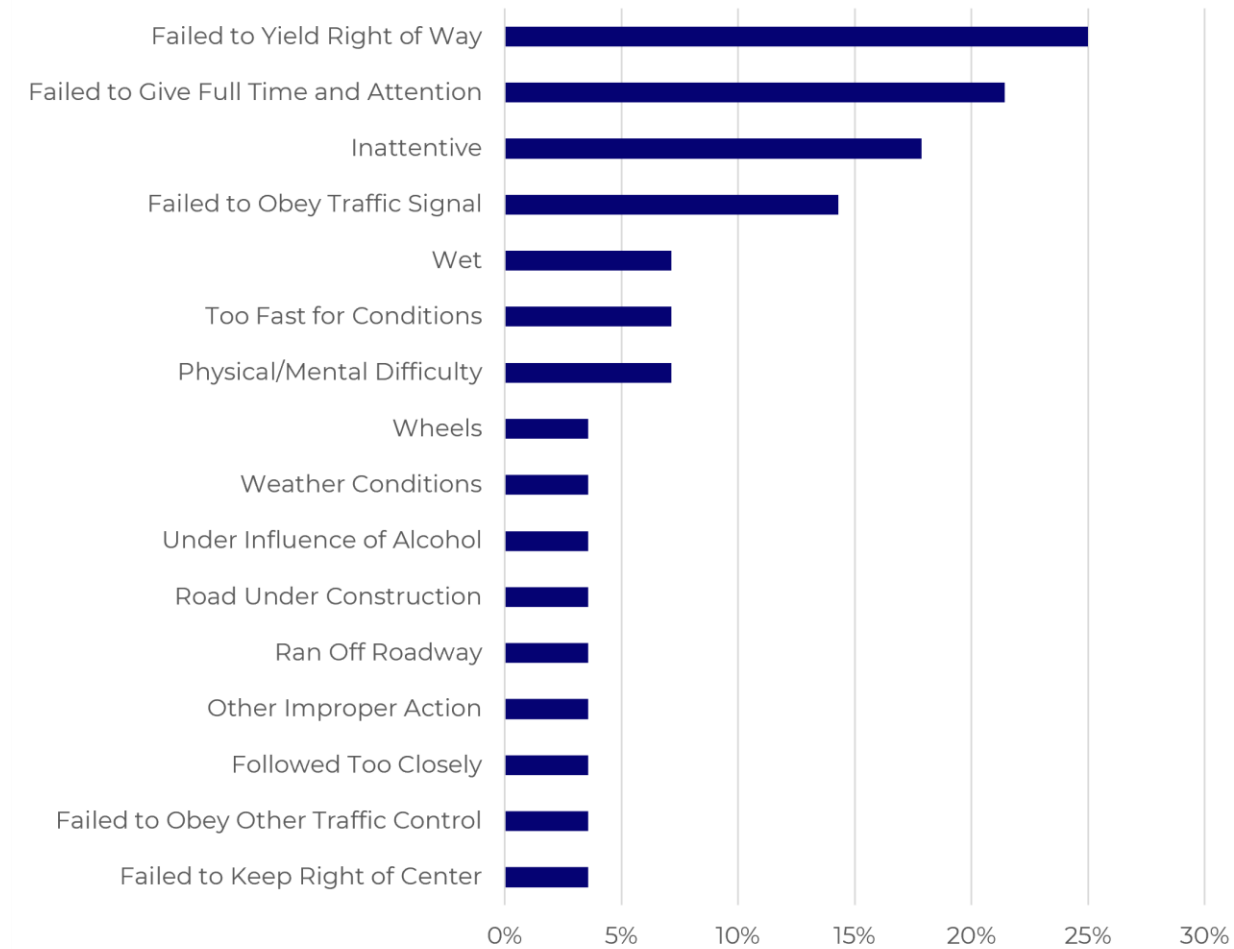
| Total Crashes by Collision Type | | | | | | | |
|---------------------------------|-------|----------------|--------------------------|-------------------|--------------|------------------------------|-------|
| Same Direction Rear End | Angle | Single Vehicle | Same Direction Sideswipe | Head On Left Turn | Rear To Side | Opposite Direction Sideswipe | Other |
| 8 | 5 | 4 | 3 | 1 | 1 | 1 | 5 |

| Lighting | | | Road Surface | | |
|----------|----------------|------|--------------|-----|---------|
| Daylight | Dark Lights On | Dusk | Dry | Wet | Unknown |
| 18 | 9 | 1 | 21 | 5 | 2 |

Note: Crash summaries are based on the available crash data reviewed for this study. Reported crash totals and locations may vary across source datasets due to differences in reporting methods, geocoding, and intersection buffers.

Figure 105 illustrates the percentage of crashes accounting for each contributing circumstance associated with crashes at the intersection during the 2022–2024 study period. A single crash may involve multiple contributing circumstances, as documented in the crash reports. As shown in the figure, most contributing circumstances were related to driver behavior, with the most common being failure to yield right-of-way, followed by failure to give full time and attention, inattentiveness, and failure to obey traffic control devices. Other contributing factors included wet roadway conditions, driving too fast for conditions, and physical or mental difficulties.

Figure 105. Percentage of Crashes Accounting for Each Contributing Circumstance at Intersection #16 - Rockville Pike (MD 355) & First Street/Wootton Parkway



NEAR-MISS VIDEO ANALYSIS

Post-Encroachment Time (PET), which measures the temporal separation between two users occupying the same conflict area, was used to assess the severity of these interactions and is calculated only when both users pass through the same conflict point. Based on 24-hour video observations at the Rockville Pike (MD 355) & First Street/Wootton Parkway intersection, a total of 119 near-miss events were identified, as summarized in Table 120. Of these, 32 involved vehicle-to-vehicle conflicts, 76 involved vehicle-to-pedestrian conflicts, and 11 involved vehicle-to-bicyclist conflicts, indicating that pedestrians were the most affected group. As shown in the table, most (91) observed conflicts fall within the 2–3 second PET range. A PET of less than 2 seconds is generally considered indicative of higher-risk interactions; 28 conflicts fall within this range at the intersection. Notably, most of these higher-risk conflicts (25 out of 28) involved pedestrians or bicyclists, indicating elevated conflict severity for vulnerable road users at the intersection.

Table 120. Summary of Near Misses for a Day (24-hours) at Intersection #16 - Rockville Pike (MD 355) & First Street/Wootton Parkway

| Post Encroachment Time (PET) | Vehicle-Vehicle | Vehicle-Pedestrian | Vehicle-Bicyclist | Total |
|------------------------------|-----------------|--------------------|-------------------|------------|
| 0.0 - 1.5s | 0 | 6 | 2 | 8 |
| 1.5 - 2.0s | 3 | 16 | 1 | 20 |
| 2.0 - 3.0s | 29 | 54 | 8 | 91 |
| Total | 32 | 76 | 11 | 119 |

Based on video analysis of near-miss events, Table 121 summarizes the most frequent conflict types observed at the intersection. The highest number of conflicts (19) occurred between pedestrians on the north leg and westbound right-turning vehicles. The next most frequent conflicts involved northbound left-turning vehicles interacting with southbound through-vehicles, followed by southbound left-turning vehicles interacting with northbound through-vehicles. The prominence of pedestrian-related conflicts among the top-ranked pairs indicates a heightened risk for pedestrians, particularly at the north leg crosswalk. In addition, the recurrence of conflicts involving left-turning vehicles suggests that left-turn movements are a notable safety concern at the intersection.

Table 121. Top Three Conflict Types by Movements based on Near Miss Video Analysis at Intersection #16 - Rockville Pike (MD 355) & First Street/Wootton Parkway.

| Conflict Rank | Movement 1 | Movement 2 | Conflicts |
|---------------|----------------------|--------------------|-----------|
| 1. | North Leg Pedestrian | Westbound Right | 19 |
| 2. | Northbound Left | Southbound Through | 16 |
| 3. | Southbound Left | Northbound Through | 15 |

EXISTING TRAFFIC OPERATIONS

Table 122 shows the results of traffic operations analysis for this intersection based on existing lane configurations, peak-hour traffic volumes, and signal timing parameters. Drivers on the eastbound and westbound approaches experience moderate delays during both the AM and PM peak hours.

Table 122. Results of Traffic Operation Analysis at Intersection #16 - Rockville Pike (MD 355) & First Street/Wootton Parkway

| Approach | Movement | Weekday AM Peak Hour | | | Weekday PM Peak Hour | | |
|-----------------------------|-------------------------|----------------------|----------|----------------------------|----------------------|----------|----------------------------|
| | | Delay (sec) | LOS | 95th Percentile Queue (ft) | Delay (sec) | LOS | 95th Percentile Queue (ft) |
| Eastbound | Eastbound Left | 65.3 | E | 157 | 49.5 | D | 262 |
| | Eastbound Through | 73.5 | E | 219 | 64.5 | E | 471 |
| | Eastbound Right | 58.4 | E | 0 | 42.8 | D | 20 |
| | Overall Approach | 70.8 | E | | 60.0 | E | |
| Westbound | Westbound Left | 79.8 | E | #680 | 68.1 | E | 373 |
| | Westbound Through | 77.3 | E | #652 | 62.9 | E | 336 |
| | Overall Approach | 78.1 | E | | 64.6 | E | |
| Northbound | Northbound Left | 29.7 | C | 36 | 34.2 | C | 65 |
| | Northbound Through | 33.6 | C | 198 | 53.7 | D | #557 |
| | Northbound Right | 31.0 | C | 55 | 40.3 | D | 89 |
| | Overall Approach | 32.8 | C | | 50.0 | D | |
| Southbound | Southbound Left | 23.1 | C | 88 | 39.1 | D | 125 |
| | Southbound Through | 36.4 | D | 480 | 43.0 | D | 409 |
| | Southbound Right | 27.6 | C | 49 | 34.6 | C | 49 |
| | Overall Approach | 34.8 | C | | 41.9 | D | |
| Overall Intersection | | 50.8 | D | | 52.1 | D | |

LOS = Level of Service

= 95th percentile volume exceeds capacity, queue may be longer

SITE VISIT OBSERVATIONS

A site visit was conducted on April 28, 2026, to document existing conditions for people walking, people biking, and drivers. Photos from the visits are included in Appendix F and Figure 106 and Figure 107.

During the visit, the team observed that making permissive left turns off MD 355 required finding gaps in three lanes of high-speed traffic. Several drivers encroached on crossing pedestrians (including several students who had just gotten out of school) in the crosswalk. Several signs were obscured or misplaced. There were also several driveways in close proximity to the intersection.

Figure 106. Obscured school zone sign at Intersection #16 - Rockville Pike (MD 355) & First Street/Wootton Parkway



Figure 107. Bicycle signs at Intersection #16 - Rockville Pike (MD 355) & First Street/Wootton Parkway



IDENTIFIED SAFETY ISSUES

Key safety issues and other findings are shown in Table 123 and described below.

Table 123. Key Safety Issues for Intersection #16 - Rockville Pike (MD 355) & First Street/Wootton Parkway

| Issue ID | Safety Issue | Safety Issue Type | Crash Data | Near-Miss Video | Site Visit |
|----------|---|--|------------|-----------------|------------|
| 16-A | Northbound and southbound permissive left-turning vehicles conflict with multiple lanes of high-speed through traffic. | 2 Conflicts Between Users | ✓ | ✓ | ✓ |
| 16-B | Drivers were observed encroaching on pedestrians' right-of-way when turning right on a red signal. Several crashes occurred between through-moving drivers and right-turning drivers on red. | 2.1 Conflicts Between Users: Drivers Turning and Pedestrians | ✓ | | ✓ |
| 16-C | There is a high frequency of rear-end crashes on the northbound approach. | 8.1 Conflict Type: Rear End | ✓ | | |
| 16-D | There is no crosswalk on the northbound leg of this intersection | 5.1 Pedestrian: Intersection Crossing | | | ✓ |
| 16-E | The AAMCO Transmissions access driveway is very close to the westbound approach, causing potential conflicts. | 3.5 Roadway Design: Access Management | | | ✓ |
| 16-F | Traffic counts indicate a high proportion of SB U-turn movements during the PM peak, which can create potential conflicts when performed permissively. | 8.8 Conflict Type: U-Turn | ✓ | | ✓ |

Bold indicates a priority safety issue.

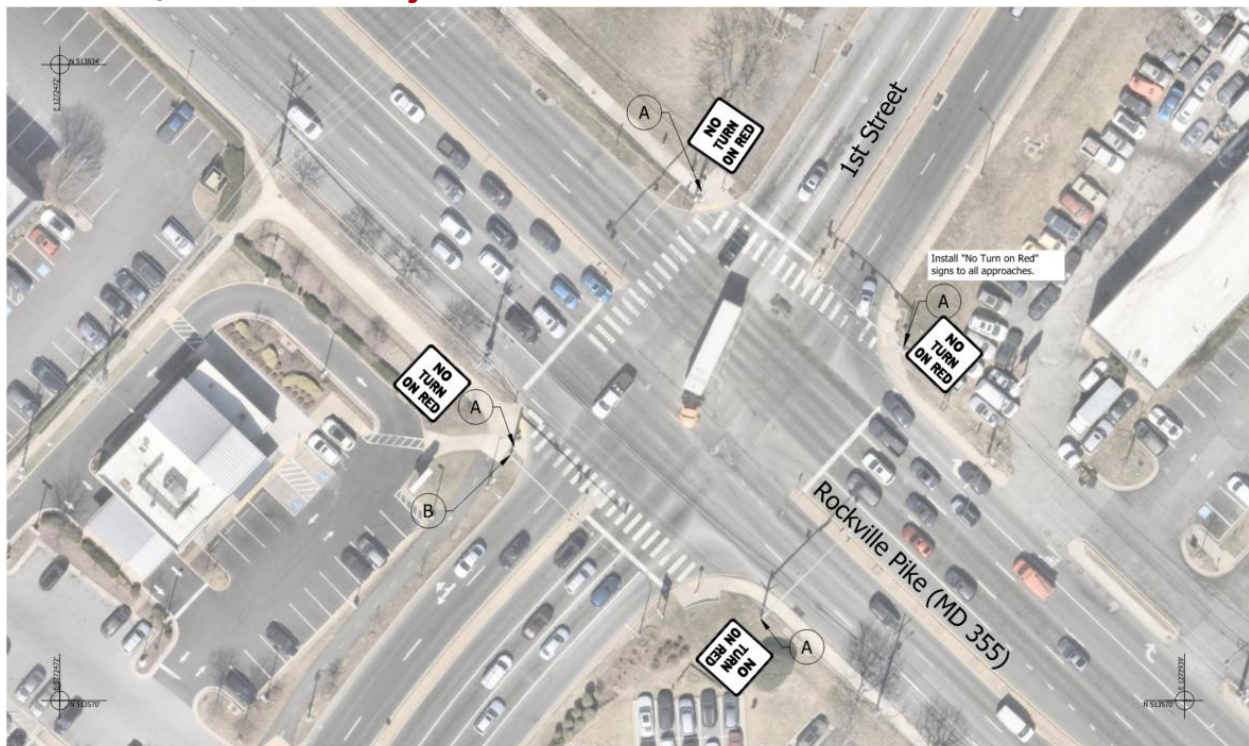
Recommendations

SHORT-TERM RECOMMENDATIONS

Figure 108 illustrates the proposed short-term, quick-build improvements for the Rockville Pike (MD 355) & First Street/Wootton Parkway intersection, with additional detail provided in Table 124. The short-term concept focuses on adjusting left-turn phasing and adding No Right Turn On Red signs.

These recommendations rely on low-cost, implementable treatments (signing, striping, and delineation) to reduce driver uncertainty, improve yielding compliance, and make pedestrian crossings more visible and predictable.

Figure 108. Short-Term Recommendations for Intersection #16 - Rockville Pike (MD 355) & First Street/Wootton Parkway



LEGEND

- (A) Add No Turn On Red (R10-11b) 36"X36" signs to all approaches.

Table 124. Short-Term Recommendations for Intersection #16 - Rockville Pike (MD 355) & First Street/Wootton Parkway

| Rec. ID | Recommendation | Safety issue(s) addressed |
|---------|---|---------------------------|
| 16-S-1 | Add 'No Right Turn On Red' signs to all approaches. | 16-B |

COST ESTIMATE

Table 125 provides a planning-level cost estimate for the short-term recommendations, based on item quantities and recent Maryland SHA price index sheets, and excludes contingency and mobilization.

Table 125. Planning-Level Cost Estimate at Intersection #16 - Rockville Pike (MD 355) & First Street/Wootton Parkway

| Item | Description | Unit | Unit Cost | Quantity | Cost |
|---------------|---------------------------------|------|-----------|----------|-------------------|
| Sign | New sign post | EACH | \$193.76 | 4 | \$775.04 |
| Sign | 'No Turn On Red' sign [R10-11b] | EACH | \$320.00 | 4 | \$1,280.00 |
| Other | Adjust signal timing | EACH | \$- | 1 | \$- |
| Total: | | | | | \$2,055.04 |

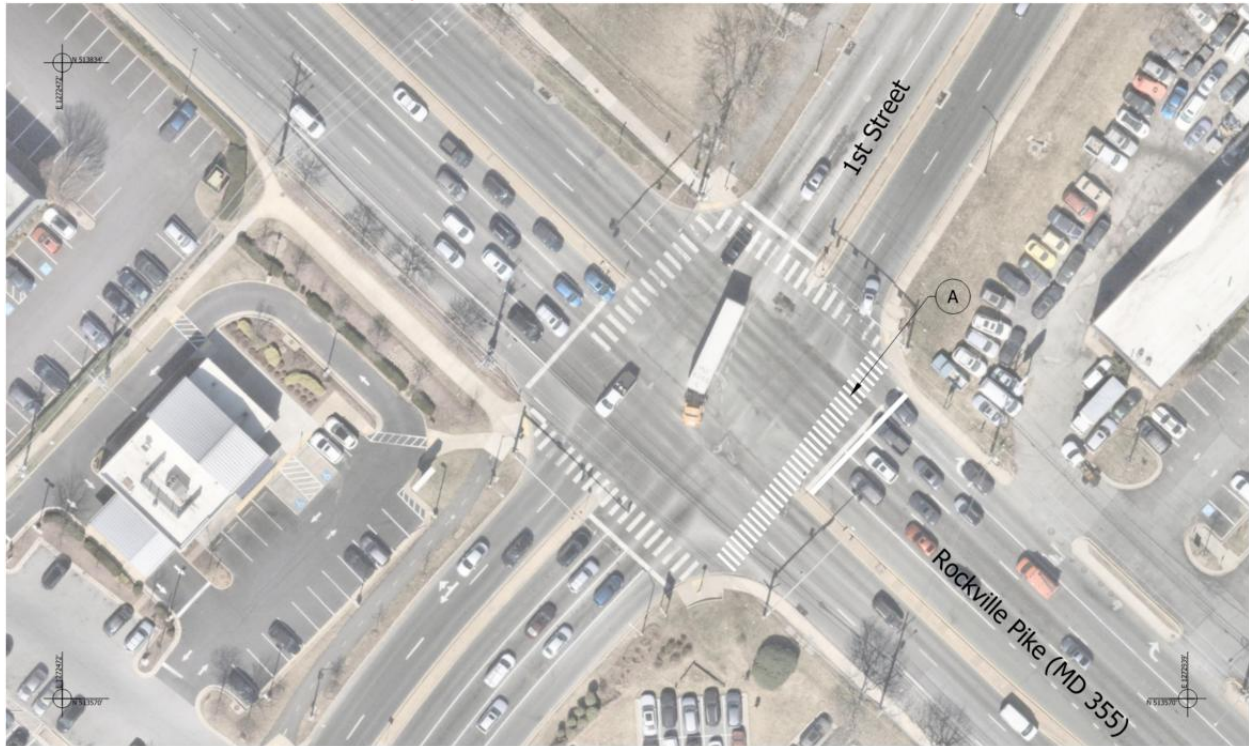
TRAFFIC IMPACT ANALYSIS

It was recommended that 'No Right Turn On Red' signs be added to all approaches at this intersection. The average anticipated increase in delay for all right-turn movements across the AM and PM peaks was less than 3 seconds.

LONG-TERM RECOMMENDATIONS

Figure 109 illustrates the proposed long-term capital improvements for the Rockville Pike (MD 355) & First Street/Wootton Parkway intersection. The long-term concept focuses on adding a new crosswalk to the northbound approach.

Figure 109. Long-Term Recommendations for Intersection #16 - Rockville Pike (MD 355) & First Street/Wootton Parkway



LEGEND

- A High-visibility continental crosswalk with stop bar and curb ramps

Key elements of the long-term recommendations are included in Table 126.

Table 126. Long-Term Recommendations for Intersection #16 - Rockville Pike (MD 355) & First Street/Wootton Parkway

| Rec. ID | Recommendation | Safety issue(s) addressed |
|---------|---|---------------------------|
| 16-L-1 | Add a crosswalk to the northbound leg of this intersection. | 16-D |

#17 - ROCKVILLE PIKE (MD 355) & TEMPLETON PLACE

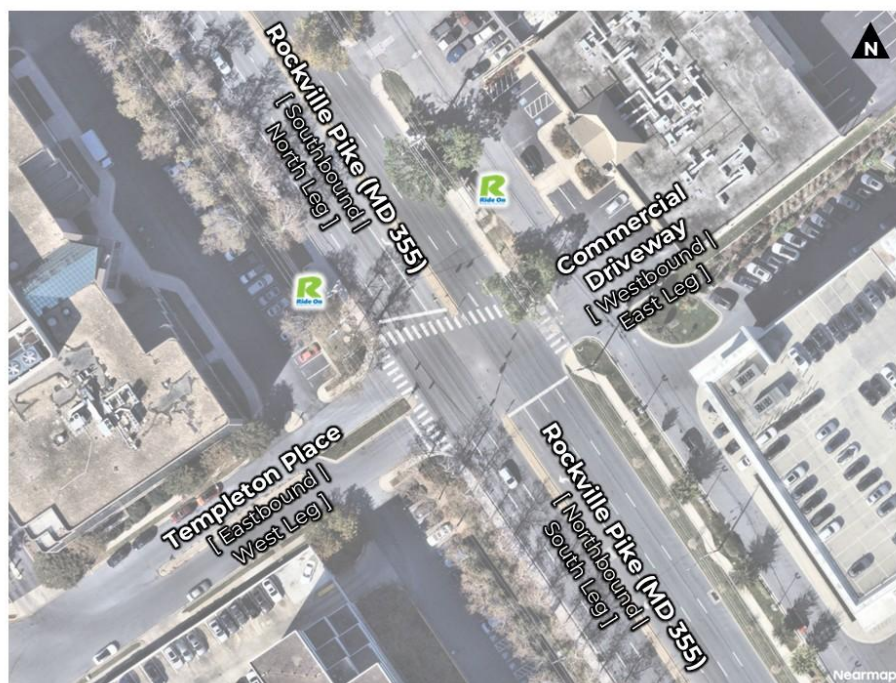
Existing Conditions

INTERSECTION DESCRIPTION

The intersection of Rockville Pike (MD 355) & Templeton Place is shown in Figure 110. MD 355 is a six-lane principal arterial with a 35 MPH speed limit and is identified as the northbound (south) and southbound (north) approaches. Templeton Place is identified as the eastbound (west) and westbound (east) approaches, and provides access to several commercial buildings. It does not have a speed limit posted. The intersection is signalized, with protected-permissive left turns on the MD 355 approaches and permissive left turns from Templeton Place.

According to the Rockville Comprehensive Land Use Policy Map,² land use adjacent to the intersection is “Residential and/or Office”. There are two RideOn transit stops near this intersection, serving routes 46 and 101.

Figure 110. #17 - Rockville Pike (MD 355) & Templeton Place Intersection



SAFETY REVIEW

Table 127 summarizes the crash characteristics, including collision types, lighting conditions, and roadway surface conditions. A total of nine (9) crashes were recorded at the intersection during the three-year period from 2022 to 2024. The reported crashes primarily involved automobiles, with one (1) pedestrian-related crash and zero (0) cyclist involvement. Most of the crashes resulted in property-damage-only (PDO) outcomes, with three (3) minor injury crashes and one (1) possible injury crash reported over the study period.

Table 127. Summary of Three-Year (2022-24) Crashes at Intersection #17 - Rockville Pike (MD 355) & Templeton Place

| Total Crashes | Total Crashes by Year | | | Total Crashes by User | | |
|---------------|-----------------------|------|------|-----------------------|---------|------------|
| 9 | 2022 | 2023 | 2024 | Auto | Cyclist | Pedestrian |
| | 3 | 3 | 3 | 8 | 0 | 1 |

| Total Crashes by Severity | | | | |
|---------------------------|---------|-------|-----------------|-----------------|
| Fatal | Serious | Minor | Possible Injury | Property Damage |
| 0 | 0 | 3 | 1 | 5 |

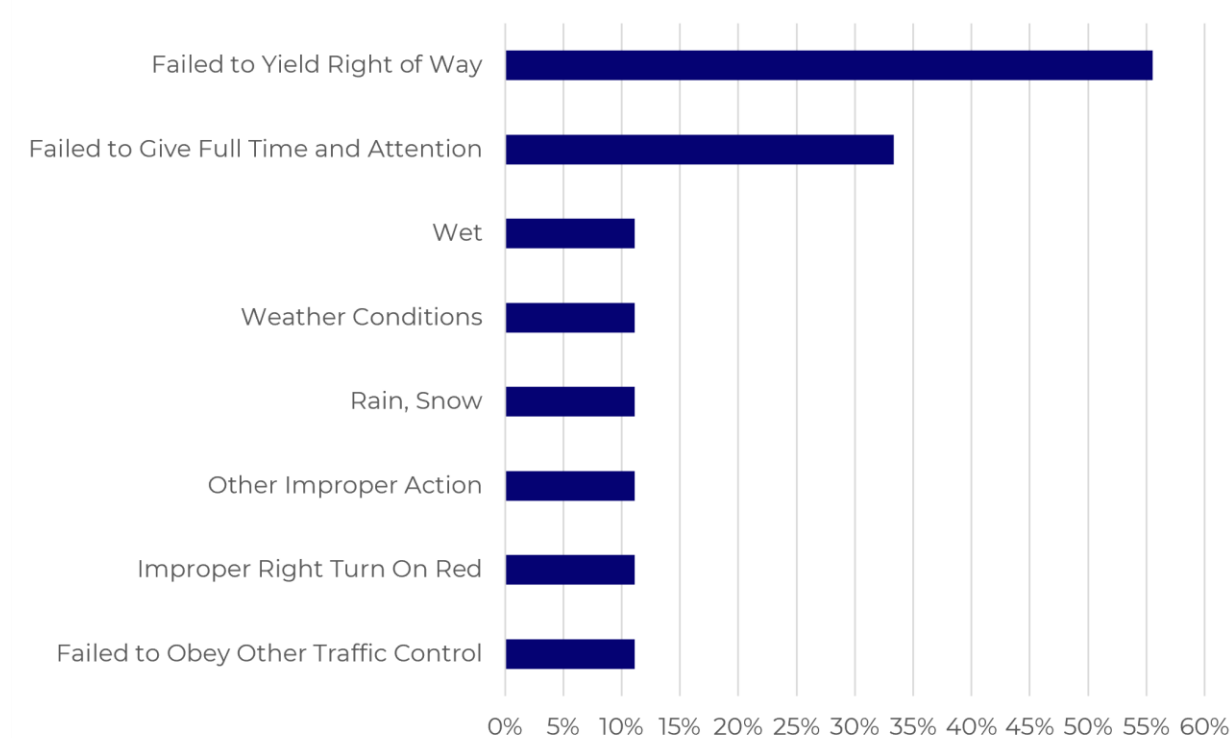
| Total Crashes by Collision Type | | | | |
|---------------------------------|---------------|------------------------|--------------------------|-------|
| Angle | Front to Rear | Angle Meets Right Turn | Same Direction Left Turn | Other |
| 4 | 2 | 1 | 1 | 1 |

| Lighting | | | Road Surface | |
|----------|----------------|------|--------------|-----|
| Daylight | Dark Lights On | Dusk | Dry | Wet |
| 7 | 1 | 1 | 7 | 2 |

Note: Crash summaries are based on the available crash data reviewed for this study. Reported crash totals and locations may vary across source datasets due to differences in reporting methods, geocoding, and intersection buffers.

Figure 111 illustrates the percentage of crashes accounting for each contributing circumstance associated with crashes at the intersection during the 2022–2024 study period. A single crash may involve multiple contributing circumstances, as documented in the crash reports. As shown in the figure, most contributing circumstances were related to driver behavior, with the most common being failure to yield right-of-way, followed by failure to give full time and attention. Other contributing factors included wet roadway conditions, weather-related conditions, improper driver actions, and failure to comply with traffic control.

Figure 111. Percentage of Crashes Accounting for Each Contributing Circumstance at Intersection #17 - Rockville Pike (MD 355) & Templeton Place



NEAR-MISS VIDEO ANALYSIS

Post-Encroachment Time (PET), which measures the temporal separation between two users occupying the same conflict area, was used to assess the severity of these interactions and is calculated only when both users pass through the same conflict point. Based on 24-hour video observations at the Rockville Pike (MD 355) & Templeton Place intersection, a total of 128 near-miss events were identified, as summarized in Table 128. Of these, 49 involved vehicle-to-vehicle conflicts, 75 involved vehicle-to-pedestrian conflicts, and four (4) involved vehicle-to-bicyclist conflicts, indicating that pedestrians were the most affected group. As shown in the table, most (93) observed conflicts fall within the 2–3 second PET range. A PET of less than 2 seconds is generally considered indicative of higher-risk interactions; 35 conflicts fall within this range at the intersection. Notably, most of these higher-risk conflicts (32 out of 35) involved pedestrians or bicyclists, indicating elevated conflict severity for vulnerable road users at the intersection.

Table 128. Summary of Near Misses for a Day (24-hours) at Intersection #17 - Rockville Pike (MD 355) & Templeton Place

| Post Encroachment Time (PET) | Vehicle-Vehicle | Vehicle-Pedestrian | Vehicle-Bicyclist | Total |
|------------------------------|-----------------|--------------------|-------------------|------------|
| 0.0 - 1.5s | 0 | 10 | 0 | 10 |
| 1.5 - 2.0s | 3 | 21 | 1 | 25 |
| 2.0 - 3.0s | 46 | 44 | 3 | 93 |
| Total | 49 | 75 | 4 | 128 |

Based on video analysis of near-miss events, Table 129 summarizes the most frequent conflict types observed at the intersection. The highest number of conflicts (30) occurred between northbound left-turning vehicles and southbound through vehicles. The next most frequent conflicts involved pedestrians on the north leg interacting with eastbound left-turning vehicles, followed by southbound left-turning vehicles interacting with northbound through vehicles. The presence of pedestrian-related conflicts among the top-ranked pairs indicates a potential safety concern for pedestrians, particularly at the north leg crosswalk. In addition, the recurrence of conflicts involving left-turning vehicles suggests that left-turn movements are a notable safety concern at the intersection.

Table 129. Top Three Conflict Types by Movements based on Near Miss Video Analysis at Intersection #17 - Rockville Pike (MD 355) & Templeton Place.

| Conflict Rank | Movement 1 | Movement 2 | Conflicts |
|---------------|----------------------|--------------------|-----------|
| 1. | Northbound Left | Southbound Through | 30 |
| 2. | North Leg Pedestrian | Eastbound Left | 27 |
| 3. | Southbound Left | Northbound Through | 18 |

EXISTING TRAFFIC OPERATIONS

Table 130 shows the results of traffic operations analysis for this intersection based on existing lane configurations, peak-hour traffic volumes, and signal timing parameters. Drivers on the eastbound and westbound approaches experience moderate delays during both the AM and PM peak hours.

Table 130. Results of Traffic Operation Analysis at Intersection #17 - Rockville Pike (MD 355) & Templeton Place

| Approach | Movement | Weekday AM Peak Hour | | | Weekday PM Peak Hour | | |
|-----------------------------|-------------------------|----------------------|----------|----------------------------|----------------------|----------|----------------------------|
| | | Delay (sec) | LOS | 95th Percentile Queue (ft) | Delay (sec) | LOS | 95th Percentile Queue (ft) |
| Eastbound | Eastbound Through | 72.8 | E | 74 | 76.0 | E | 162 |
| | Eastbound Right | 66.6 | E | 12 | 58.8 | E | 43 |
| | Overall Approach | 69.9 | E | | 69.8 | E | |
| Westbound | Westbound Through | 70.9 | E | 70 | 62.7 | E | 91 |
| | Overall Approach | 70.9 | E | | 62.7 | E | |
| Northbound | Northbound Left | 5.4 | A | 16 | 8.1 | A | 23 |
| | Northbound Through | 4.7 | A | 173 | 9.1 | A | 381 |
| | Overall Approach | 4.7 | A | | 9.1 | A | |
| Southbound | Southbound Left | 12.2 | B | 12 | 15.7 | B | 16 |
| | Southbound Through | 19.2 | B | 364 | 22.5 | C | 416 |
| | Overall Approach | 19.0 | B | | 22.3 | C | |
| Overall Intersection | | 14.5 | B | | 18.3 | B | |

LOS = Level of Service
 # = 95th percentile volume exceeds capacity, queue may be longer

SITE VISIT OBSERVATIONS

A site visit was conducted on April 28, 2026 to document existing conditions for people walking, people biking, and drivers. Photos from the site visit are included in Appendix F and in Figure 112 and Figure 113.

The team observed a lack of pedestrian signal heads and push buttons on the minor approaches. Existing pedestrian push buttons and signals were outdated. Many existing pedestrian signal heads were obscured by trees. Drivers were observed to encroach on crossing pedestrians in the crosswalk.

Figure 112. Obstructed pedestrian signal head at Intersection #17 - Rockville Pike (MD 355) & Templeton Place



Figure 113. Missing pedestrian signal heads on the westbound approach at Intersection #17 - Rockville Pike (MD 355) & Templeton Place



IDENTIFIED SAFETY ISSUES

Key safety issues and other findings are shown in Table 131 and described below.

Table 131. Key Safety Issues for Intersection #17 - Rockville Pike (MD 355) & Templeton Place

| Issue ID | Safety Issue | Safety Issue Type | Crash Data | Near-Miss Video | Site Visit |
|----------|---|--|------------|-----------------|------------|
| 17-A | The pedestrian push buttons are outdated and do not have Flash Don't Walk countdowns. There are no pedestrian push buttons to cross the minor approaches. The westbound approach does not have pedestrian signal heads. All pedestrian signal heads at this intersection are almost completely obstructed by vegetation. | 5.1 Pedestrian: Intersection Crossing | | | ✓ |
| 17-B | Northbound and southbound permissive left-turning vehicles conflict with multiple lanes of high-speed through traffic. | 2 Conflicts Between Users | ✓ | | ✓ |
| 17-C | Several pedestrians were observed to be nearly hit by northbound and southbound left-turning drivers within the crosswalk. | 2.2 Conflicts Between Users: Drivers and Pedestrians | | | ✓ |
| 17-D | There is no crosswalk on the northbound approach. | 5.1 Pedestrian: Intersection Crossing | ✓ | ✓ | ✓ |
| 17-E | The traffic signal heads are suspended by spanwires, which are not as visible and sometimes sway in the wind. | 7.3 User Behavior: Driver Awareness | | | ✓ |

Bold indicates a priority safety issue.

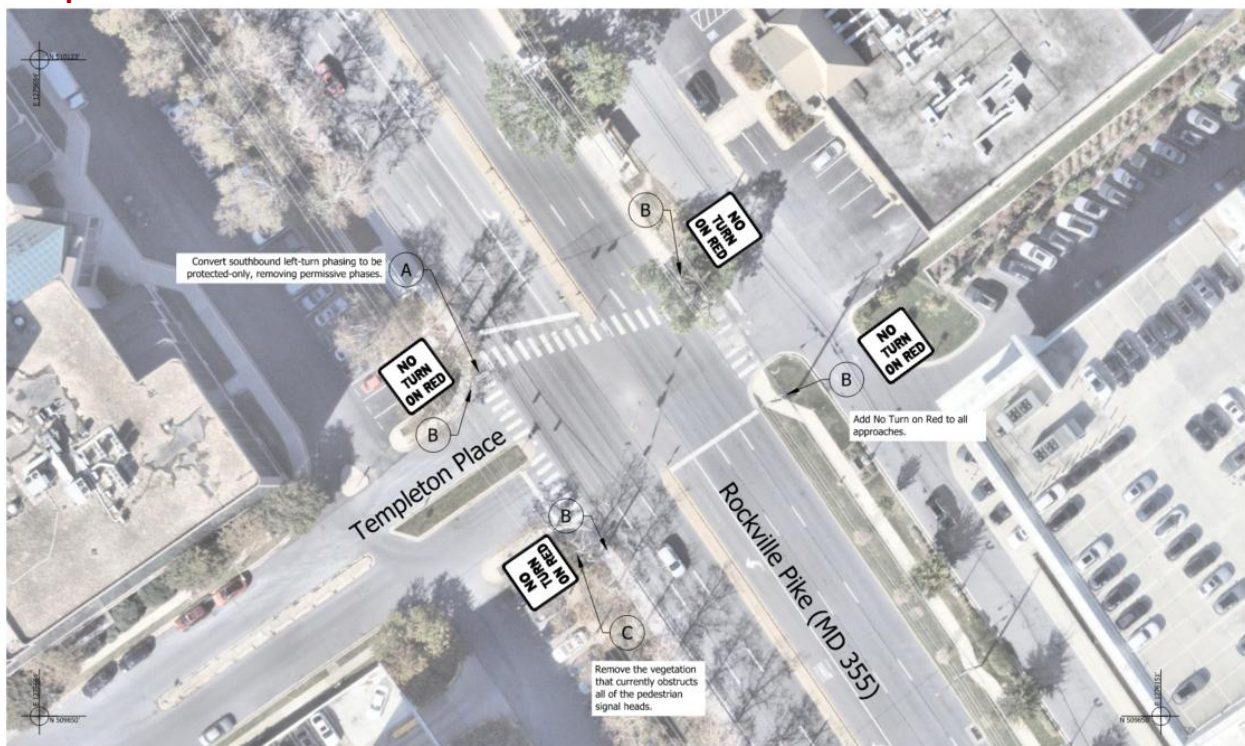
Recommendations

SHORT-TERM RECOMMENDATIONS

Figure 114 illustrates the proposed short-term, quick-build improvements for the Rockville Pike (MD 355) & Templeton Place intersection, with additional detail provided in Table 132. The short-term concept focuses on adding Right Turn on Red restrictions, clearing vegetation, and adjusting left-turn phasing.

These recommendations rely on low-cost, implementable treatments (signing, striping, and delineation) to reduce driver uncertainty, improve yielding compliance, and make pedestrian crossings more visible and predictable.

Figure 114. Short-Term Recommendations for Intersection #17 - Rockville Pike (MD 355) & Templeton Place



LEGEND

- A** Proposed left-turn phasing to be protected-only.
- B** Add No Turn On Red (R10-11b) 36"X36" signs to all approaches.
- C** Proposed removal of vegetation that obstructs pedestrian signal heads.

Table 132. Short-Term Recommendations for Intersection #17 - Rockville Pike (MD 355) & Templeton Place

| Rec. ID | Recommendation | Safety issue(s) addressed |
|---------|--|---------------------------|
| 17-S-1 | Adjust the left-turn signal timing for the SBL movement to be protected-only, removing the permissive phase. | 17-B |
| 17-S-2 | Remove the vegetation that currently obstructs all of the pedestrian signal heads. | 17-A |
| 17-S-3 | Add 'No Right Turn On Red' signs to all approaches. | 17-C |

COST ESTIMATE

Table 133 provides a planning-level cost estimate for the short-term recommendations, based on item quantities and recent Maryland SHA price index sheets, and excludes contingency and mobilization.

Table 133. Planning-Level Cost Estimate at Intersection #17 - Rockville Pike (MD 355) & Templeton Place

| Item | Description | Unit | Unit Cost | Quantity | Cost |
|---------------|---------------------------------|------|-----------|----------|-------------------|
| Sign | New sign post | EACH | \$193.76 | 4 | \$775.04 |
| Sign | 'No Turn On Red' sign [R10-11b] | EACH | \$320.00 | 4 | \$1,280.00 |
| Other | Adjust signal timing | EACH | \$- | 1 | \$- |
| Other | Vegetation removal | EACH | \$- | 1 | \$- |
| Total: | | | | | \$2,055.04 |

TRAFFIC IMPACT ANALYSIS

It was recommended that the left-turn signal timing for the southbound left movement be adjusted to be protected-only, removing the permissive phase. Included below is the anticipated increase in delay (in seconds) for the southbound left-turn movement. While the delays do increase substantially, this adjustment is justifiable considering only 1 and 4 vehicles perform this movement in the AM and PM peaks, respectively.

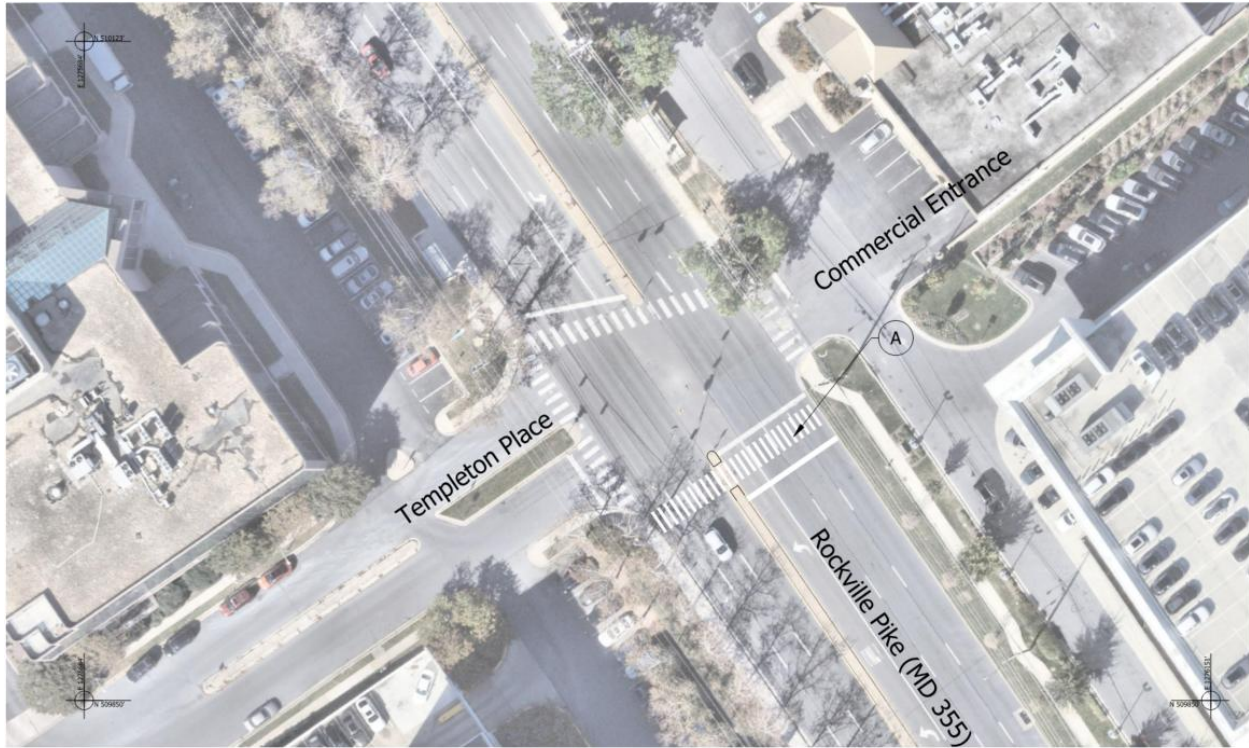
- AM Peak: 12.2 → 72.3
- PM Peak: 15.7 → 81.8

It was also recommended that 'No Right Turn On Red' signs be added to all approaches at this intersection. The average anticipated increase in delay for all right-turn movements across the AM and PM peaks was less than 2 seconds.

LONG-TERM RECOMMENDATIONS

Figure 115 illustrates the proposed long-term capital improvements for the Rockville Pike (MD 355) & Templeton Place intersection. The long-term concept focuses on adding pedestrian signal heads and crosswalks to all approaches.

Figure 115. Long-Term Recommendations for Intersection #17 - Rockville Pike (MD 355) & Templeton Place



LEGEND

- A** High-visibility continental crosswalk with stop bar, curb ramps, and median cut-through

Key elements of the long-term recommendations are included in Table 134.

Table 134. Long-Term Recommendations for Intersection #17 - Rockville Pike (MD 355) & Templeton Place

| Rec. ID | Recommendation | Safety issue(s) addressed |
|---------|--|---------------------------|
| 17-L-1 | Install updated pedestrian signal heads and push buttons on all approaches. | 17-A |
| 17-L-2 | Add a crosswalk to the northbound leg of this intersection. | 17-A |
| 17-L-3 | Upgrade the traffic signals at this intersection to be mounted on mast arms instead of span wires. | 17-E |

#18 - NORBECK ROAD (MD 28) & AVERY ROAD

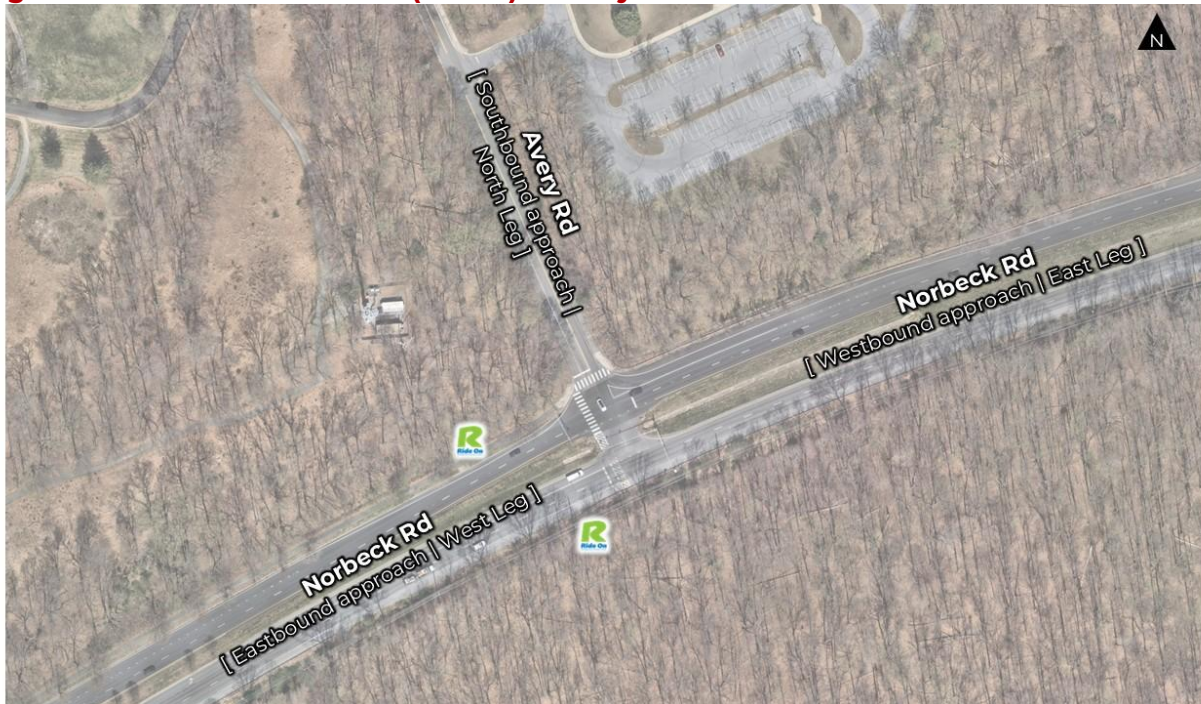
Existing Conditions

INTERSECTION DESCRIPTION

The intersection of Norbeck Road (MD 28) & Avery Road is shown in Figure 116. Norbeck Road is classified as a major arterial with a speed limits of 45 to 50 MPH and four lanes in addition to a designated eastbound left-turn lane. Avery Road is classified as a minor collector with a speed limit of 25 MPH, one northbound lane, and two southbound lanes³. The intersection is signalized. In 2024, Annual Average Daily Traffic (AADT) on Norbeck Road was 40,382 and 3,855 on Avery Road¹.

According to the Rockville Comprehensive Land Use Policy Map², land use to the south and west of the intersection is “Public Park” and to the east of the intersection is “Civic and Public Institutional.” To the south and west is a park and to the northeast is a school. There are RideOn Route 48, 49, and 52 eastbound and westbound bus stops located on both sides of the west leg of the intersection. There are sidewalks on the east side of the southbound approach and north side of the eastbound approach with crosswalks on the north leg and west leg. There is not a sidewalk on the south side of Norbeck Road between the crosswalk and bus stop nor a crosswalk on the east leg.

Figure 116. #18 - Norbeck Road (MD 28) & Avery Road Intersection



SAFETY REVIEW

Table 135 summarizes the crash characteristics, including collision types, lighting conditions, and roadway surface conditions. A total of 16 crashes were recorded at the intersection during the three-year period from 2022 to 2024. All reported crashes involved only automobiles. Half of the crashes resulted in property-damage-only (PDO) outcomes, with five (5) minor injury crashes and three (3) possible injury crashes reported over the study period.

Table 135. Summary of Three-Year (2022-24) Crashes at Intersection #18 - Norbeck Road (MD 28) & Avery Road

| Total Crashes | Total Crashes by Year | | | Total Crashes by User | | |
|---------------|-----------------------|------|------|-----------------------|---------|------------|
| 16 | 2022 | 2023 | 2024 | Auto | Cyclist | Pedestrian |
| | 1 | 11 | 4 | 16 | 0 | 0 |

| Total Crashes by Severity | | | | |
|---------------------------|---------|-------|-----------------|-----------------|
| Fatal | Serious | Minor | Possible Injury | Property Damage |
| 0 | 0 | 5 | 3 | 8 |

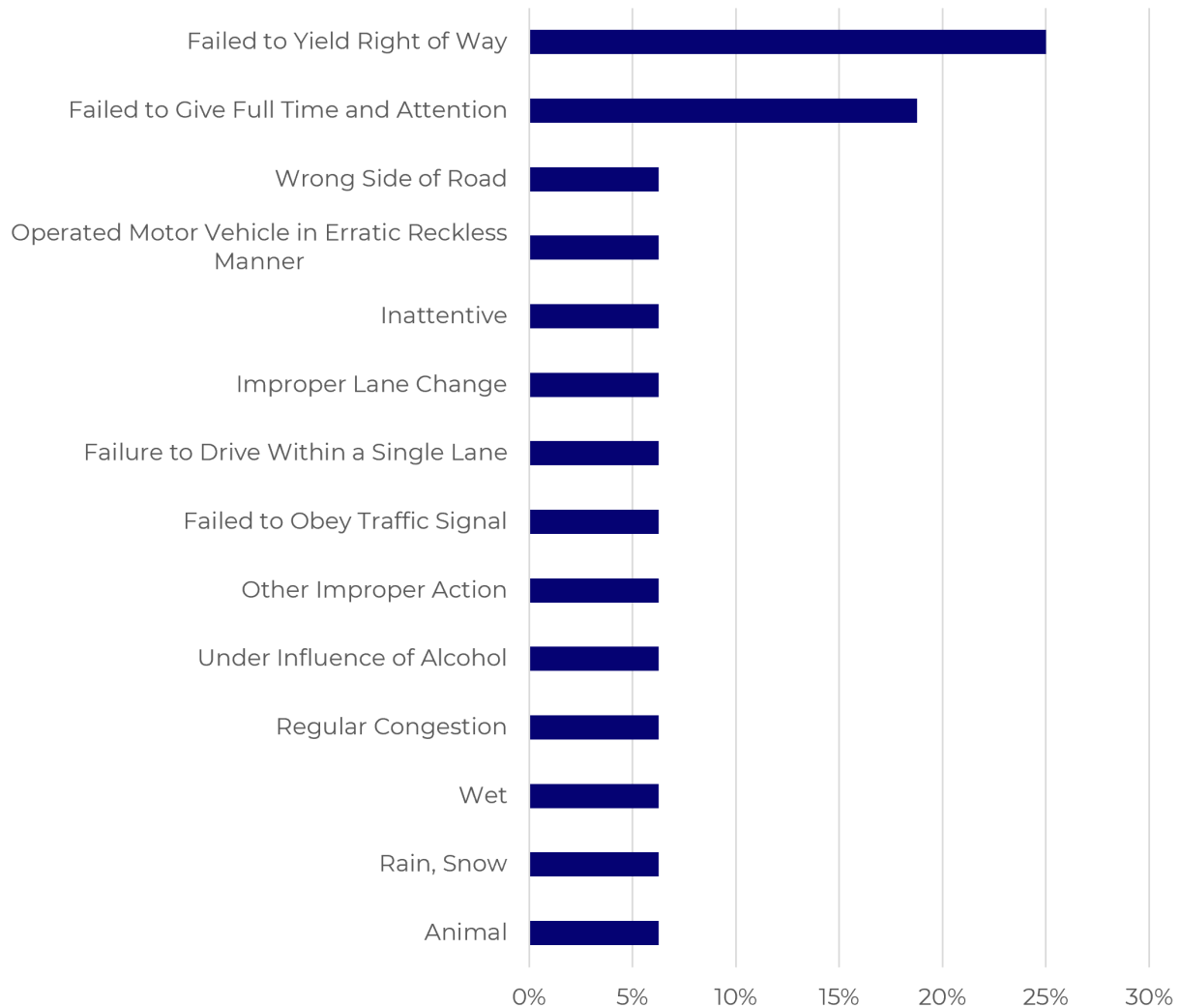
| Total Crashes by Collision Type | | | | | |
|---------------------------------|-------------------|-------|---------|--------------------------|-------|
| Same Direction Rear End | Head On Left Turn | Angle | Head On | Same Direction Sideswipe | Other |
| 8 | 3 | 1 | 1 | 1 | 2 |

| Lighting | | | Road Surface | |
|----------|----------------|------|--------------|-----|
| Daylight | Dark Lights On | Dawn | Dry | Wet |
| 11 | 4 | 1 | 15 | 1 |

Note: Crash summaries are based on the available crash data reviewed for this study. Reported crash totals and locations may vary across source datasets due to differences in reporting methods, geocoding, and intersection buffers.

Figure 117 illustrates the percentage of crashes accounting for each contributing circumstance associated with crashes at the intersection during the 2022–2024 study period. A single crash may involve multiple contributing circumstances, as documented in the crash reports. As shown in the figure, most contributing circumstances were related to driver behavior, with the most common being failure to yield right-of-way, followed by failure to give full time and attention. Other contributing factors included driving on the wrong side of the road, erratic or reckless driving behavior, inattentiveness, improper lane changes, and failure to obey traffic control devices.

Figure 117. Percentage of Crashes Accounting for Each Contributing Circumstance at Intersection #18 - Norbeck Road (MD 28) & Avery Road



NEAR-MISS VIDEO ANALYSIS

Post-Encroachment Time (PET), which measures the temporal separation between two users occupying the same conflict area, was used to assess the severity of these interactions and is calculated only when both users pass through the same conflict point. Based on 24-hour video observations at the Norbeck Road (MD 28) & Avery Road intersection, a total of 147 near-miss events were identified, as summarized in Table 136. Of these, 138 involved vehicle-to-vehicle conflicts, nine (9) involved vehicle-to-pedestrian conflicts, and zero (0) involved vehicle-to-bicyclist conflicts, indicating that vehicles were the most affected group. As shown in the table, most (120) observed conflicts fall within the 2–3 second PET range. A PET of less than 2 seconds is generally considered indicative of higher-risk interactions; 27 conflicts fall within this range at the intersection. Notably, only four (4) of these higher-risk conflicts involved pedestrians or bicyclists, indicating that most higher-risk interactions occurred between vehicles.

Table 136. Summary of Near Misses for a Day (24-hours) at Intersection #18 - Norbeck Road (MD 28) & Avery Road

| Post Encroachment Time (PET) | Vehicle-Vehicle | Vehicle-Pedestrian | Vehicle-Bicyclist | Total |
|------------------------------|-----------------|--------------------|-------------------|------------|
| 0.0 - 1.5s | 3 | 1 | 0 | 4 |
| 1.5 - 2.0s | 20 | 3 | 0 | 23 |
| 2.0 - 3.0s | 115 | 5 | 0 | 120 |
| Total | 138 | 9 | 0 | 147 |

Based on video analysis of near-miss events, Table 137 summarizes the most frequent conflict types observed at the intersection. The highest number of conflicts (138) occurred between eastbound left-turning vehicles and westbound through vehicles. The next most frequent conflicts involved eastbound through and westbound through vehicles interacting with pedestrians on the west leg, each with two (2) conflicts. While pedestrian-related conflicts are present, they occur at a lower frequency than vehicle-to-vehicle conflicts. The concentration of conflicts involving left-turning vehicles indicates that left-turn movements are a primary safety concern at the intersection.

Table 137. Top Three Conflict Types by Movements based on Near Miss Video Analysis at Intersection #18 - Norbeck Road (MD 28) & Avery Road.

| Conflict Rank | Movement 1 | Movement 2 | Conflicts |
|---------------|-------------------|---------------------|-----------|
| 1. | Eastbound Left | Westbound Through | 138 |
| 2. | Eastbound Through | West Leg Pedestrian | 2 |
| 3. | Westbound Through | West Leg Pedestrian | 2 |

EXISTING TRAFFIC OPERATIONS

Table 138 shows the results of traffic operations analysis for this intersection based on existing lane configurations, peak-hour traffic volumes, and signal timing parameters. Drivers on the southbound approach experience moderate-to-heavy delays during the AM and PM peak hours.

Table 138. Results of Traffic Operation Analysis at Intersection #18 - Norbeck Road (MD 28) & Avery Road

| Approach | Movement | Weekday AM Peak Hour | | | Weekday PM Peak Hour | | |
|-----------------------------|-------------------------|----------------------|----------|----------------------------|----------------------|----------|----------------------------|
| | | Delay (sec) | LOS | 95th Percentile Queue (ft) | Delay (sec) | LOS | 95th Percentile Queue (ft) |
| Eastbound | Eastbound Left | 62.7 | E | 112 | 13.4 | B | 138 |
| | Eastbound Through | 4.9 | A | 271 | 5.4 | A | 402 |
| | Overall Approach | 8.9 | A | | 6.4 | A | |
| Westbound | Westbound Through | 23.5 | C | #1623 | 14.2 | B | 458 |
| | Westbound Right | 6.7 | A | 23 | 9.1 | A | 29 |
| | Overall Approach | 23.3 | C | | 13.9 | B | |
| Southbound | Southbound Left | 76.3 | E | 150 | 70.6 | E | 120 |
| | Southbound Right | 95.2 | F | 247 | 64.8 | E | 64 |
| | Overall Approach | 90.8 | F | | 66.8 | E | |
| Overall Intersection | | 24.9 | C | | 12.3 | B | |

LOS = Level of Service
 # = 95th percentile volume exceeds capacity, queue may be longer

SITE VISIT OBSERVATIONS

The project team conducted a site visit on Friday, May 1, 2026. Key findings from the site observations included vehicles traveling at high speed in both directions on Norbeck Road, with the westbound vehicles accelerating uphill. Limited visibility of the east leg was observed for vehicles from the southbound approach making right turns onto Norbeck Road, creating a potential safety concern given the prevailing speed.

Several deficiencies in pedestrian crossing infrastructure were noted. The west leg crosswalk was observed in poor condition, with faded and cracked pavement, and lacking a refuge island as considered a long crosswalk. Additionally, pedestrian crosswalk signs throughout the intersection were observed to be cracked and faded.

Transit access and pedestrian comfort issues were also observed along the south side of Norbeck Road, where a sidewalk connection to the bus stop was lacking, and the pedestrian waiting area near the bus stop lacked separation from adjacent travel lanes. From an operational standpoint, vehicles from the southbound approach making right turns were required to stop on red and yield to higher-speed eastbound through vehicles. The team also observed a short clearance interval for eastbound left-turn vehicles, in addition to permitted left-turn vehicles.

Photos in Appendix F and in Figure 118, Figure 119, and Figure 120 document site visit observations.

Figure 118. Long west leg pedestrian crosswalk deteriorated and lacking high visibility design on south side #18 - Norbeck Road (MD 28) & Avery Road



Figure 119. Vehicles turning on a permissive left turn from eastbound Norbeck to northbound Avery. Three head on left turn crashes and 138 near misses occurred in this movement. #18 - Norbeck Road (MD 28) & Avery Road



Figure 120. Lack of separated pedestrian facility on the south leg of eastbound approach between crosswalk and bus stop #18 - Norbeck Road (MD 28) & Avery Road



IDENTIFIED SAFETY ISSUES

Key safety issues and other findings are shown in Table 139 and described below.

Table 139. Key Safety Issues for Intersection #18 - Norbeck Road (MD 28) & Avery Road

| Issue ID | Safety Issue | Safety Issue Type | Crash Data | Near-Miss Video | Site Visit |
|----------|--|---|------------|-----------------|------------|
| 18-A | Eastbound and westbound vehicles traveling at 45+ MPH and westbound vehicles accelerating uphill | 1.1 Speeds, Severity, and Compliance: High Vehicle Speeds | | | ✓ |
| 18-B | Poor visibility of east leg for southbound right-turn traffic | 3.1 Roadway Design: Inadequate Sight Distance (Lack of Driver Visibility) | | | ✓ |
| 18-C | Three head on left turn crashes between 2022 and 2024 and 138 near miss conflicts between eastbound left-turn vehicles and westbound through vehicles between 2022 and 2024 | 8.4 Conflict Type: Left Turn | ✓ | ✓ | |
| 18-D | West leg crosswalk markings are faded; crosswalk is long and lacks pedestrian refuge | 5.1 Pedestrian: Intersection Crossing | | | ✓ |
| 18-E | South side of Norbeck Road lacks sidewalk from crosswalk to bus stop | 5.2 Pedestrian: Missing or Inadequate Sidewalk | | | ✓ |
| 18-F | South side of Norbeck Road lacks pedestrian space and bus stop is not separated from travel lanes | 5.3 pedestrian: Low-Comfort Facility | | | ✓ |
| 18-G | Short signal phase for eastbound left-turn traffic | 8.4 Conflict Type: Left Turn | | | ✓ |
| 18-H | Two near miss conflicts between pedestrians on west leg crosswalk and eastbound vehicles, and two near miss conflicts between pedestrians on west leg crosswalk and westbound vehicles | 2.2 Conflicts Between Users: Drivers and Pedestrians | | ✓ | |
| 18-I | One instance of same direction sideswipe crash from 2022 to 2024. | 8.3 Conflict Type: Sideswipe | ✓ | | |

Bold indicates a priority safety issue.

Recommendations

SHORT-TERM RECOMMENDATIONS

Figure 121 illustrates the proposed short-term, quick-build improvements for the Norbeck Road (MD 28) & Avery Road intersection, with additional detail provided in Table 140. The short-term concept focuses on refurbishing existing crosswalks and adding school zone signs.

These recommendations rely on low-cost, implementable treatments (signing, striping, and delineation) to reduce driver uncertainty, improve yielding compliance, and make pedestrian crossings more visible and predictable.

Figure 121. Short-Term Recommendations for Intersection #18 - Norbeck Road (MD 28) & Avery Road



LEGEND

- | | | | |
|---|--|---|--|
| (A) Proposed lane configuration markings | (D) Refurbish puppy track markings | (G) Proposed pedestrian crossing warning sign | (J) Proposed crosswalk markings. See Detail A. |
| (B) Replace damaged U-Pole | (E) Proposed delineated bus zone area | (H) Relocate existing school crossing sign (S1-1): 36" x 36" and Ahead plaque (W16-9P): 24" x 12" | |
| (C) Proposed speed limit sign (R2-1): 24" x 30" | (F) Proposed turn lane pavement markings | (I) Proposed No Turn on Red sign (R10-11b): 24" x 30" | |

Table 140. Short-Term Recommendations for Intersection #18 - Norbeck Road (MD 28) & Avery Road

| Rec. ID | Recommendation | Safety issue(s) addressed |
|---------|--|---------------------------|
| 18-S-1 | Install speed limit signs on eastbound and westbound Norbeck Road | 18-A |
| 18-S-2 | Install flex post barriers on south side of Norbeck Road between bus stop and cross walk set back from the edge line, and pedestrian pavement markings to delineate bus stop | 18E, 18F |
| 18-S-3 | Install arrow and letter pavement markings for lane configuration on westbound approach | 18-I |
| 18-S-4 | Refurbish and restripe existing crosswalk on west leg with high-visibility markings | 18-D |
| 18-S-5 | Refurbish faded puppy track pavement markings | 18-C |
| 18-S-6 | Replace damaged U-pole and Keep Right sign | 18-J |
| 18-S-7 | Install No Turn on Red (NTOR) sign for southbound right-turn traffic | 18-A, 18-B |
| 18-S-8 | Replace faded pedestrian signs and relocate them on a new U-pole | 18-K |
| 18-S-9 | Install left arrow ONLY and letter pavement markings for eastbound approach lane configuration | 18-C |

COST ESTIMATE

Table 141 provides a planning-level cost estimate for the short-term recommendations, based on item quantities and recent Maryland SHA price index sheets, and excludes contingency and mobilization.

Table 141. Planning-Level Cost Estimate at Intersection #18 - Norbeck Road (MD 28) & Avery Road

| Item | Description | Unit | Unit Cost | Quantity | Cost |
|------------------|--|------|-----------|----------|--------------------|
| Pavement Marking | 12" Crosswalk | LF | \$6.19 | 450 | \$2,784.64 |
| Pavement Marking | 5" solid marking (white) | LF | \$7.00 | 385 | \$2,695.00 |
| Pavement Marking | 5" dashed marking (yellow) | LF | \$1.75 | 68.3 | \$119.58 |
| Pavement Marking | Straight arrow marking | EACH | \$157.85 | 2 | \$315.70 |
| Pavement Marking | Turn arrow marking | EACH | \$395.15 | 3 | \$1,185.45 |
| Pavement Marking | ONLY' marking (letter) | EACH | \$375.23 | 2 | \$750.46 |
| Pavement Marking | Pedestrian Marking | EACH | \$375.23 | 2 | \$750.46 |
| Sign | New sign post | EACH | \$193.76 | 5 | \$968.80 |
| Sign | Remove sign post | EACH | \$79.54 | 2 | \$159.08 |
| Sign | Advance Pedestrian Warning sign [W11-2] | EACH | \$180.00 | 1 | \$180.00 |
| Sign | Speed limit sign [R2-1] | EACH | \$400.00 | 2 | \$800.00 |
| Sign | 'Ahead' plaque (under school zone sign) [W16-9P] | EACH | \$160.00 | 1 | \$160.00 |
| Sign | Directional downward arrow plaque [W16-7p] | EACH | \$160.00 | 1 | \$160.00 |
| Sign | 'No Turn On Red' sign [R10-11b] | EACH | \$320.00 | 1 | \$320.00 |
| Sign | School zone sign [S1-1] | EACH | \$540.00 | 1 | \$540.00 |
| Other | Flex Post | EACH | \$39.67 | 22 | \$872.77 |
| Other | Adjust signal timing | EACH | \$- | 1 | \$- |
| Total: | | | | | \$12,761.94 |

LONG-TERM RECOMMENDATIONS

Figure 122 illustrates the proposed long-term capital improvements for the Norbeck Road (MD 28) & Avery Road intersection. The long-term concept focuses on improving pedestrian accessibility while optimizing traffic safety and operations. They aim to enhance crossing safety, provide better sidewalk connections, and adjust signal timing to improve vehicle flow.

Figure 122. Long-Term Recommendations for Intersection #18 - Norbeck Road (MD 28) & Avery Road



LEGEND

- (A)** Install concrete sidewalk connecting bus stop and crosswalk
- (B)** Relocate crosswalk to median, widen crosswalk and add refuge island

Key elements of the long-term recommendations are included in Table 142.

Table 142. Long-Term Recommendations for Intersection #18 - Norbeck Road (MD 28) & Avery Road

| Rec. ID | Recommendation | Safety issue(s) addressed |
|---------|--|---------------------------|
| 18-L-1 | Consider relocating the west leg crosswalk and make it wider to 15' with a refuge island on the existing median island and install ADA curb ramps with detectable warning surface on the west leg crosswalk. | 18-D, 18-H |
| 18-L-2 | Consider installing a concrete sidewalk on the south side of Norbeck Road to connect the crosswalk and bus stop. | 18-E, 18-F |
| 18-L-3 | Consider having a longer time for the exclusive left-turn phase so that more eastbound left-turn vehicles can use it | 18-C, 18-G |

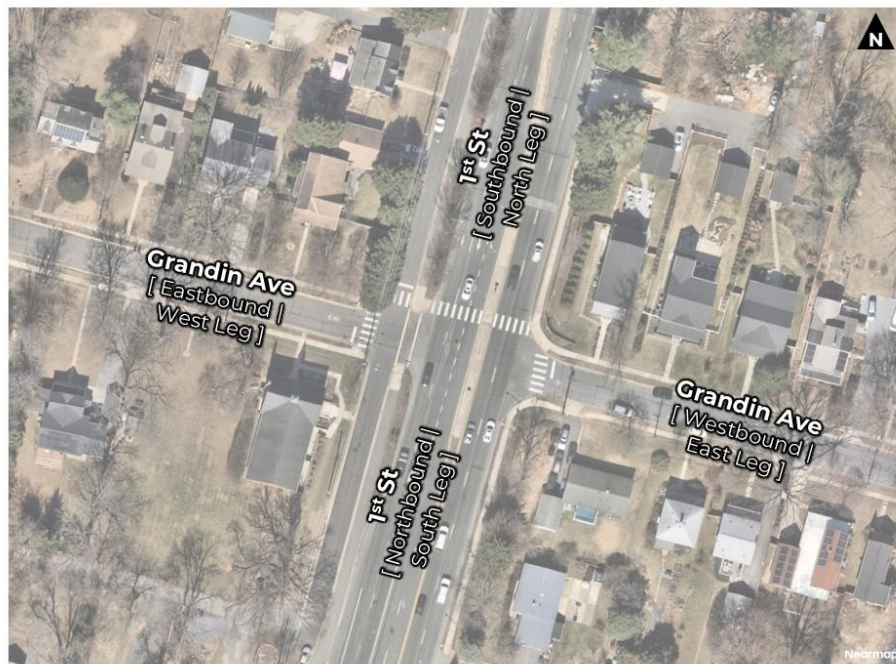
#19 - FIRST STREET (MD 28) & GRANDIN AVENUE

Existing Conditions

INTERSECTION DESCRIPTION

The intersection of First Street (MD 28) & Grandin Avenue is shown in Figure 123. First Street is a four-lane principal arterial with a 35 MPH speed limit and is identified as the northbound (south) and southbound (north) approaches. Grandin Avenue is a two-lane local road with a 25 MPH speed limit and is identified as the eastbound (west) and westbound (east) approaches. The intersection is unsignalized, with northbound and southbound traffic running freely, and eastbound and westbound traffic only allowed to perform right turns onto the mainline. According to the Rockville Comprehensive Land Use Policy Map,² land uses adjacent to the intersection are “residential detached”, and “residential attached”.

Figure 123. #19 - First Street (MD 28) & Grandin Avenue Intersection



SAFETY REVIEW

Table 143 summarizes the crash characteristics, including collision types, lighting conditions, and roadway surface conditions. A total of 11 crashes were recorded at the intersection during the three-year period from 2022 to 2024. All reported crashes involved only automobiles. Most of the crashes resulted in property-damage-only (PDO) outcomes, with two (2) minor injury crashes reported over the study period.

Table 143. Summary of Three-Year (2022-24) Crashes at Intersection #19 - First Street (MD 28) & Grandin Avenue

| Total Crashes | Total Crashes by Year | | | Total Crashes by User | | |
|---------------|-----------------------|------|------|-----------------------|---------|------------|
| 11 | 2022 | 2023 | 2024 | Auto | Cyclist | Pedestrian |
| | 3 | 0 | 8 | 11 | 0 | 0 |

| Total Crashes by Severity | | | | |
|---------------------------|---------|-------|-----------------|-----------------|
| Fatal | Serious | Minor | Possible Injury | Property Damage |
| 0 | 0 | 2 | 0 | 9 |

| Total Crashes by Collision Type | | | |
|---------------------------------|--------------|------------------------------|----------------|
| Same Direction Rear End | Rear To Rear | Opposite Direction Sideswipe | Single Vehicle |
| 8 | 1 | 1 | 1 |

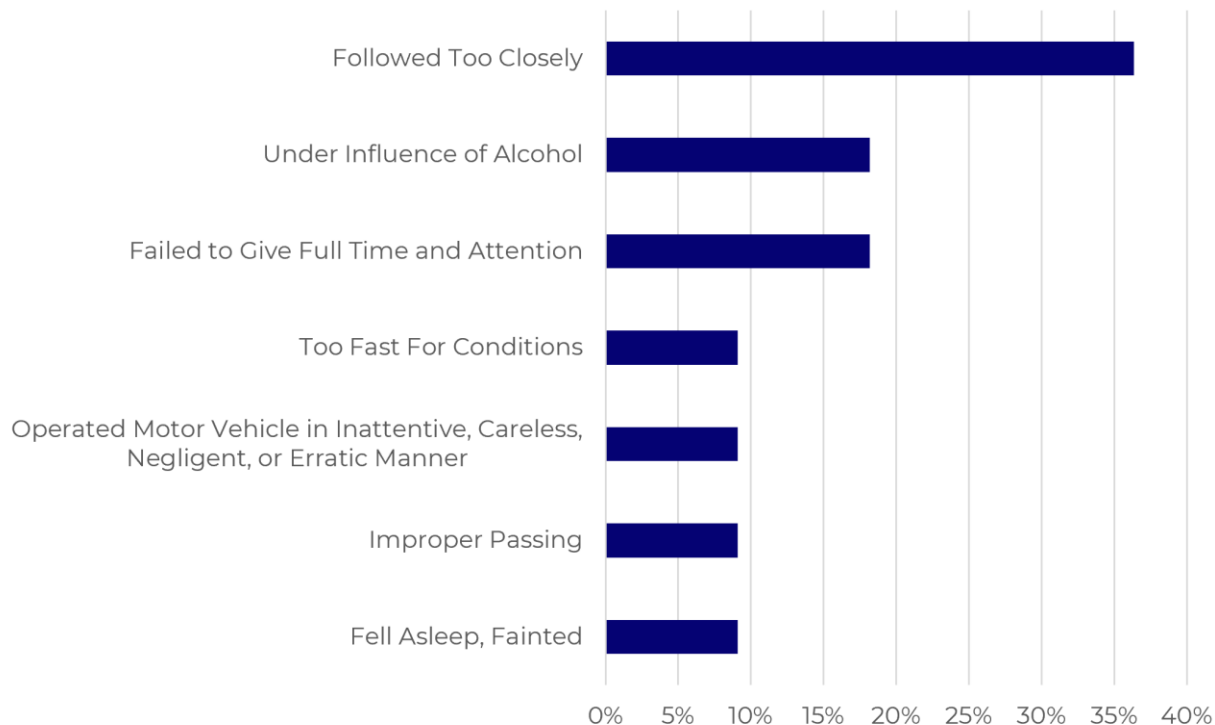
| Lighting | | |
|----------|----------------|----------------|
| Daylight | Dark Lights On | Dark No Lights |
| 7 | 3 | 1 |

| Road Surface | | |
|--------------|-----|---------|
| Dry | Wet | Unknown |
| 9 | 1 | 1 |

Note: Crash summaries are based on the available crash data reviewed for this study. Reported crash totals and locations may vary across source datasets due to differences in reporting methods, geocoding, and intersection buffers.

Figure 124 illustrates the percentage of crashes accounting for each contributing circumstance associated with crashes at the intersection during the 2022–2024 study period. A single crash may involve multiple contributing circumstances, as documented in the crash reports. As shown in the figure, most contributing circumstances were related to driver behavior, with the most common being following too closely, followed by driving under the influence of alcohol and failure to give full time and attention. Other contributing factors included driving too fast for conditions, inattentive or erratic driving behavior, improper passing, and driver fatigue-related conditions.

Figure 124. Percentage of Crashes Accounting for Each Contributing Circumstance at Intersection #19 - First Street (MD 28) & Grandin Avenue



NEAR-MISS VIDEO ANALYSIS

Post-Encroachment Time (PET), which measures the temporal separation between two users occupying the same conflict area, was used to assess the severity of these interactions and is calculated only when both users pass through the same conflict point. Based on 24-hour video observations at the First Street (MD 28) & Grandin Avenue intersection, a total of 32 near-miss events were identified, as summarized in Table 144. Of these, zero (0) involved vehicle-to-vehicle conflicts, 25 involved vehicle-to-pedestrian conflicts, and seven (7) involved vehicle-to-bicyclist conflicts, indicating that pedestrians were the most affected group. As shown in the table, most (23) observed conflicts fall within the 2–3 second PET range. A PET of less than 2 seconds is generally considered indicative of higher-risk interactions; nine (9) conflicts fall within this range at the intersection. Notably, all of these higher-risk conflicts involved pedestrians, indicating elevated conflict severity for pedestrians at the intersection.

Table 144. Summary of Near Misses for a Day (24-hours) at Intersection #19 - First Street (MD 28) & Grandin Avenue

| Post Encroachment Time (PET) | Vehicle-Vehicle | Vehicle-Pedestrian | Vehicle-Bicyclist | Total |
|------------------------------|-----------------|--------------------|-------------------|-----------|
| 0.0 - 1.5s | 0 | 7 | 0 | 7 |
| 1.5 - 2.0s | 0 | 2 | 0 | 2 |
| 2.0 - 3.0s | 0 | 16 | 7 | 23 |
| Total | 0 | 25 | 7 | 32 |

Based on video analysis of near-miss events, Table 145 summarizes the most frequent conflict types observed at the intersection. The highest number of conflicts (11) occurred between northbound through vehicles and pedestrians on the north leg. The next two most frequent conflicts involved southbound through vehicles interacting with pedestrians on the north leg. All top-ranked conflicts involve pedestrian interactions on the north leg, indicating a heightened risk to pedestrians at this crosswalk location.

Table 145. Top Three Conflict Types by Movements based on Near Miss Video Analysis at Intersection #19 - First Street (MD 28) & Grandin Avenue.

| Conflict Rank | Movement 1 | Movement 2 | Conflicts |
|---------------|----------------------|----------------------|-----------|
| 1. | Northbound Through | North Leg Pedestrian | 11 |
| 2. | Southbound Through | North Leg Pedestrian | 7 |
| 3. | North Leg Pedestrian | Southbound Through | 3 |

EXISTING TRAFFIC OPERATIONS

Table 146 shows the results of traffic operations analysis for this intersection based on existing lane configurations and peak-hour traffic volumes. Drivers at this intersection experience light delays, all due to the signalized intersection 400 feet to the south.

Table 146. Results of Traffic Operation Analysis at Intersection #19 - First Street (MD 28) & Grandin Avenue

| Approach | Movement | Weekday AM Peak Hour | | | Weekday PM Peak Hour | | |
|-----------------------------|-------------------------|----------------------|----------|----------------------------|----------------------|----------|----------------------------|
| | | Delay (sec) | LOS | 95th Percentile Queue (ft) | Delay (sec) | LOS | 95th Percentile Queue (ft) |
| Eastbound | Eastbound Right | 12.8 | B | - | 10.8 | B | - |
| | Overall Approach | 12.8 | B | | 10.8 | B | |
| Westbound | Westbound Right | 12.7 | B | - | 17.9 | C | - |
| | Overall Approach | 12.7 | B | | 17.9 | C | |
| Northbound | Northbound Through | 0.0 | - | - | 0.0 | - | - |
| | Overall Approach | 0.0 | - | | 0.0 | - | |
| Southbound | Southbound Through | 0.0 | - | - | 0.0 | - | - |
| | Overall Approach | 0.0 | - | | 0.0 | - | |
| Overall Intersection | | 0.6 | A | | 0.1 | A | |

LOS = Level of Service
 # = 95th percentile volume exceeds capacity, queue may be longer

SITE VISIT OBSERVATIONS

A site visit was conducted on April 28, 2026 to document existing conditions for people walking, people biking, and drivers. Photos from the site visit are included in Appendix F and in Figure 125 and Figure 126.

During the site visit, the team observed that queues from the signal to the south often extend through the crosswalk, limiting pedestrian visibility. There are no stop bars accompanying the mainline crosswalk, and pedestrians must cross 5 lanes of traffic to navigate the intersection, presenting multiple threats and high exposure.

Figure 125. Drivers queued in the crosswalk at Intersection #19 - First Street (MD 28) & Grandin Avenue



Figure 126. No crosswalks on Grandin Avenue at Intersection #19 - First Street (MD 28) & Grandin Avenue



IDENTIFIED SAFETY ISSUES

Key safety issues and other findings are shown in Table 147 and described below.

Table 147. Key Safety Issues for Intersection #19 - First Street (MD 28) & Grandin Avenue

| Issue ID | Safety Issue | Safety Issue Type | Crash Data | Near-Miss Video | Site Visit |
|----------|--|---------------------------------------|------------|-----------------|------------|
| 19-A | Pedestrians must cross 5 lanes of traffic to navigate the mainline crosswalk, presenting multiple threats and high exposure. Queues from the signal to the south often extend through this crosswalk, limiting pedestrian visibility. | 5.1 Pedestrian: Intersection Crossing | | ✓ | ✓ |
| 19-B | There are no stop bars accompanying the mainline crosswalk at this intersection. | 5.1 Pedestrian: Intersection Crossing | | | ✓ |
| 19-C | There are missing crosswalk pavement markings on the frontage road and across the eastbound approach. There is no stop bar on the eastbound approach. | 5.1 Pedestrian: Intersection Crossing | | | ✓ |

Bold indicates a priority safety issue.

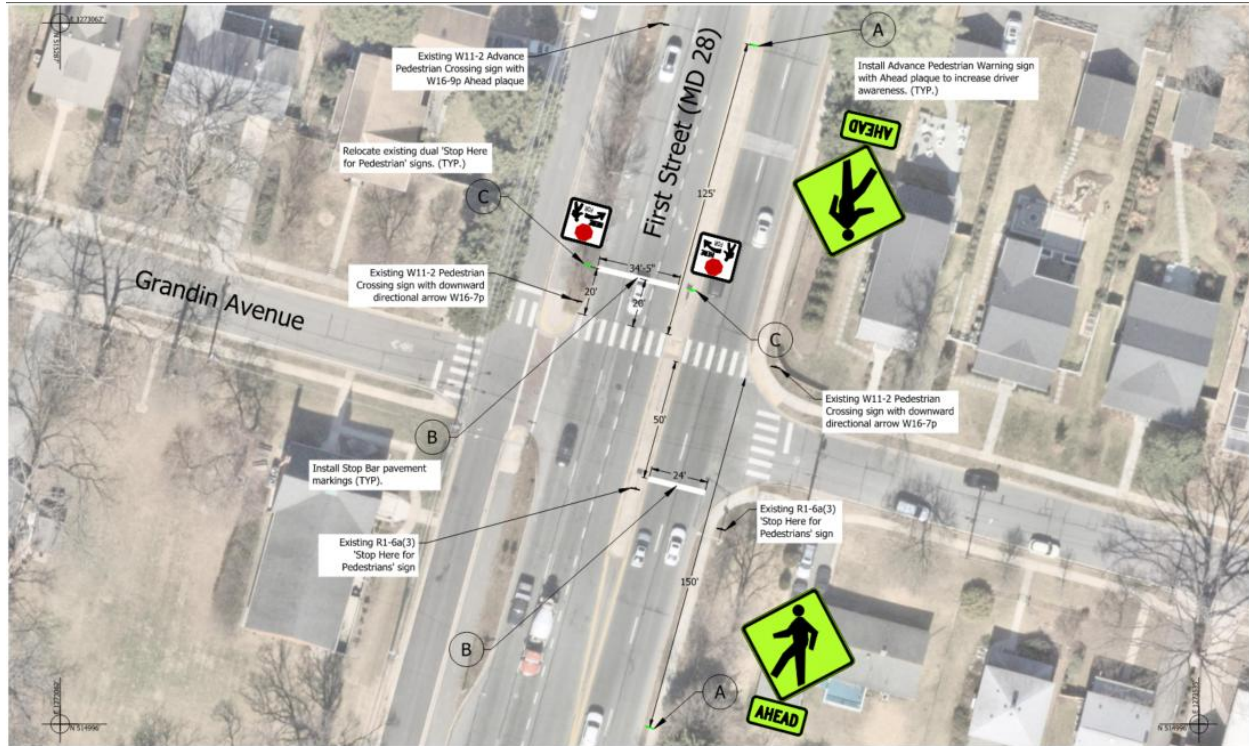
Recommendations

SHORT-TERM RECOMMENDATIONS

Figure 127 illustrates the proposed short-term, quick-build improvements for the First Street (MD 28) & Grandin Avenue intersection, with additional detail provided in Table 148. The short-term concept focuses on adding signs to improve driver awareness of crossing pedestrians.

These recommendations rely on low-cost, implementable treatments (signing, striping, and delineation) to reduce driver uncertainty, improve yielding compliance, and make pedestrian crossings more visible and predictable.

Figure 127. Short-Term Recommendations for Intersection #19 - First Street (MD 28) & Grandin Avenue



LEGEND

- A** Proposed Advance Pedestrian Warning sign (W11-2); 36" x 36" with Ahead plaque (W16-9p); 24" x 12"
- B** Proposed stop bar pavement markings
- C** Relocated Stop Here for Pedestrian signs (R1-6a(3)); 30" x 30"

Table 148. Short-Term Recommendations for Intersection #19 - First Street (MD 28) & Grandin Avenue

| Rec. ID | Recommendation | Safety issue(s) addressed |
|---------|---|---------------------------|
| 19-S-1 | Add additional pedestrian crossing warning signs upstream of this intersection on 1st Street. | 19-A |
| 19-S-2 | Install stop bars in advance of the mainline crosswalk at this intersection. | 19-B |

COST ESTIMATE

Table 149 provides a planning-level cost estimate for the short-term recommendations, based on item quantities and recent Maryland SHA price index sheets, and excludes contingency and mobilization.

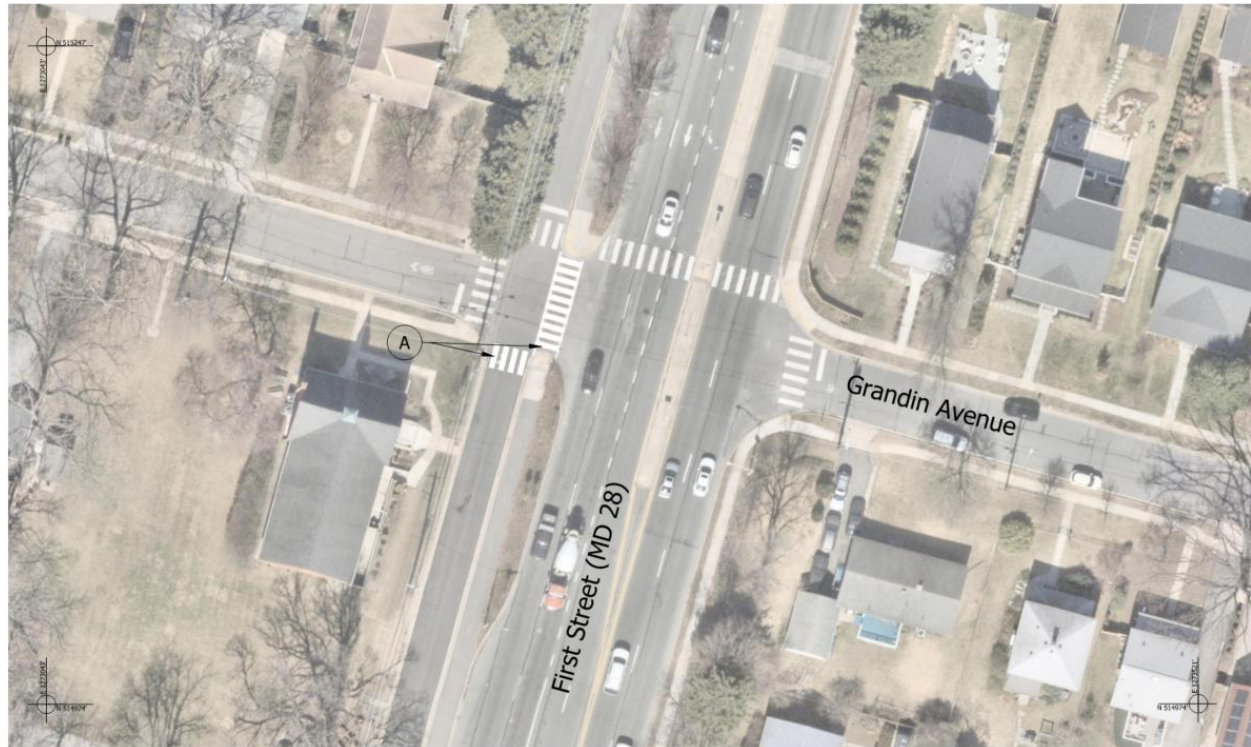
Table 149. Planning-Level Cost Estimate at Intersection #19 - First Street (MD 28) & Grandin Avenue

| Item | Description | Unit | Unit Cost | Quantity | Cost |
|------------------|--|------|-----------|----------|-------------------|
| Pavement Marking | 24" Stop Bar | LF | \$21.75 | 58.5 | \$1,272.38 |
| Sign | New sign post | EACH | \$193.76 | 2 | \$387.52 |
| Sign | Relocate sign post | EACH | \$79.54 | 2 | \$159.08 |
| Sign | Advance Pedestrian Warning sign [W11-2] | EACH | \$180.00 | 2 | \$360.00 |
| Sign | Stop Here for Pedestrians sign [R1-6a (3)] | EACH | \$500.00 | 2 | \$1,000.00 |
| Sign | 'Ahead' plaque (under school zone sign) [W16-9P] | EACH | \$160.00 | 2 | \$320.00 |
| Total: | | | | | \$3,498.98 |

LONG-TERM RECOMMENDATIONS

Figure 128 illustrates the proposed long-term capital improvements for the First Street (MD 28) & Grandin Avenue intersection. The long-term concept focuses on improving safety for people walking through high-visibility crosswalk installation and adjusting crosswalk locations.

Figure 128. Long-Term Recommendations for Intersection #19 - First Street (MD 28) & Grandin Avenue



LEGEND

- A Proposed high-visibility continental crosswalks

Key elements of the long-term recommendations are included in Table 150.

Table 150. Long-Term Recommendations for Intersection #19 - First Street (MD 28) & Grandin Avenue

| Rec. ID | Recommendation | Safety issue(s) addressed |
|---------|--|---------------------------|
| 19-L-1 | Apply high visibility pavement markings to all pedestrian crossings at this intersection. | 19-C |
| 19-L-2 | Explore the relocation of this mainline crosswalk to be closer to the midpoint between the Veirs Mill Road and Baltimore Road signals. | 19-A |

#20 - ROCKVILLE PIKE (MD 355) & CONGRESSIONAL LANE

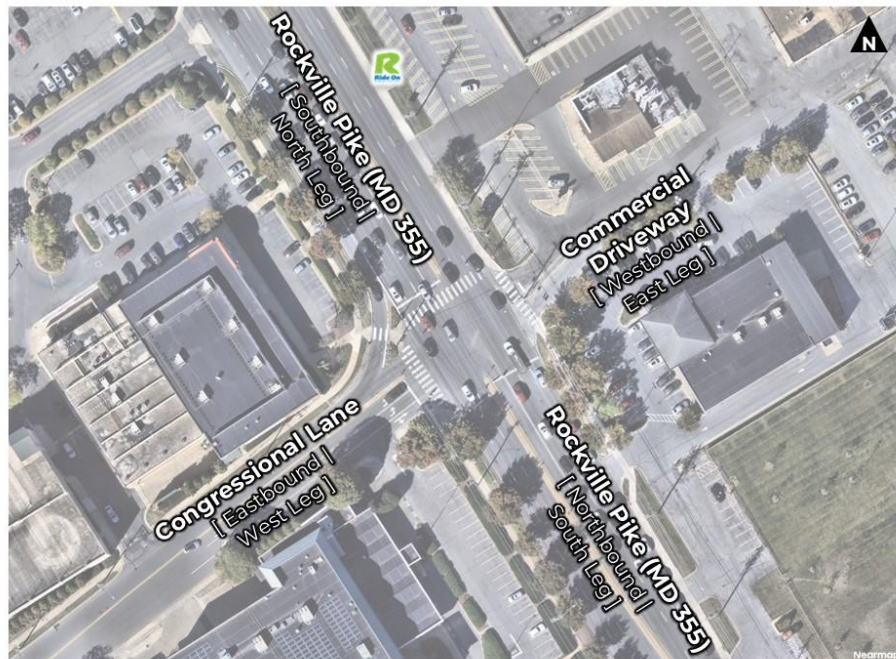
Existing Conditions

INTERSECTION DESCRIPTION

The intersection of Rockville Pike (MD 355) & Congressional Lane is shown in Figure 129. Rockville Pike is a six-lane principal arterial with a 35 MPH speed limit and is identified as the northbound (south) and southbound (north) approaches. Congressional Lane is a two-lane major collector with a 25 MPH speed limit and is identified as the eastbound (west) approach. The westbound (east) approach is a commercial driveway. Rockville Pike has protected-permissive left-turn phasing, while Congressional Lane has protected left-turn phasing. According to the Rockville Comprehensive Land Use Policy Map,² land uses adjacent to the intersection are “residential and/or office” in the immediate vicinity.

Montgomery County’s Vision Zero Plan and the City of Rockville’s Congressional Lane Complete Streets Report both include the intersection of Rockville Pike (MD 355) & Congressional Lane. The Congressional Lane Complete Streets Report calls for the removal of the right-turn slip lane on the southbound leg of the intersection. While Montgomery County’s Vision Zero Plan does not have specific recommendations, it identified the intersection as part of a high priority road.

Figure 129. #20 - Rockville Pike (MD 355) & Congressional Lane Intersection



SAFETY REVIEW

Table 151 summarizes the crash characteristics, including collision types, lighting conditions, and roadway surface conditions. A total of 26 crashes were recorded at the intersection during the three-year period from 2022 to 2024. The reported crashes primarily involved automobiles, with two (2) pedestrian-related crashes and one (1) cyclist-related crash. Most crashes resulted in property-damage-only (PDO) outcomes, with five (5) minor-injury crashes and four (4) possible-injury crashes reported over the study period.

Table 151. Summary of Three-Year (2022-24) Crashes at Intersection #20 - Rockville Pike (MD 355) & Congressional Lane

| Total Crashes | Total Crashes by Year | | | Total Crashes by User | | |
|---------------|-----------------------|------|------|-----------------------|---------|------------|
| 26 | 2022 | 2023 | 2024 | Auto | Cyclist | Pedestrian |
| | | 8 | 9 | 9 | 23 | 1 |

| Total Crashes by Severity | | | | |
|---------------------------|---------|-------|----------|-----------------|
| Fatal | Serious | Minor | Possible | Property Damage |
| 0 | 0 | 5 | 4 | 17 |

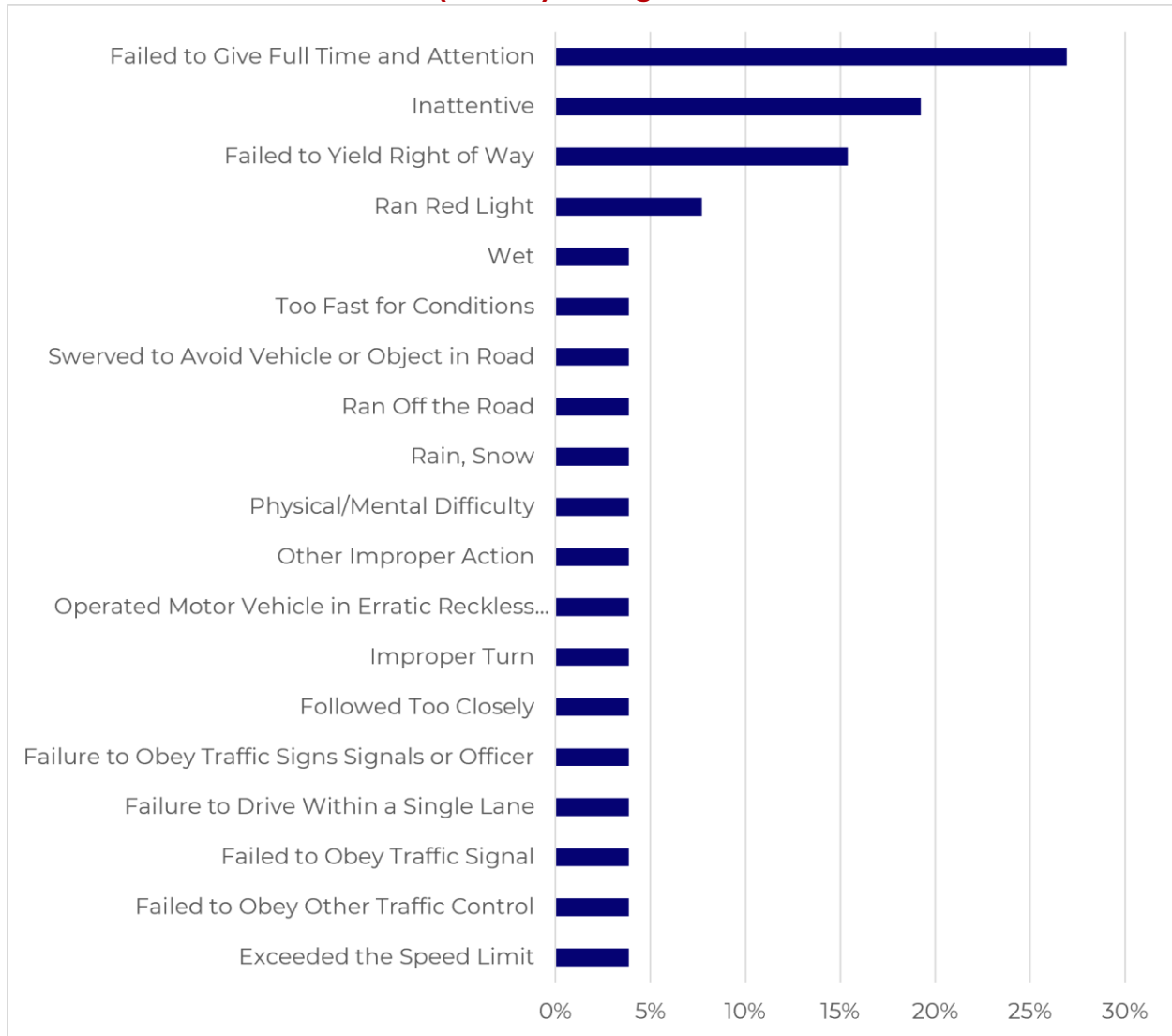
| Total Crashes by Collision Type | | | | | |
|---------------------------------|-------------------------|--------------------------|----------------|-------------------|-------|
| Angle | Same Direction Rear End | Same Direction Sideswipe | Single Vehicle | Head On Left Turn | Other |
| 8 | 5 | 3 | 3 | 1 | 6 |

| Lighting | | | Road Surface | | |
|----------|----------------|------|--------------|-----|---------|
| Daylight | Dark Lights On | Dawn | Dry | Wet | Unknown |
| 16 | 9 | 1 | 22 | 2 | 2 |

Note: Crash summaries are based on the available crash data reviewed for this study. Reported crash totals and locations may vary across source datasets due to differences in reporting methods, geocoding, and intersection buffers.

Figure 130 illustrates the percentage of crashes accounting for each contributing circumstance associated with crashes at the intersection during the 2022–2024 study period. A single crash may involve multiple contributing circumstances, as documented in the crash reports. As shown in the figure, most contributing circumstances were related to driver behavior, with the most common being failure to give full time and attention, followed by inattentiveness and failure to yield right-of-way. Other contributing factors included running red lights, wet roadway conditions, driving too fast for conditions, and various improper or erratic driving behaviors.

Figure 130. Percentage of Crashes Accounting for Each Contributing Circumstance at Intersection #20 - Rockville Pike (MD 355) & Congressional Lane



NEAR-MISS VIDEO ANALYSIS

Post-Encroachment Time (PET), which measures the temporal separation between two users occupying the same conflict area, was used to assess the severity of these interactions and is calculated only when both users pass through the same conflict point. Based on 24-hour video observations at the Rockville Pike (MD 355) & Congressional Lane intersection, a total of 151 near-miss events were identified, as summarized in Table 152. Of these, 55 involved vehicle-to-vehicle conflicts, 92 involved vehicle-to-pedestrian conflicts, and four (4) involved vehicle-to-bicyclist conflicts, indicating that pedestrians were the most affected group. As shown in the table, most (122) observed conflicts fall within the 2–3 second PET range. A PET of less than 2 seconds is generally considered indicative of higher-risk interactions; 29 conflicts fall within this range at the intersection. Notably, most of these higher-risk conflicts (25 out of 29) involved pedestrians or bicyclists, indicating elevated conflict severity for vulnerable road users at the intersection.

Table 152. Summary of Near Misses for a Day (24-hours) at Intersection #20 - Rockville Pike (MD 355) & Congressional Lane

| Post Encroachment Time (PET) | Vehicle-Vehicle | Vehicle-Pedestrian | Vehicle-Bicyclist | Total |
|------------------------------|-----------------|--------------------|-------------------|------------|
| 0.0 - 1.5s | 0 | 9 | 0 | 9 |
| 1.5 - 2.0s | 4 | 14 | 2 | 20 |
| 2.0 - 3.0s | 51 | 69 | 2 | 122 |
| Total | 55 | 92 | 4 | 151 |

Based on video analysis of near-miss events, Table 153 summarizes the most frequent conflict types observed at the intersection. The highest number of conflicts (40) occurred between northbound left-turning vehicles and southbound through vehicles. The next two most frequent conflicts involved pedestrians on the north leg interacting with southbound right-turning vehicles. When combined, these pedestrian-related conflicts account for 38 conflicts, indicating a heightened risk for pedestrians at the north leg crosswalk. In addition, conflicts involving left-turning vehicles indicate that left-turn movements are a notable safety concern at the intersection.

Table 153. Top Three Conflict Types by Movements based on Near Miss Video Analysis at Intersection #20 - Rockville Pike (MD 355) & Congressional Lane.

| Conflict Rank | Movement 1 | Movement 2 | Conflicts |
|---------------|----------------------|----------------------|-----------|
| 1. | Northbound Left | Southbound Through | 40 |
| 2. | North Leg Pedestrian | Southbound Right | 21 |
| 3. | Southbound Right | North Leg Pedestrian | 17 |

EXISTING TRAFFIC OPERATIONS

Table 154 shows the results of traffic operations analysis for this intersection based on existing lane configurations, peak-hour traffic volumes, and signal timing parameters. Drivers on the eastbound and westbound approaches experience moderate delays during both the AM and PM peak hours.

Table 154. Results of Traffic Operation Analysis at Intersection #20 - Rockville Pike (MD 355) & Congressional Lane

| Approach | Movement | Weekday AM Peak Hour | | | Weekday PM Peak Hour | | |
|-----------------------------|-------------------------|----------------------|----------|----------------------------|----------------------|----------|----------------------------|
| | | Delay (sec) | LOS | 95th Percentile Queue (ft) | Delay (sec) | LOS | 95th Percentile Queue (ft) |
| Eastbound | Eastbound Left | 69.1 | E | 145 | 69.3 | E | 178 |
| | Eastbound Through | 62.6 | E | 75 | 60.7 | E | 80 |
| | Overall Approach | 66.6 | E | | 66.4 | E | |
| Westbound | Westbound Through | 75.2 | E | 116 | 71.6 | E | 142 |
| | Westbound Right | 66.0 | E | 0 | 62.8 | E | 0 |
| | Overall Approach | 73.1 | E | | 70.6 | E | |
| Northbound | Northbound Left | 10.0 | A | 63 | 13.4 | B | 81 |
| | Northbound Through | 12.1 | B | 266 | 18.2 | B | 507 |
| | Overall Approach | 11.9 | B | | 17.9 | B | |
| Southbound | Southbound Left | 8.8 | A | 26 | 14.8 | B | 42 |
| | Southbound Through | 14.6 | B | 358 | 19.2 | B | 426 |
| | Southbound Right | 11.1 | B | 34 | 14.7 | B | 42 |
| | Overall Approach | 14.1 | B | | 18.6 | B | |
| Overall Intersection | | 20.0 | B | | 24.2 | C | |

LOS = Level of Service

= 95th percentile volume exceeds capacity, queue may be longer

SITE VISIT OBSERVATIONS

A site visit was conducted on April 28, 2026 to document existing conditions for people walking, people biking, and drivers. Photos from the site visit are included in Appendix F and in Figure 131, Figure 132, and Figure 133. The team observed outdated pedestrian signal heads, high-speed southbound right turns on the slip lane, and a lack of ADA-compliant curb ramps.

Figure 131. Missing pedestrian push button at Intersection #20 - Rockville Pike (MD 355) & Congressional Lane



Figure 132. Missing ADA-compliant curb ramps at Intersection #20 - Rockville Pike (MD 355) & Congressional Lane



Figure 133. Slip lane at Intersection #20 - Rockville Pike (MD 355) & Congressional Lane



IDENTIFIED SAFETY ISSUES

Key safety issues and other findings are shown in Table 155 and described below.

Table 155. Key Safety Issues for Intersection #20 - Rockville Pike (MD 355) & Congressional Lane

| Issue ID | Safety Issue | Safety Issue Type | Crash Data | Near-Miss Video | Site Visit |
|----------|--|--|------------|-----------------|------------|
| 20-A | There are no pedestrian push buttons to cross the minor approaches. The crosswalk on the westbound approach is missing pedestrian signal heads. The pedestrian signal heads are outdated at this intersection. | 5.1 Pedestrian: Intersection Crossing | | | ✓ |
| 20-B | Northbound and southbound permissive left-turning vehicles conflict with multiple lanes of high-speed through traffic. There is a high frequency of crashes between northbound left-turning and southbound through drivers. | 2 Conflicts Between Users | ✓ | ✓ | ✓ |
| 20-C | There is a slip lane on the northwest corner that allows drivers to perform high-speed right turns that conflict with crossing pedestrians. | 3 Roadway Design | | ✓ | ✓ |
| 20-D | Nearly all of the pedestrian curb ramps at this intersection are missing detectable warning surfaces. | 4.1 Accessibility (ADA): Insufficient Curb Ramps | | | ✓ |
| 20-E | There is not a crosswalk on the northbound approach. | 5.1 Pedestrian: Intersection Crossing | | | ✓ |
| 20-F | The traffic signal heads are suspended by spanwires, which are not as visible and sometimes sway in the wind. | 7.3 User Behavior: Driver Awareness | | | ✓ |

Bold indicates a priority safety issue.

Recommendations

SHORT-TERM RECOMMENDATIONS

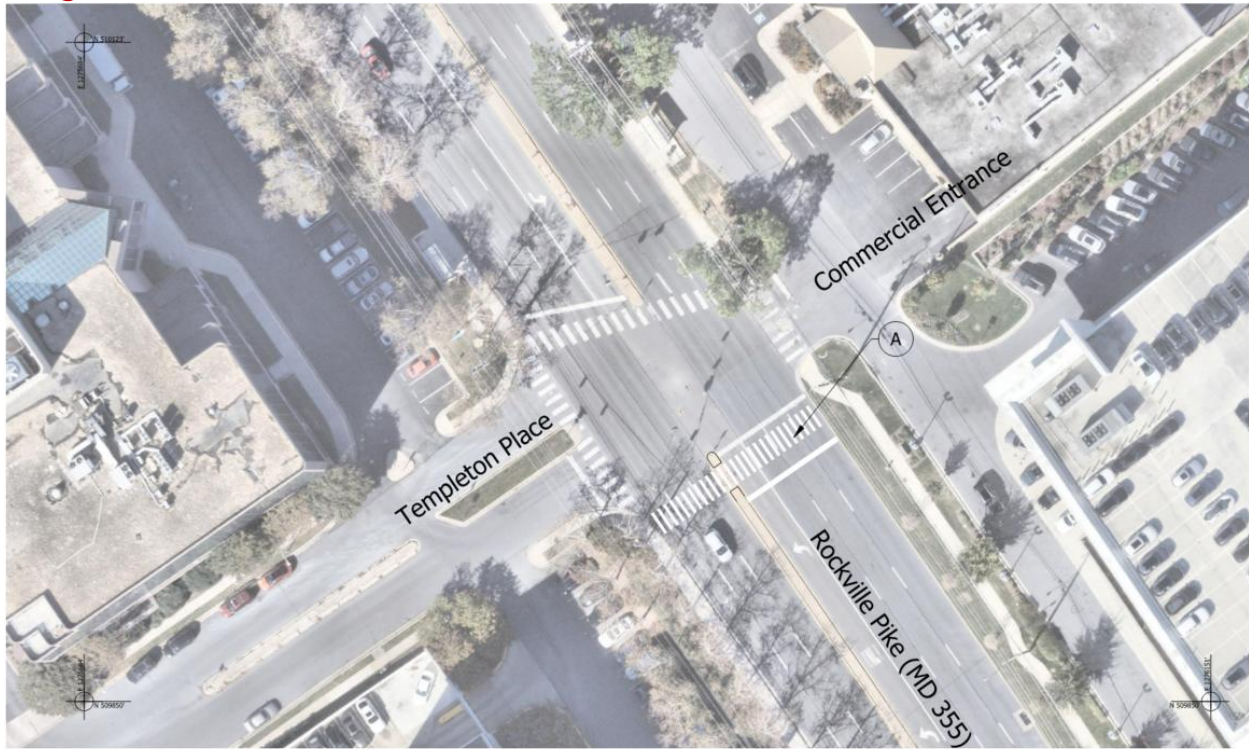
There are no proposed short-term, quick-build improvements for the Rockville Pike (MD 355) & Congressional Lane intersection.

LONG-TERM RECOMMENDATIONS

Figure 134 illustrates the proposed long-term capital improvements for the Rockville Pike (MD 355) & Congressional Lane intersection. The long-term concept focuses on increasing

safety for people walking, updating signal locations to be mounted on mast arms, and removing the southbound slip lane.

Figure 134. Long-Term Recommendations for Intersection #20 - Rockville Pike (MD 355) & Congressional Lane



LEGEND

- A** High-visibility continental crosswalk with stop bar, curb ramps, and median cut-through

Key elements of the long-term recommendations are included in Table 156.

Table 156. Long-Term Recommendations for Intersection #20 - Rockville Pike (MD 355) & Congressional Lane

| Rec. ID | Recommendation | Safety issue(s) addressed |
|---------|--|---------------------------|
| 20-L-1 | Explore feasibility of installing all pedestrian curb ramps to include detectable warning surfaces. | 20-D |
| 20-L-2 | Install up-to-date pedestrian signal heads and push buttons on all approaches with crosswalks. | 20-A |
| 20-L-3 | In future projects, adjust the traffic signals at this intersection to be mounted on mast arms instead of span wires. | 20-F |
| 20-L-4 | Consider reconstructing the northwest corner by closing the existing slip lane, removing the exclusive right-turn lane, and adjusting the curb radius while still accommodating necessary heavy-vehicle turning movements. | 20-C |

#21 - ROCKVILLE PIKE (MD 355) & VEIRS MILL ROAD (MD 28)

Existing Conditions

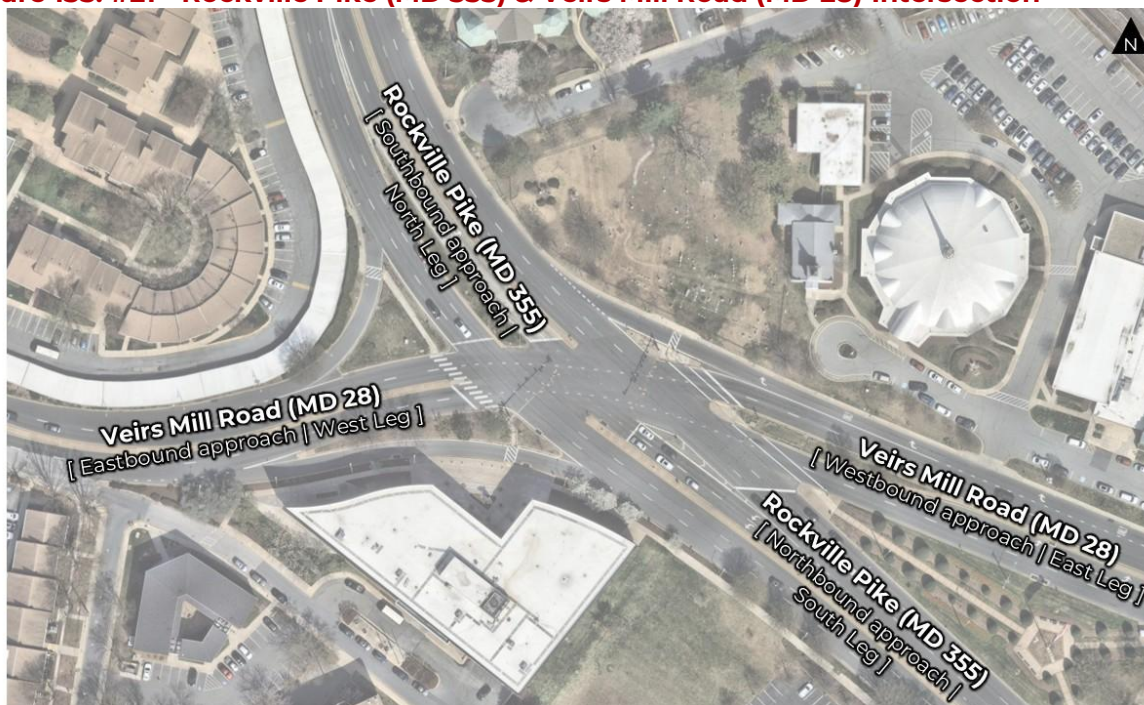
INTERSECTION DESCRIPTION

The intersection of Rockville Pike (MD 355) & Veirs Mill Road (MD 28) is shown in Figure 135. Rockville Pike is classified as a principal arterial with a speed limit of 30 MPH and six lanes in addition to two designated northbound left-turn lanes and two designated southbound left-turn lanes. Rockville Pike also includes a slip lane on the southbound approach. Veirs Mill Road is classified as a principal arterial with a speed limit of 30 MPH, four lanes, a slip lane on the eastbound approach, and a slip lane on the westbound approach³. The intersection is signalized. In 2024, Annual Average Daily Traffic (AADT) on Rockville Pike was 48,215 and 23,810 on Veirs Mill Road¹.

According to the Rockville Comprehensive Land Use Policy Map², land use to the south and west of the intersection is "Office, Commercial and Residential Mix," immediately to the southeast is "Exempt Commercial" containing a small pocket park, and immediately to the northeast is "Exempt Commercial" containing a private school, church, and cemetery. The Rockville MetroRail station is one block north of the intersection and there is one RideOn bus stop south of the intersection serving routes 46 and 81 southbound. There are sidewalks on all legs of the intersection, and crosswalks on the east and west legs. There are no crosswalks on the north and south legs.

MCDOT is expanding their BRT service and Rockville Pike is included in the project. The plan includes the installation of a transit signal to improve transit travel along the corridor.

Figure 135. #21 - Rockville Pike (MD 355) & Veirs Mill Road (MD 28) Intersection



SAFETY REVIEW

A total of 58 crashes were recorded at the intersection during the three-year period from 2022 to 2024. The reported crashes primarily involved automobiles, with one (1) pedestrian-related crash and no cyclist-related crashes. Most of the crashes resulted in property-damage-only (PDO) outcomes, with 13 minor injury crashes, 10 possible injury crashes, and one (1) serious injury crash reported over the study period.

Table 157 summarizes the crash characteristics, including collision types, lighting conditions, and roadway surface conditions.

Table 157. Summary of Three-Year (2022-24) Crashes at Intersection #21 - Rockville Pike (MD 355) & Veirs Mill Road (MD 28)

| Total Crashes | Total Crashes by Year | | | Total Crashes by User | | |
|---------------|-----------------------|------|------|-----------------------|---------|------------|
| 58 | 2022 | 2023 | 2024 | Auto | Cyclist | Pedestrian |
| | | 18 | 15 | 25 | 57 | 0 |

| Total Crashes by Severity | | | | |
|---------------------------|---------|-------|-----------------|-----------------|
| Fatal | Serious | Minor | Possible Injury | Property Damage |
| 0 | 1 | 13 | 10 | 34 |

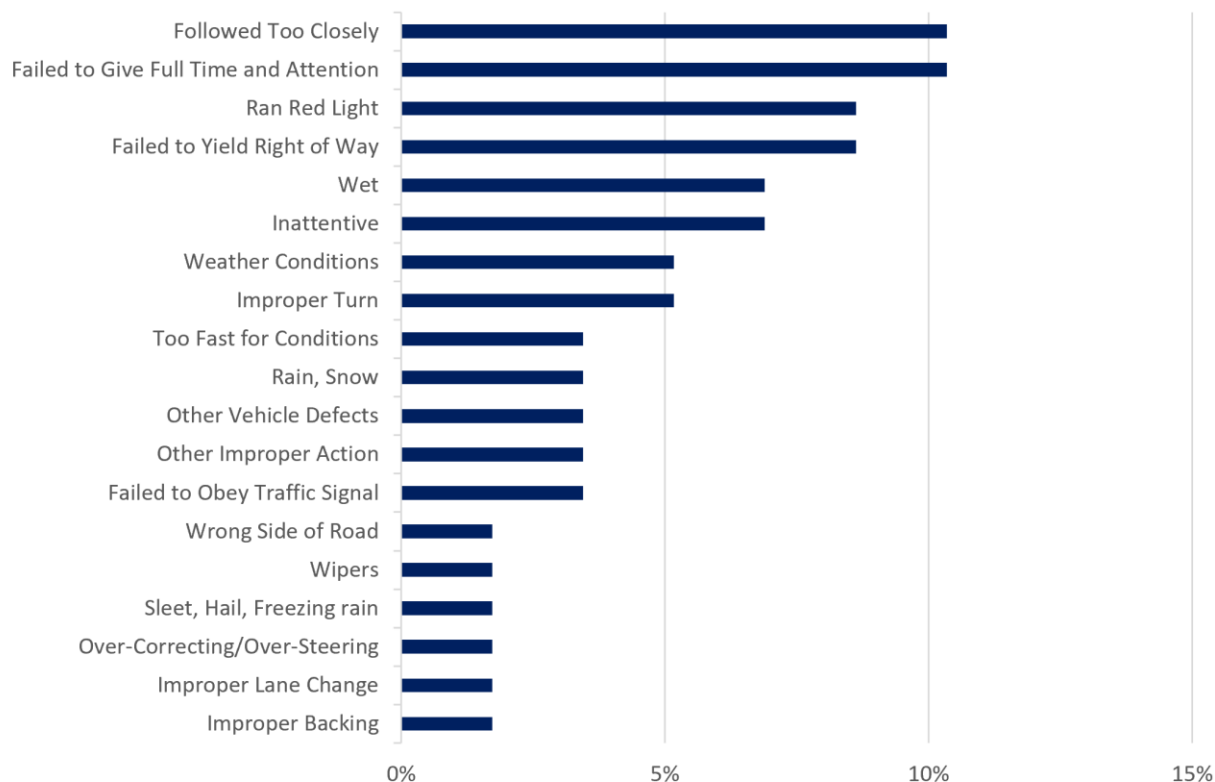
| Total Crashes by Collision Type | | | | | | | | | |
|---------------------------------|-------|---------------|----------------|-------|-------------------|---------------------------|---------------------------|--------------------------|---------|
| Rear End | Angle | Front to Rear | Single Vehicle | Other | Head On Left Turn | Same Direction Right Turn | Sideswipe, Same Direction | Angle Meets Left Head On | Unknown |
| 15 | 14 | 10 | 5 | 4 | 3 | 3 | 2 | 1 | 1 |

| Lighting Conditions | | | Road Surface | | |
|---------------------|----------------|------|--------------|-----|---------|
| Daylight | Dark Lights On | Dawn | Dry | Wet | Unknown |
| 37 | 17 | 4 | 42 | 12 | 4 |

Note: Crash summaries are based on the available crash data reviewed for this study. Reported crash totals and locations may vary across source datasets due to differences in reporting methods, geocoding, and intersection buffers.

Figure 136 illustrates the percentage of crashes accounting for each contributing circumstance associated with crashes at the intersection during the 2022–2024 study period. A single crash may involve multiple contributing circumstances, as documented in the crash reports. As shown in the figure, most contributing circumstances were related to driver behavior, with the most common being following too closely and failure to give full time and attention, followed by running red lights and failure to yield right-of-way. Other contributing factors included wet roadway conditions, inattentive driving, and other weather-related conditions, as well as additional driver-related behaviors such as improper turning, speeding for conditions, and failure to obey traffic control devices, each occurring less frequently.

Figure 136. Percentage of Crashes Accounting for Each Contributing Circumstance at Intersection #21 - Rockville Pike (MD 355) & Veirs Mill Road (MD 28)



NEAR-MISS VIDEO ANALYSIS

Post-Encroachment Time (PET), which measures the temporal separation between two users occupying the same conflict area, was used to assess the severity of these interactions and is calculated only when both users pass through the same conflict point. Based on 24-hour video observations at the intersection, a total of six (6) near-miss events were identified, including 1 vehicle-to-vehicle conflict, 4 vehicle-to-pedestrian conflicts, and 1 vehicle-to-bicyclist conflict, indicating that pedestrians were the most affected group as shown in Table 158. Most (4) observed conflicts fall within the 2.0–3.0 second PET range. Conflicts with a PET of less than 2 seconds are generally considered indicative of a higher risk of crash. Although few in number, all of these higher-risk conflicts (2) involved pedestrians, highlighting elevated conflict severity for vulnerable road users at the intersection.

Table 158. Summary of Near Misses for a Day (24-hours) at Intersection #21 - Rockville Pike (MD 355) & Veirs Mill Road (MD 28)

| Post Encroachment Time (PET) | Vehicle-Vehicle | Vehicle-Pedestrian | Vehicle-Bicyclist | Total |
|------------------------------|-----------------|--------------------|-------------------|----------|
| 0.0 - 1.5s | 0 | 1 | 0 | 1 |
| 1.5 - 2.0s | 0 | 1 | 0 | 1 |
| 2.0 - 3.0s | 1 | 2 | 1 | 4 |
| Total | 1 | 4 | 1 | 6 |

Based on video analysis of near-miss events, Table 159 summarizes the most frequent conflict types observed at the intersection. The highest number of conflicts (2) occurred between north leg (NL) pedestrians and southbound left-turning vehicles. The next two most frequent conflicts involved southbound left-turning vehicles interacting with east leg (EL) bicyclists, and west leg (WL) pedestrians interacting with eastbound right-turning vehicles, each with 1 conflict. Although few in number, all of the top conflicts involve vulnerable road users. In addition, the presence of conflicts involving turning vehicles suggests that turning movements are also a notable safety concern at the intersection.

Table 159. Top Three Conflict Types by Movements based on Near Miss Video Analysis at Intersection #21 - Rockville Pike (MD 355) & Veirs Mill Road (MD 28).

| Conflict Rank | Movement 1 | Movement 2 | Conflicts |
|---------------|----------------------|------------------|-----------|
| 1. | North Leg Pedestrian | Southbound Left | 2 |
| 2. | Southbound Left | East Leg Bicycle | 1 |
| 3. | West Leg Pedestrian | Eastbound Right | 1 |

EXISTING TRAFFIC OPERATIONS

Table 160 shows the results of traffic operations analysis for this intersection based on existing lane configurations, peak-hour traffic volumes, and signal timing parameters. Drivers experience moderate delays at this intersection. Westbound-through-moving drivers experience the highest delays.

Table 160. Results of Traffic Operation Analysis at Intersection #21 - Rockville Pike (MD 355) & Veirs Mill Road (MD 28)

| Approach | Movement | Weekday AM Peak Hour | | | Weekday PM Peak Hour | | |
|-----------------------------|-------------------------|----------------------|----------|----------------------------|----------------------|----------|----------------------------|
| | | Delay (sec) | LOS | 95th Percentile Queue (ft) | Delay (sec) | LOS | 95th Percentile Queue (ft) |
| Eastbound | Eastbound Through | 49.5 | D | 190 | 65.4 | E | 345 |
| | Eastbound Right | 50.7 | D | 207 | 51.1 | D | 85 |
| | Overall Approach | 50.1 | D | | 60.1 | E | |
| Westbound | Westbound Through | 62.1 | E | 401 | 61.2 | E | 311 |
| | Westbound Right | 48.3 | D | 100 | 52.7 | D | 131 |
| | Overall Approach | 56.6 | E | | 57.5 | E | |
| Northbound | Northbound Left | 88.9 | F | 117 | 77.1 | E | 135 |
| | Northbound Through | 32.4 | C | 145 | 22.8 | C | 284 |
| | Overall Approach | 44.1 | D | | 33.1 | C | |
| Southbound | Southbound Left | 43.8 | D | 175 | 66.5 | E | 314 |
| | Southbound Through | 23.7 | C | 374 | 21.5 | C | 242 |
| | Southbound Right | 17.7 | B | 21 | 18.0 | B | 14 |
| | Overall Approach | 27.1 | C | | 36.6 | D | |
| Overall Intersection | | 41.5 | D | | 44.0 | D | |

LOS = Level of Service

= 95th percentile volume exceeds capacity, queue may be longer

SITE VISIT OBSERVATIONS

A site visit was conducted on May 12, 2026. The intersection was observed to be particularly active with high volumes of motorists, pedestrians, and the presence of bicyclists, and its proximity to a Metrorail station located approximately one block to the north. Pedestrian activity was observed moving north to south, particularly along the west side of the intersection. Additional observations include one instance of a pedestrian crossing the south leg without a marked crosswalk through northbound traffic, suggesting a potential unmet desire line.

The visibility of crosswalks was limited for vehicles entering from the southbound and eastbound slip lanes, while pedestrian push buttons on the east leg were faded and incorrectly configured, reducing usability. Crosswalk markings were inconsistent, including missing high-visibility markings on the east leg and absent transverse lines on the west leg, and the east leg crossing distance was observed to be relatively long, increasing pedestrian

exposure. The pedestrian refuge island between the slip lanes was also narrow, limiting its effectiveness as a safe waiting area. Additionally, an ADA-related maintenance issue was identified at the brick curb ramp along the eastbound slip lane, where missing bricks create an uneven surface and reduce accessibility.

The site visit also documented several issues related to pavement markings, signage, and accessibility that may affect overall safety and operational clarity. Pavement markings were incomplete or missing in key locations, including the absence of “shark teeth” at the southbound slip lane to indicate a controlled merge condition, as well as incomplete pavement markings for certain turn movements. Inconsistencies in lane-use markings were observed, including missing “puppy track” markings for northbound and southbound left-turn lanes. Signage deficiencies included missing “No Merge Area” signs at the westbound slip lane and “Yield” signs that were partially obscured by vegetation, limiting visibility for approaching drivers.

Photos in Appendix F and in Figure 137, Figure 138, and Figure 139 document site visit observations.

Figure 137. Faded pedestrian crosswalks along the eastbound, westbound, and southbound (show below) approach slip lanes with poor visibility of crosswalks from approach #21 - Rockville Pike (MD 355) & Veirs Mill Road (MD 28)



Figure 138. Long pedestrian crosswalk along the west leg with faded pavement markings, lacking high visibility design, and crosswalk signals difficult to see across long distance #21 - Rockville Pike (MD 355) & Veirs Mill Road (MD 28)



Figure 139. Lack of No Merge Area signs on westbound approach slip lane #21 - Rockville Pike (MD 355) & Veirs Mill Road (MD 28)



IDENTIFIED SAFETY ISSUES

Key safety issues and other findings are shown in Table 161 and described below.

Table 161. Key Safety Issues for Intersection #21 - Rockville Pike (MD 355) & Veirs Mill Road (MD 28)

| Issue ID | Safety Issue | Safety Issue Type | Crash Data | Near-Miss Video | Site Visit |
|----------|---|---|------------|-----------------|------------|
| 21-A | Vehicles from all approaches, especially northbound and southbound vehicles, traveling at high speeds likely above the posted 30 MPH | 1.1 Speeds, Severity, and Compliance: High Vehicle Speeds | | | ✓ |
| 21-B | Vehicles entering the southbound, eastbound, and westbound slip lanes at high speeds | 1.2 Speeds, Severity, and Compliance: High-Speed Turns | | | ✓ |
| 21-C | Drivers exiting westbound slip lane must look over shoulder behind to yield to northbound through vehicles | 7.4 User Behavior: Driver Yielding | | | ✓ |
| 21-D | One pedestrian crash from 2022 to 2024 | 2.2 Conflicts Between Users: Drivers and Pedestrians | ✓ | | |

| Issue ID | Safety Issue | Safety Issue Type | Crash Data | Near-Miss Video | Site Visit |
|-------------|--|---|------------|-----------------|------------|
| 21-E | Fifteen instances of same direction rear end crashes and ten instances of front to rear crashes from 2022 to 2024 | 8.1 Conflict Type: Rear End | ✓ | | |
| 21-F | Three instances of head on left turn crashes from 2022 to 2024 | 8.2 Conflict Type: Opposite Direction | ✓ | | |
| 21-G | Fourteen instances of angle crashes from 2022 to 2024 | 8.5 Conflict Type: Angle | ✓ | | |
| 21-H | Two instances of same direction sideswipe crashes and three instances of same direction right turn crashes | 8.3 Conflict Type: Sideswipe | ✓ | | |
| 21-I | One pedestrian observed crossing the south leg without a crosswalk through northbound through traffic | 2.2 Conflicts Between Users: Drivers and Pedestrians | | | ✓ |
| 21-J | Poor visibility of crosswalk for vehicles entering the southbound and eastbound slip lanes | 3.2 Roadway Design: Pedestrian Visibility | | | ✓ |
| 21-K | Brick curb ramp at eastbound slip lane missing bricks | 4.1 Accessibility (ADA): Insufficient Curb Ramps | | | ✓ |
| 21-L | East leg crosswalk lacking high visibility pattern | 5.1 Pedestrian: Intersection Crossing | | | ✓ |
| 21-M | East leg crosswalk pedestrian push buttons faded and configured the wrong direction | 5.1 Pedestrian: Intersection Crossing | | | ✓ |
| 21-N | West leg crosswalk is long and lacks transverse lines | 5.1.1 Pedestrian: Intersection Crossing (Long Crossing) | | | ✓ |
| 21-O | Difficult to see pedestrian signals on from opposite end of east leg crosswalk | 5.1.1 Pedestrian: Intersection Crossing (Long Crossing) | | | ✓ |
| 21-P | Narrow pedestrian refuge between westbound slip lane and eastbound through | 5.3 Pedestrian: Low-Comfort Facility | | | ✓ |
| 21-Q | Southbound slip lane lacks shark teeth to indicate limited merge area | 3 Roadway Design | | | ✓ |
| 21-R | There are puppy tracks for eastbound and westbound through lanes, but none for northbound and southbound left turn lanes (two in each direction) | 3 Roadway Design | | | ✓ |
| 21-S | Westbound slip lane lacks "No Merge Area" signs; "Yield" signs obscured by trees | 3 Roadway Design | | | ✓ |
| 21-T | Eastbound and westbound approach medians lack object markers | 3.4 Roadway Design: Night Time Visibility | | | |
| 21-U | There are no crosswalks for pedestrians to cross Rockville Pike | 5.1 Pedestrian: Intersection Crossing | | | ✓ |

Bold indicates a priority safety issue.

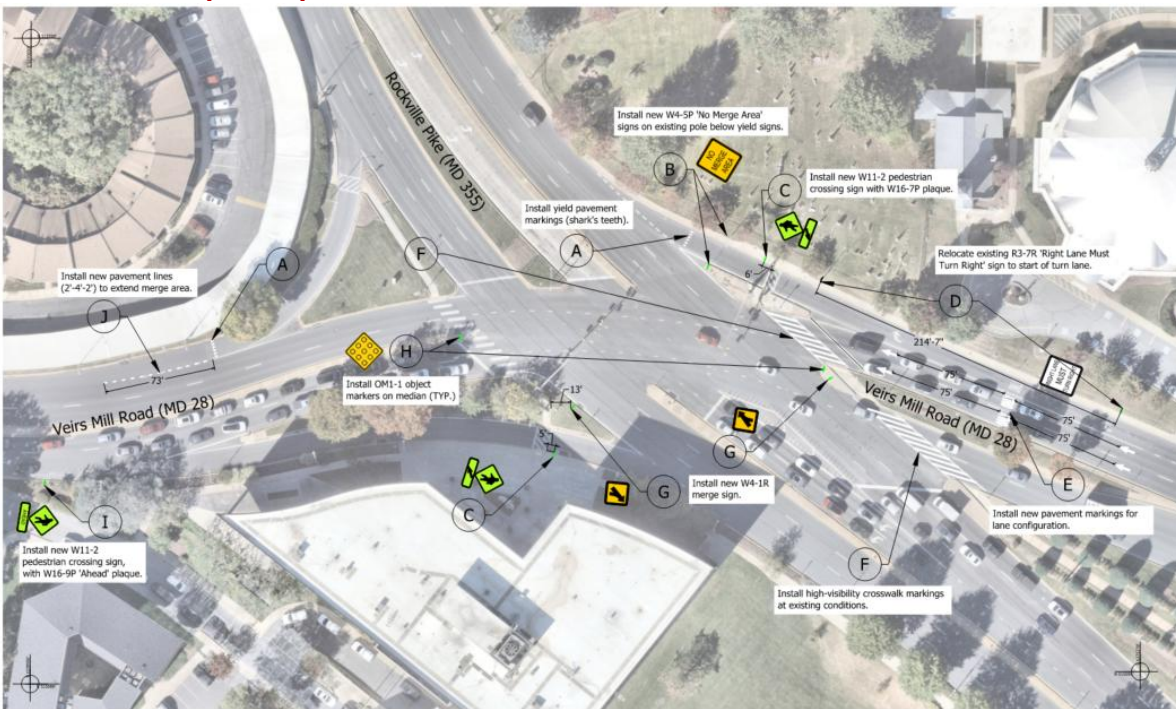
Recommendations

SHORT-TERM RECOMMENDATIONS

Figure 140 illustrates the proposed short-term, quick-build improvements for the Rockville Pike (MD 355) & Veirs Mill Road (MD 28) intersection, with additional detail provided in Table 162.

These recommendations rely on low-cost, implementable treatments (signing, striping, and delineation) to reduce driver uncertainty, improve yielding compliance, and make pedestrian crossings more visible and predictable.

Figure 140. Short-Term Recommendations for Intersection #21 - Rockville Pike (MD 355) & Veirs Mill Road (MD 28)



LEGEND

- | | | | |
|---|---|---|---|
| A Proposed yield pavement markings. See Detail D. | D Relocate existing right turn sign (R3-7R): 30" x 30" | G Proposed merge sign (W4-1R): 36" x 36" | J Proposed merge pavement markings |
| B Proposed No Merge Area sign (W4-5P): 36" x 36" | E Proposed lane configuration markings | H Proposed object markers (OM1-1): 18" x 18" | |
| C Proposed pedestrian sign (W11-2): 24" x 24" and arrow plaque (W16-7P): 24" x 12" | F Proposed crosswalk markings. See Detail A. | I Proposed pedestrian sign (W11-2): 24" x 24" and Ahead plaque (W16-9P): 24" x 12" | |

Table 162. Short-Term Recommendations for Intersection #21 - Rockville Pike (MD 355) & Veirs Mill Road (MD 28)

| Rec. ID | Recommendation | Safety issue(s) addressed |
|---------|--|---------------------------|
| 21-S-1 | Install Merge (W4-1) sign for vehicles on the eastbound slip lane merge area with southbound traffic | 21-B, 21-G |
| 21-S-2 | Install shark's tooth pavement marking at the southbound slip lane merge area with westbound traffic | 21-B, 21-Q |
| 21-S-3 | Install the 2'-4'-2' dotted lane line to extend the merge area longer on the southbound slip lane merge area with westbound traffic | 21-Q |
| 21-S-4 | Install a pedestrian sign with an AHEAD plaque around the off-ramp corner at the start of the eastbound slip lane | 21-J |
| 21-S-5 | Install pedestrian warning (W11-2) sign with Downward Arrow (W16-7P) plaque at pedestrian crosswalks on eastbound and westbound slip lanes | 21-B, 21-J |
| 21-S-6 | Install object markers on the medians of the eastbound and westbound legs | 21-T |
| 21-S-7 | Install Merge (W4-1) sign on the median for northbound traffic on MD-355 | 21-A, 21-B, 21-C |
| 21-S-8 | Upgrade east leg crosswalks to high visibility | 21-B, 21-L |
| 21-S-9 | Install through arrow and ONLY letter pavement markings for lane configurations | 21-H |
| 21-S-10 | Relocate the Right Lane Must Turn Right (R3-7R) sign to upstream (where the solid lane line starts) on westbound slip lane | 21-B, 21-E |
| 21-S-11 | Install No Merge Area (W4-5P) plaques below existing yield signs on westbound slip lane | 21-B, 21-E, 21-G |
| 21-S-12 | Install shark's tooth pavement marking at the westbound slip lane merge area with northbound traffic | 21-B, 21-E, 21-G |

COST ESTIMATE

Table 163 provides a planning-level cost estimate for the short-term recommendations, based on item quantities and recent Maryland SHA price index sheets, and excludes contingency and mobilization.

Table 163. Planning-Level Cost Estimate at Intersection #21 - Rockville Pike (MD 355) & Veirs Mill Road (MD 28)

| Item | Description | Unit | Unit Cost | Quantity | Cost |
|------------------|--|------|-----------|----------|--------------------|
| Pavement Marking | 12" Crosswalk | LF | \$6.19 | 450 | \$2,784.64 |
| Pavement Marking | 5" dashed marking (white) | LF | \$1.75 | 30 | \$52.50 |
| Pavement Marking | Yield (sharks teeth) marking | LF | \$60.49 | 12 | \$725.83 |
| Pavement Marking | Straight arrow marking | EACH | \$157.85 | 4 | \$631.39 |
| Pavement Marking | ONLY' marking (letter) | EACH | \$375.23 | 2 | \$750.46 |
| Sign | New sign post | EACH | \$193.76 | 6 | \$1,162.56 |
| Sign | Relocate sign post | EACH | \$79.54 | 1 | \$79.54 |
| Sign | Merge sign [W4-1R] | EACH | \$720.00 | 2 | \$1,440.00 |
| Sign | Advance Pedestrian Warning sign [W11-2] | EACH | \$180.00 | 3 | \$540.00 |
| Sign | 'Ahead' plaque (under school zone sign) [W16-9P] | EACH | \$160.00 | 1 | \$160.00 |
| Sign | Directional downward arrow plaque [W16-7p] | EACH | \$160.00 | 2 | \$320.00 |
| Sign | Object marker sign [OM1-3] | EACH | \$180.00 | 2 | \$360.00 |
| Sign | No Merge Area' sign [W4-5P] | EACH | \$720.00 | 2 | \$1,440.00 |
| Total: | | | | | \$10,446.93 |

LONG-TERM RECOMMENDATIONS

The long-term concept focuses on improving safety for people walking by adding high-visibility crosswalks, a pedestrian refuge island, and pedestrian signal heads. Improvements also removing slip lanes and adding merge lanes (Table 164). illustrates the proposed long-term capital improvements for the Rockville Pike (MD 355) & Veirs Mill Road (MD 28) intersection. The long-term concept focuses on improving safety for people walking by adding high-visibility crosswalks, a pedestrian refuge island, and pedestrian signal heads. Improvements also removing slip lanes and adding merge lanes (Table 164).

Figure 141. Long-Term Recommendations for Intersection #21 - Rockville Pike (MD 355) & Veirs Mill Road (MD 28)



LEGEND

- | | | |
|---|---|---|
| A Reconstruct corners to have a merge lane from VMR to MD-355 | C Reconstruct the corner, shrink median and close RT slip lane | E Install high-visibility crosswalk and refuge island on median with adjusted stop lines marking |
| B Reconstruct the corner, shrink median and close RT slip lane | D Extend median to accommodate refuge island | F Reconstruct the corner, shrink median and close RT slip lane |

Table 164. Long-Term Recommendations for Intersection #21 - Rockville Pike (MD 355) & Veirs Mill Road (MD 28)

| Rec. ID | Recommendation | Safety issue(s) addressed |
|---------|--|---------------------------|
| 21-L-1 | Consider installing a high-visibility crosswalk on the north leg paired with a pedestrian refuge island on the existing median island. | 21-I, 21-U |
| 21-L-2 | Consider reconstructing the southwest corner to make it a regular right-turn lane intersection, including shrinking the median and closing the right-turn slip lane. | 21-B, 21-J |
| 21-L-3 | Consider extending the median for a pedestrian refuge island on the west leg. | 21-N |
| 21-L-4 | Consider installing pedestrian signal heads on the median for both directions on the east leg. | 21-O |
| 21-L-5 | Reconstruct the northeast corner to make it a regular right-turn lane intersection, including shrinking the median and closing the right-turn slip lane | 21-B, 21-C, 21-E |
| 21-L-6 | Consider extending the all-red time to minimize left-turn conflicts between southbound through vehicles and northbound left-turn vehicles. | 21-F |
| 21-L-7 | Consider reconstructing the northeast corner to have a merge lane for traffic from Veirs Mills Road westbound to Rockville Pike northbound. | 21-B, 21-C, 21-E |

#22 - FIRST STREET (MD 28) & BALTIMORE ROAD

Existing Conditions

INTERSECTION DESCRIPTION

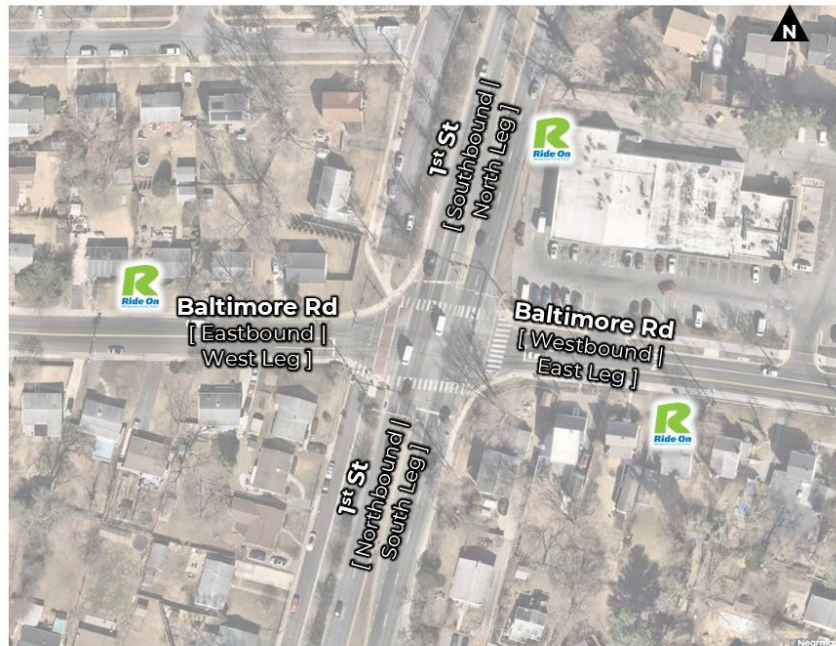
The intersection of First Street (MD 28) & Baltimore Road is shown in Figure 142. First Street is classified as a principal arterial with a speed limit of 40 MPH and four lanes in addition to one designated northbound left-turn lane and one designated southbound left-turn lane.

Baltimore Road is classified as a major collector with a speed limit of 25 MPH, two lanes, and a designated left-turn lane on the westbound approach³. The intersection is signalized. In 2024, Annual Average Daily Traffic (AADT) on First Street was 32,320 and 8,241 on Baltimore Road¹.

According to the Rockville Comprehensive Land Use Policy Map², land use immediately to the northwest, southwest, and southeast of the intersection is "Residential Detached," while immediately to the northeast is "Commercial and Residential Mix," containing a shopping center. There are two RideOn bus stops north of the intersection serving routes 49 and 52 and two RideOn bus stops west of the intersection serving route 45. There are sidewalks and crosswalks on all legs of the intersection.

The City of Rockville recently completed improvements along Baltimore Road. At the intersection of First Street (MD 28) and Baltimore road accessible pedestrian signal push-buttons and countdown pedestrian signals were added. The sidewalk north of Baltimore road was realigned and part of the existing sidewalk on the southeastern leg of the intersection was removed.

Figure 142. #22 - First Street (MD 28) & Baltimore Road Intersection



SAFETY REVIEW

A total of 15 crashes were recorded at the intersection during the three-year period from 2022 to 2024. The reported crashes primarily involved automobiles, with two (2) pedestrian-related crashes and no cyclist-related crashes. Most of the crashes resulted in property-damage-only (PDO) outcomes, with three (3) minor injury crashes and two (2) possible injury crashes reported over the study period.

Table 165 summarizes the crash characteristics, including collision types, lighting conditions, and roadway surface conditions.

Table 165. Summary of Three-Year (2022-24) Crashes at Intersection #22 - First Street (MD 28) & Baltimore Road

| Total Crashes | Total Crashes by Year | | | Total Crashes by User | | |
|---------------|-----------------------|------|------|-----------------------|---------|------------|
| 15 | 2022 | 2023 | 2024 | Auto | Cyclist | Pedestrian |
| | | 3 | 7 | 5 | 13 | 0 |

| Total Crashes by Severity | | | | |
|---------------------------|---------|-------|-----------------|-----------------|
| Fatal | Serious | Minor | Possible Injury | Property Damage |
| 0 | 0 | 3 | 2 | 10 |

| Total Crashes by Collision Type | | | | | | | | |
|---------------------------------|-------------------|-------------------------|--------------------------|----------------|----------------|---------------|--------------------------|------------------------------------|
| Angle | Head On Left Turn | Same Direction Rear End | Same Direction Sideswipe | Single Vehicle | Front to Front | Front to Rear | Same Direction Left Turn | Same Direction Rear End Right Turn |
| 3 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 1 |

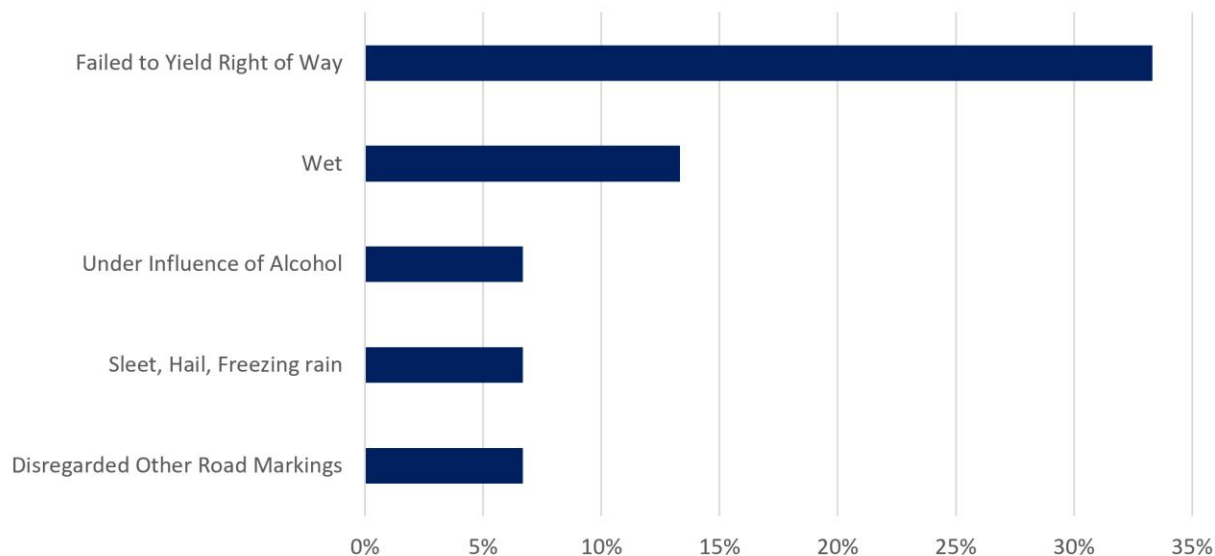
| Lighting | |
|----------|----------------|
| Daylight | Dark Lights On |
| 10 | 5 |

| Road Surface | |
|--------------|-----|
| Dry | Wet |
| 11 | 4 |

Note: Crash summaries are based on the available crash data reviewed for this study. Reported crash totals and locations may vary across source datasets due to differences in reporting methods, geocoding, and intersection buffers.

Figure 143 illustrates the percentage of crashes accounting for each contributing circumstance associated with crashes at the intersection during the 2022–2024 study period. A single crash may involve multiple contributing circumstances, as documented in the crash reports. As shown in the figure, the most common contributing circumstance was failure to yield right-of-way, followed by wet roadway conditions. Other contributing factors included driving under the influence of alcohol, sleet, hail, or freezing rain, and disregarding road markings, each occurring less frequently.

Figure 143. Percentage of Crashes Accounting for Each Contributing Circumstance at Intersection #22 - First Street (MD 28) & Baltimore Road



NEAR-MISS VIDEO ANALYSIS

Post-Encroachment Time (PET), which measures the temporal separation between two users occupying the same conflict area, was used to assess the severity of these interactions and is calculated only when both users pass through the same conflict point. Based on 24-hour video observations at the First Street (MD 28) & Baltimore Road intersection, a total of 102 near-miss events were identified, including 61 vehicle-to-vehicle conflicts, 33 vehicle-to-pedestrian conflicts, and 8 vehicle-to-bicyclist conflicts, as summarized in Table 166. Vehicle-to-vehicle interactions were the most common, though vulnerable road users remain significantly represented. Most (88) observed conflicts fall within the 2.0–3.0 second PET range. Conflicts with a PET of less than 2 seconds are generally considered indicative of a higher risk of crash. A total of 14 conflicts fall within this range at the intersection. Notably, a substantial portion of these higher-risk conflicts (9 out of 14) involved pedestrians or bicyclists, highlighting elevated conflict severity for vulnerable road users at the intersection.

Table 166. Summary of Near Misses for a Day (24-hours) at Intersection #22 - First Street (MD 28) & Baltimore Road

| Post Encroachment Time (PET) | Vehicle-Vehicle | Vehicle-Pedestrian | Vehicle-Bicyclist | Total |
|------------------------------|-----------------|--------------------|-------------------|------------|
| 0.0 - 1.5s | 1 | 1 | 1 | 3 |
| 1.5 - 2.0s | | 5 | 2 | 11 |
| 2.0 - 3.0s | 56 | 27 | 5 | 88 |
| Total | 61 | 33 | 8 | 102 |

Based on video analysis of near-miss events, Table 167 summarizes the most frequent conflict types observed at the intersection. The highest number of conflicts (45) occurred between southbound left-turning vehicles and northbound through vehicles. The next two most frequent conflicts involved north leg (NL) pedestrians interacting with westbound right-turning vehicles (9 conflicts), and northbound left-turning vehicles interacting with southbound through vehicles (8 conflicts). Pedestrian-related conflicts account for nine (9) occurrences, indicating a notable risk for pedestrians at the north leg crosswalk. In addition, the presence of conflicts involving turning vehicles suggests that turning movements are a key safety concern at the intersection.

Table 167. Top Three Conflict Types by Movements based on Near Miss Video Analysis at Intersection #22 - First Street (MD 28) & Baltimore Road.

| Conflict Rank | Movement 1 | Movement 2 | Conflicts |
|---------------|----------------------|--------------------|-----------|
| 1. | Southbound Left | Northbound Through | 45 |
| 2. | North Leg Pedestrian | Westbound Right | 9 |
| 3. | Northbound Left | Southbound Through | 8 |

EXISTING TRAFFIC OPERATIONS

Table 168 shows the results of the traffic operations analysis at the First Street (MD 28) & Baltimore Road intersection based on existing lane configurations, peak-hour traffic volumes, and signal timing parameters. This intersection experiences moderate delays in the AM and PM peaks, particularly on the westbound approach.

Table 168. Results of Traffic Operation Analysis at Intersection #22 - First Street (MD 28) & Baltimore Road

| Approach | Movement | Weekday AM Peak Hour | | | Weekday PM Peak Hour | | |
|-----------------------------|-------------------------|----------------------|----------|----------------------------|----------------------|----------|----------------------------|
| | | Delay (sec) | LOS | 95th Percentile Queue (ft) | Delay (sec) | LOS | 95th Percentile Queue (ft) |
| Eastbound | Eastbound Left | 44.3 | D | 104 | 58.9 | E | 187 |
| | Eastbound Through | 42.4 | D | 124 | 47.6 | D | 146 |
| | Overall Approach | 43.3 | D | | 54.0 | D | |
| Westbound | Westbound Left | 61.0 | E | 167 | 63.9 | E | 95 |
| | Westbound Through | 70.4 | E | 289 | 71.2 | E | 192 |
| | Overall Approach | 67.5 | E | | 69.4 | E | |
| Northbound | Northbound Left | 27.2 | C | 16 | 23.0 | C | 14 |
| | Northbound Through | 33.3 | C | 396 | 57.8 | E | #913 |
| | Overall Approach | 33.2 | C | | 57.5 | E | |
| Southbound | Southbound Left | 15.8 | B | 108 | 37.8 | D | 191 |
| | Southbound Through | 32.8 | C | #1138 | 17.1 | B | 474 |
| | Overall Approach | 31.5 | C | | 19.8 | B | |
| Overall Intersection | | 36.5 | D | | 42.6 | D | |

LOS = Level of Service

= 95th percentile volume exceeds capacity, queue may be longer

SITE VISIT OBSERVATIONS

A site visit was conducted on 5/18/2026 to document existing conditions for people walking, people biking, and people driving. Photos of the site visit are included in Appendix F and in Figure 144 and Figure 145.

During the visit, the team observed that the frontage road entrance near this intersection may present conflicts. Several of the intersection corners have wide radii, which could contribute to higher turning speeds. Three of the left-turn lanes lack 'LEFT TURN ONLY' pavement markings.

Figure 144. Missing turn lane pavement markings at Intersection #22 - First Street (MD 28) & Baltimore Road



Figure 145. Wide curb radius at Intersection #22 - First Street (MD 28) & Baltimore Road



IDENTIFIED SAFETY ISSUES

Key safety issues and other findings are shown in Table 169 and described below.

Table 169. Key Safety Issues for Intersection #22 - First Street (MD 28) & Baltimore Road

| Issue ID | Safety Issue | Safety Issue Type | Crash Data | Near-Miss Video | Site Visit |
|-------------|--|---|------------|-----------------|------------|
| 22-A | The two-lane eastbound approach lacks any 'Left Turn Only' pavement markings, potentially leading to drivers using both lanes as through lanes, even though there is only one receiving lane on the far side. | 2 Conflicts Between Users | ✓ | | ✓ |
| 22-B | Left-turning vehicles must find gaps in two lanes of conflicting traffic on 1st St. | 2 Conflicts Between Users | ✓ | | ✓ |
| 22-C | This intersection is at a slight skew, creating wide curb radii on the northwest and southeast corners, which allow for high-speed right turns. | 3 Roadway Design | | | ✓ |
| 22-D | There are no object markers on the intersection medians. | 8.7 Conflict Type: Fixed Object | | | ✓ |
| 22-E | Landscaping is overgrown in several locations, near this intersection, obstructing sight lines. | 3.1 Roadway Design: Inadequate Sight Distance (Lack of Driver Visibility) | | | ✓ |
| 22-F | There is no sidewalk on the northeast corner leading to the transit stop. | 5.2 Pedestrian: Missing or Inadequate Sidewalk | | | ✓ |
| 22-G | The crosswalk on the west leg is not high-visibility. | 5.1 Pedestrian: Intersection Crossing | | | ✓ |
| 22-H | The frontage road entrance on the southwest corner of this intersection is accessible by via all approaches, presenting opportunities for conflicts between users. | 2 Conflicts Between Users | | | ✓ |
| 22-I | The pedestrian signal heads on the northwest corner are dim and difficult to see in bright sunlight. | 5.1 Pedestrian: Intersection Crossing | | | ✓ |

Bold indicates a priority safety issue.

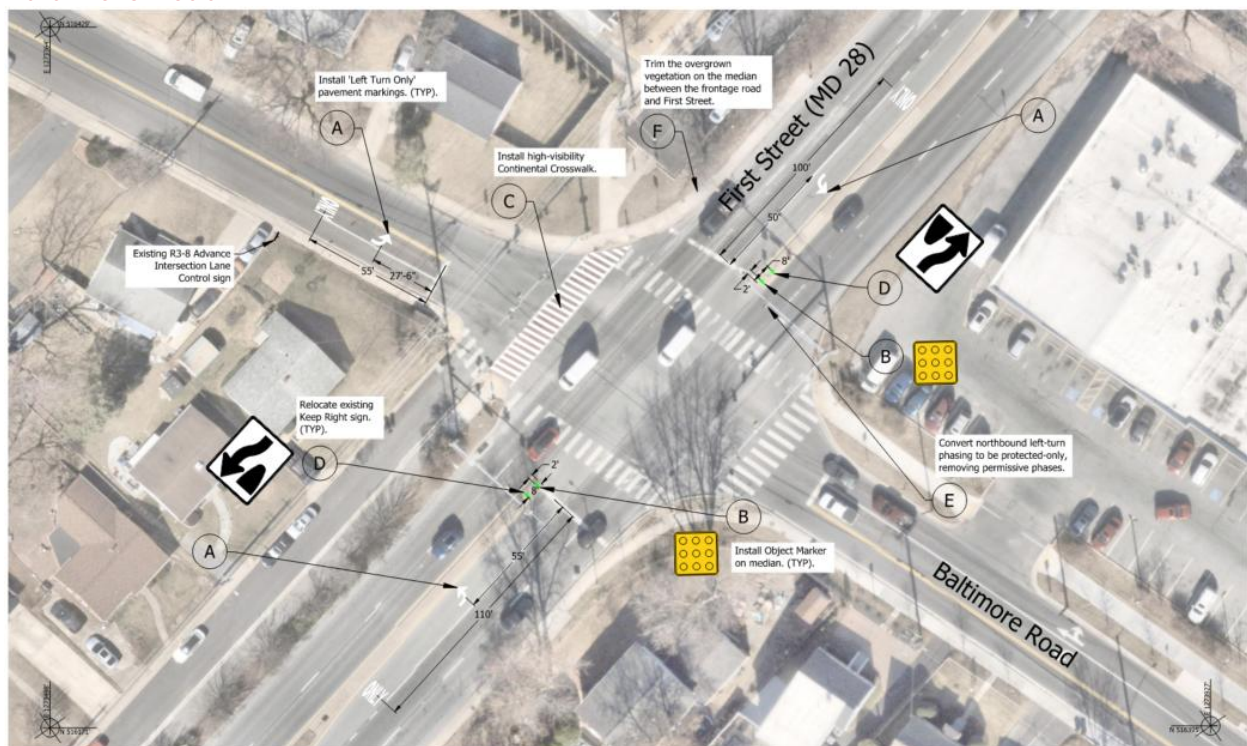
Recommendations

SHORT-TERM RECOMMENDATIONS

Figure 146 illustrates the proposed short-term, quick-build improvements for the First Street (MD 28) & Baltimore Road intersection, with additional detail provided in Table 170. The short-term concept focuses on adding left-turn lane pavement markings and adding object markers to the medians.

These recommendations rely on low-cost, implementable treatments (signing, striping, and delineation) to reduce driver uncertainty, improve yielding compliance, and make pedestrian crossings more visible and predictable.

Figure 146. Short-Term Recommendations for Intersection #22 - First Street (MD 28) & Baltimore Road



LEGEND

- | | | |
|---|---|--|
| (A) Proposed 'Left Turn Only' pavement markings | (C) Proposed Continental Crosswalk (See Detail A) | (E) Proposed protected left-turn phasing |
| (B) Proposed Object Markers (OM1-1): 18"x18" | (D) Relocated Keep Right signs (R4-7): 24"x30" | (F) Trim overgrown vegetation to improve sight distances |

Table 170. Short-Term Recommendations for Intersection #22 - First Street (MD 28) & Baltimore Road

| Rec. ID | Recommendation | Safety issue(s) addressed |
|---------|--|---------------------------|
| 22-S-1 | Apply 'Left Turn Only' pavement markings on the eastbound, northbound, and southbound left-turn lanes. | 22-A |
| 22-S-2 | Adjust the left-turn signal timing for the NBL movement to be protected-only, removing the permissive phase. | 22-B |
| 22-S-3 | Install high-visibility crosswalk pavement markings to the eastbound approach. | 22-G |
| 22-S-4 | Install object markers on the medians on the northbound and southbound approaches. | 22-D |
| 22-S-5 | Trim the overgrown vegetation on the median between the frontage road and 1st St. | 22-E |

COST ESTIMATE

Table 171 provides a planning-level cost estimate for the short-term recommendations, based on item quantities and recent Maryland SHA price index sheets, and excludes contingency and mobilization.

Table 171. Planning-Level Cost Estimate at Intersection #22 - First Street (MD 28) & Baltimore Road

| Item | Description | Unit | Unit Cost | Quantity | Cost |
|------------------|----------------------------|------|-----------|----------|-------------------|
| Pavement Marking | 12" Crosswalk | LF | \$6.19 | 272 | \$1,683.16 |
| Pavement Marking | Turn arrow marking | EACH | \$395.15 | 3 | \$1,185.45 |
| Pavement Marking | ONLY' marking (letter) | EACH | \$375.23 | 3 | \$1,125.69 |
| Sign | New sign post | EACH | \$193.76 | 2 | \$387.52 |
| Sign | Relocate sign post | EACH | \$79.54 | 2 | \$159.08 |
| Sign | Object marker sign [OM1-3] | EACH | \$180.00 | 2 | \$360.00 |
| Sign | Keep Right' sign [R4-7] | EACH | \$400.00 | 2 | \$800.00 |
| Other | Adjust signal timing | EACH | \$- | 1 | \$- |
| Total: | | | | | \$5,700.90 |

TRAFFIC IMPACT ANALYSIS

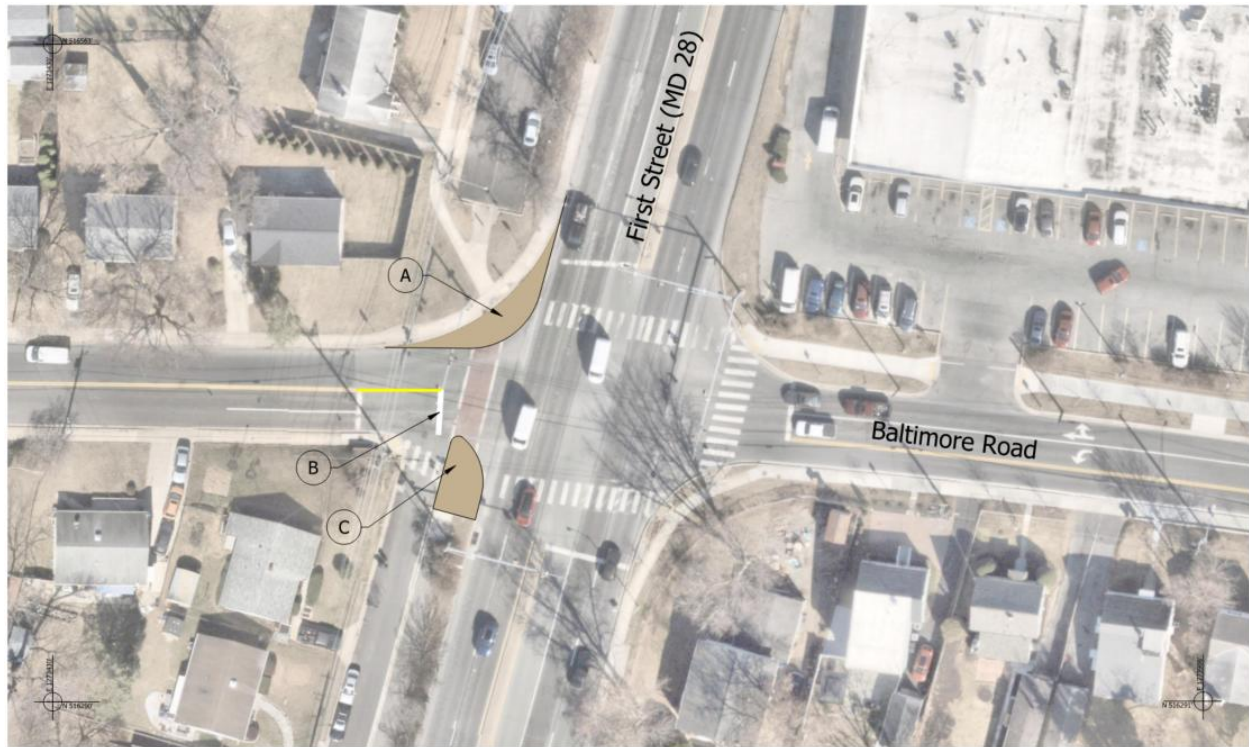
It was recommended that the left-turn signal timing for the northbound left movement to be adjusted to be protected-only, removing the permissive phase. Included below is the anticipated increase in delay (in seconds) for the southbound left-turn movement. While the delays do increase substantially, this adjustment is justifiable considering only 10 and 13 vehicles perform this movement in the AM and PM peaks, respectively.

- AM Peak: 27.2 → 90.1
- PM Peak: 23 → 78.4

LONG-TERM RECOMMENDATIONS

Figure 147 illustrates the proposed long-term capital improvements for the First Street (MD 28) & Baltimore Road intersection. The long-term concept focuses on reducing right-turn radius and access to the frontage road and replacing dimming pedestrian signal heads (Table 172).

Figure 147. Long-Term Recommendations for Intersection #22 - First Street (MD 28) & Baltimore Road



LEGEND

- A** Tighten curb radii
- B** Proposed stop bar and double yellow centerline pavement marking
- C** Proposed median extension to restrict frontage road access to right-in-only

Table 172. Long-Term Recommendations for Intersection #22 - First Street (MD 28) & Baltimore Road

| Rec. ID | Recommendation | Safety issue(s) addressed |
|---------|---|---------------------------|
| 22-L-1 | Consider reconfiguring the northwest corner to have a reduced radius. | 22-C |
| 22-L-2 | Explore reconstructing the frontage road entrance on the southwest corner to be right-in-only. Shift the stop bar to be closer to the intersection. | 22-H |
| 22-L-3 | In future projects, replace the dimming pedestrian signal heads on the northwest corner. | 22-I |

#23 - ROCKVILLE PIKE (MD 355) & RICHARD MONTGOMERY STREET

Existing Conditions

INTERSECTION DESCRIPTION

The intersection of Rockville Pike (MD 355) & Richard Montgomery Street is shown in Figure 148. Rockville Pike is classified as a principal arterial with a speed limit of 30 MPH and six lanes in addition to a designated northbound left-turn lane. Richard Montgomery Street (west side) and Dodge Street (east side) are classified a local with a speed limit of 25 MPH, four lanes on the southwest leg and three lanes on the northeast leg³. The intersection is signalized. In 2024, Annual Average Daily Traffic (AADT) on Rockville Pike was 48,215 and 3,371 on Richard Montgomery Street¹.

According to the Rockville Comprehensive Land Use Policy Map², land use to the south, southeast, and southwest of the intersection is “Office, Commercial and Residential Mix” and to the northeast is “Exempt Commercial” containing a small pocket park. There is a high school one block to the southwest. There is one RideOn bus stop on the north leg of the intersection serving Routes 46 and 81 southbound. There are sidewalks and crosswalk on all legs of the intersection.

Figure 148. #23 - Rockville Pike (MD 355) & Richard Montgomery Street Intersection



SAFETY REVIEW

A total of 13 crashes were recorded at the intersection during the three-year period from 2022 to 2024. The reported crashes primarily involved automobiles, with one (1) pedestrian-related crash and no cyclist-related crashes. Most of the crashes resulted in property-damage-only (PDO) outcomes, with four (4) possible injury crashes and one (1) serious injury crash reported over the study period.

Table 173 summarizes the crash characteristics, including collision types, lighting conditions, and roadway surface conditions.

Table 173. Summary of Three-Year (2022-24) Crashes at Intersection #23 - Rockville Pike (MD 355) & Richard Montgomery Street

| Total Crashes | Total Crashes by Year | | | Total Crashes by User | | |
|---------------|-----------------------|------|------|-----------------------|---------|------------|
| 13 | 2022 | 2023 | 2024 | Auto | Cyclist | Pedestrian |
| | | 3 | 5 | 5 | 12 | 0 |

| Total Crashes by Severity | | | | |
|---------------------------|---------|-------|-----------------|-----------------|
| Fatal | Serious | Minor | Possible Injury | Property Damage |
| 0 | 1 | 0 | 4 | 8 |

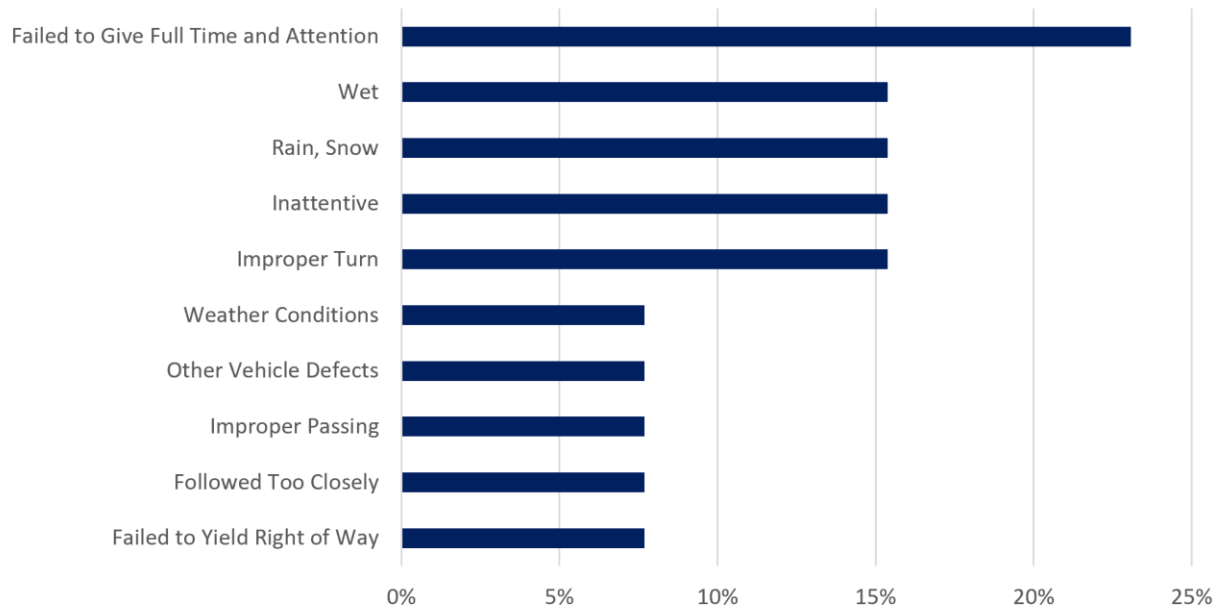
| Same Direction Rear End | Sideswipe, Same Direction | Head On, Left Turn | Same Direction Rear End, Right Turn | Same Direction Right Turn | Same Vehicle | Other |
|-------------------------|---------------------------|--------------------|-------------------------------------|---------------------------|--------------|-------|
| 6 | 2 | 1 | 1 | 1 | 1 | 1 |

| Lighting | | | Road Surface | | |
|----------|----------------|---------|--------------|-----|---------|
| Daylight | Dark Lights On | Unknown | Dry | Wet | Unknown |
| 7 | 5 | 1 | 9 | 2 | 2 |

Note: Crash summaries are based on the available crash data reviewed for this study. Reported crash totals and locations may vary across source datasets due to differences in reporting methods, geocoding, and intersection buffers.

Figure 149 illustrates the percentage of crashes accounting for each contributing circumstance associated with crashes at the intersection during the 2022–2024 study period. A single crash may involve multiple contributing circumstances, as documented in the crash reports. As shown in the figure, most contributing circumstances were related to driver behavior, with the most common being failure to give full time and attention, followed by wet roadway conditions, rain/snow conditions, inattentive driving, and improper turning movements. Other contributing factors included general weather conditions, vehicle-related defects, and additional driver-related behaviors such as improper passing, following too closely, and failure to yield right-of-way, each occurring less frequently.

Figure 149. Percentage of Crashes Accounting for Each Contributing Circumstance at Intersection #23 - Rockville Pike (MD 355) & Richard Montgomery Street



NEAR-MISS VIDEO ANALYSIS

Post-Encroachment Time (PET), which measures the temporal separation between two users occupying the same conflict area, was used to assess the severity of these interactions and is calculated only when both users pass through the same conflict point. Based on 24-hour video observations at the Rockville Pike (MD 355) & Richard Montgomery Street intersection, a total of 169 near-miss events were identified, including 67 vehicle-to-vehicle conflicts, 96 vehicle-to-pedestrian conflicts, and 6 vehicle-to-bicyclist conflicts, as summarized in Table 174. Vehicle-to-pedestrian interactions were the most common, indicating that pedestrians were the most affected group. Most (144) observed conflicts fall within the 2.0–3.0 second PET range. Conflicts with a PET of less than 2 seconds are generally considered indicative of a higher risk of crash. A total of 25 conflicts fall within this range at the intersection. Notably, a substantial majority of these higher-risk conflicts (20 out of 25) involved pedestrians or bicyclists, highlighting elevated conflict severity for vulnerable road users at the intersection.

Table 174. Summary of Near Misses for a Day (24-hours) at Intersection #23 - Rockville Pike (MD 355) & Richard Montgomery Street

| Post Encroachment Time (PET) | Vehicle-Vehicle | Vehicle-Pedestrian | Vehicle-Bicyclist | Total |
|------------------------------|-----------------|--------------------|-------------------|------------|
| 0.0 - 1.5s | 1 | 7 | 0 | 8 |
| 1.5 - 2.0s | 4 | 12 | 1 | 17 |
| 2.0 - 3.0s | 62 | 77 | 5 | 144 |
| Total | 67 | 96 | 6 | 169 |

Based on video analysis of near-miss events, Table 175 summarizes the most frequent conflict types observed at the intersection. The highest number of conflicts (55) occurred between northbound left-turning vehicles and southbound through vehicles. The next two most frequent conflicts involved north leg (NL) pedestrians interacting with eastbound left-turning vehicles (17 conflicts) and northbound through vehicles interacting with north leg pedestrians (13 conflicts). When combined, these pedestrian-related conflicts account for 30 occurrences, indicating a heightened risk for pedestrians at the north leg crosswalk. In addition, the presence of conflicts involving turning vehicles suggests that turning movements are a key safety concern at the intersection.

Table 175. Top Three Conflict Types by Movements based on Near Miss Video Analysis at Intersection #23 - Rockville Pike (MD 355) & Richard Montgomery Street.

| Conflict Rank | Movement 1 | Movement 2 | Conflicts |
|---------------|----------------------|----------------------|-----------|
| 1. | Northbound Left | Southbound Through | 55 |
| 2. | North Leg Pedestrian | Eastbound Left | 17 |
| 3. | Northbound Through | North Leg Pedestrian | 13 |

EXISTING TRAFFIC OPERATIONS

Table 176 shows the results of traffic operations analysis for this intersection based on existing lane configurations, peak-hour traffic volumes, and signal timing parameters. Drivers experience fairly light delays at this intersection during both peak hours.

Table 176. Results of Traffic Operation Analysis at Intersection #23 - Rockville Pike (MD 355) & Richard Montgomery Street

| Approach | Movement | Weekday AM Peak Hour | | | Weekday PM Peak Hour | | |
|-----------------------------|-------------------------|----------------------|----------|----------------------------|----------------------|----------|----------------------------|
| | | Delay (sec) | LOS | 95th Percentile Queue (ft) | Delay (sec) | LOS | 95th Percentile Queue (ft) |
| Eastbound | Eastbound Left | 47.7 | D | 133 | 51.2 | D | 107 |
| | Eastbound Through | 43.2 | D | 90 | 50.0 | D | 128 |
| | Eastbound Right | 41.9 | D | 40 | 47.4 | D | 51 |
| | Overall Approach | 44.6 | D | | 49.4 | D | |
| Westbound | Westbound Left | 42.2 | D | 41 | 48.4 | D | 58 |
| | Westbound Through | 44.7 | D | 134 | 48.5 | D | 84 |
| | Overall Approach | 44.2 | D | | 48.5 | D | |
| Northbound | Northbound Left | 21.1 | C | 68 | 8.9 | A | 53 |
| | Northbound Through | 10.0 | A | 105 | 9.2 | A | 222 |
| | Overall Approach | 11.3 | B | | 9.2 | A | |
| Southbound | Southbound Through | 13.4 | B | 575 | 6.8 | A | 101 |
| | Overall Approach | 13.4 | B | | 6.8 | A | |
| Overall Intersection | | 16.8 | B | | 12.6 | B | |

LOS = Level of Service
 # = 95th percentile volume exceeds capacity, queue may be longer

SITE VISIT OBSERVATIONS

A site visit was conducted on May 12, 2026. The northwest corner was particularly active, with individuals waiting for and boarding RideOn buses, while others were observed disembarking and dispersing in multiple directions across the intersection. Two pedestrian-vehicle conflict points were observed, particularly along the north leg, including multiple near misses involving eastbound left-turning vehicles and northbound through traffic. Crossing conditions were further complicated by long crossing distances spanning six to seven lanes on the north and south legs, with no pedestrian refuge island present.

Vehicle operations and infrastructure conditions also contributed to safety concerns. Northbound left-turning vehicles were observed taking short gaps and turning quickly in front of southbound traffic, while overall travel speeds appeared elevated above the posted 30 MPH limit. Crosswalk visibility was limited because both the west and east legs lacked high-visibility markings, reducing awareness among approaching drivers.

Photos in Appendix F and in Figure 150, Figure 151, Figure 152 document observations from the site visit.

Figure 150. Long pedestrian crosswalks on north and south legs with faded pavement markings #23 - Rockville Pike (MD 355) & Richard Montgomery Street



Figure 151. Overhead signal post lacks Left Turn Yield on Green sign with 55 near misses between northbound left-turn vehicles and southbound vehicles #23 - Rockville Pike (MD 355) & Richard Montgomery Street



Figure 152. Pedestrian crosswalks on the east and west legs lack a high-visibility design #23 - Rockville Pike (MD 355) & Richard Montgomery Street



IDENTIFIED SAFETY ISSUES

Key safety issues and other findings are shown in Table 177 and described below.

Table 177. Key Safety Issues for Intersection #23 - Rockville Pike (MD 355) & Richard Montgomery Street

| Issue ID | Safety Issue | Safety Issue Type | Crash Data | Near-Miss Video | Site Visit |
|-------------|--|---|------------|-----------------|------------|
| 23-A | Several instances observed where northbound left turn traffic made quick left turn in short gaps between southbound traffic; Southbound traffic moving quickly and many vehicles appeared driving over 30MPH posted; 55 near misses between NB left traffic and SB through vehicles | 1.2 Speeds, Severity, and Compliance: High-Speed Turns | | ✓ | ✓ |
| 23-B | North leg and south leg crosswalks cover 6-7 lanes with no pedestrian refuge island | 5.1.1 Pedestrian: Intersection Crossing (Long Crossing) | | | ✓ |
| 23-C | One pedestrian crash from 2022 to 2024 | 2.2 Conflicts Between Users: Drivers and Pedestrians | ✓ | | |
| 23-D | Seventeen near misses between pedestrians crossing the north leg and eastbound left turn traffic | 2.2 Conflicts Between Users: Drivers and Pedestrians | | ✓ | |
| 23-E | Thirteen near misses between pedestrians crossing the north leg and northbound through traffic | 2.2 Conflicts Between Users: Drivers and Pedestrians | | ✓ | |
| 23-F | Six instances of same direction rear end crashes from 2022 to 2024 | 8.1 Conflict Type: Rear End | ✓ | | |
| 23-G | Two instances of same direction sideswipe from 2022 to 2024 | 8.3 Conflict Type: Sideswipe | ✓ | | |
| 23-H | Crosswalks on west leg and east leg lack high visibility pattern | 5.1 Pedestrian: Intersection Crossing | | | ✓ |
| 23-I | One pedestrian observed crossing south leg crosswalk with one second to spare on signal | 10.2 Signal Timing: Inadequate Pedestrian Crossing Time | | | ✓ |
| 23-J | Pavement markings are faded | 3.4 Roadway Design: Night Time Visibility | | | ✓ |
| 23-K | Object markers are lacking on MD 355 northbound and southbound approach | 3.4 Roadway Design: Night Time Visibility | | | ✓ |
| 23-L | Vegetation is blocking crosswalk signal | 3.2 Roadway Design: Pedestrian Visibility | | | ✓ |
| 23-M | No parking signs are missing on east leg | 3.2 Roadway Design: Pedestrian Visibility | | | ✓ |

Bold indicates a priority safety issue.

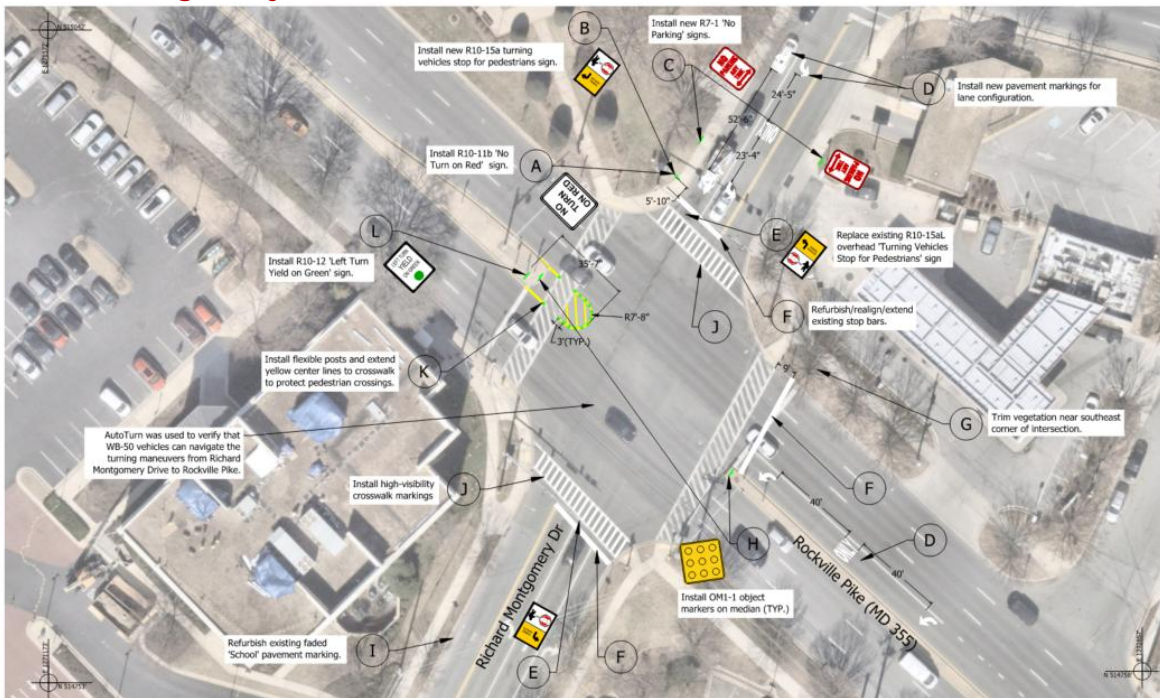
Recommendations

SHORT-TERM RECOMMENDATIONS

Figure 153 illustrates the proposed short-term, quick-build improvements for the Rockville Pike (MD 355) & Richard Montgomery Street intersection, with additional detail provided in Table 178. The short-term concept focuses on

These recommendations rely on low-cost, implementable treatments (signing, striping, and delineation) to reduce driver uncertainty, improve yielding compliance, and make pedestrian crossings more visible and predictable.

Figure 153. Short-Term Recommendations for Intersection #23 - Rockville Pike (MD 355) & Richard Montgomery Street



LEGEND

- | | | | |
|---|--|---|--|
| (A) Proposed No Turn on Red sign (R10-11b): 24" x 30" | (D) Proposed lane configuration pavement markings | (G) Vegetation maintenance for sight distance | (J) Proposed crosswalk markings. See Detail A. |
| (B) Proposed regulatory sign (R10-15a): 24" x 30" | (E) Replace existing regulatory sign (R10-15aL): 24" x 30" | (H) Proposed object marker (OM1-1): 18" x 18" | (K) Proposed pedestrian protection. See Detail C. |
| (C) Proposed parking restriction sign (R7-1): 12" x 30" | (F) Replace stop bars | (I) Refurbish school pavement marking | (L) Proposed No Turn on Red sign (R10-12): 30" x 36" |

Table 178. Short-Term Recommendations for Intersection #23 - Rockville Pike (MD 355) & Richard Montgomery Street

| Rec. ID | Recommendation | Safety issue(s) addressed |
|---------|---|---------------------------|
| 23-S-1 | Upgrade the crosswalks on the east and west legs with high visibility pavement markings | 23-H |
| 23-S-2 | Install the LEFT TURN YIELD ON GREEN (R10-12) sign for northbound left-turn traffic | 23-A |
| 23-S-3 | Install flex posts to protect pedestrians crossing the north leg | 23-D, 23-E |
| 23-S-4 | Replace Turning Vehicles Stop to Pedestrians (R10-15aL/R10-15aR) sign on east and west leg | 23-D |
| 23-S-5 | Refurbish faded Stop Bar (maybe realign it) to have a bigger gap from crosswalk | 23-J |
| 23-S-6 | Refurbish SCHOOL pavement marking on west leg | 23-J |
| 23-S-7 | Install Object Marker (OM1-3) on the median of MD-355 northbound and southbound approaches | 23-K |
| 23-S-8 | Install left arrow and ONLY letter pavement markings for lane configuration | 23-G |
| 23-S-9 | Realign the stop bar to parallel the crosswalk on south leg | 23-J |
| 23-S-10 | Trim vegetation at the southeast corner to provide more visibility of the pedestrian signal | 23-L |
| 23-S-11 | Extend the stop bar to the double yellow centerline on the east leg | 23-J |
| 23-S-12 | Install Right/Thru arrow for lane configuration on east leg | 23-G |
| 23-S-13 | Install No parking sign on both curbs of east leg | 23-M |
| 23-S-14 | Install No Turn on Red for the westbound traffic | 23-A |

COST ESTIMATE

Table 179 provides a planning-level cost estimate for the short-term recommendations, based on item quantities and recent Maryland SHA price index sheets, and excludes contingency and mobilization.

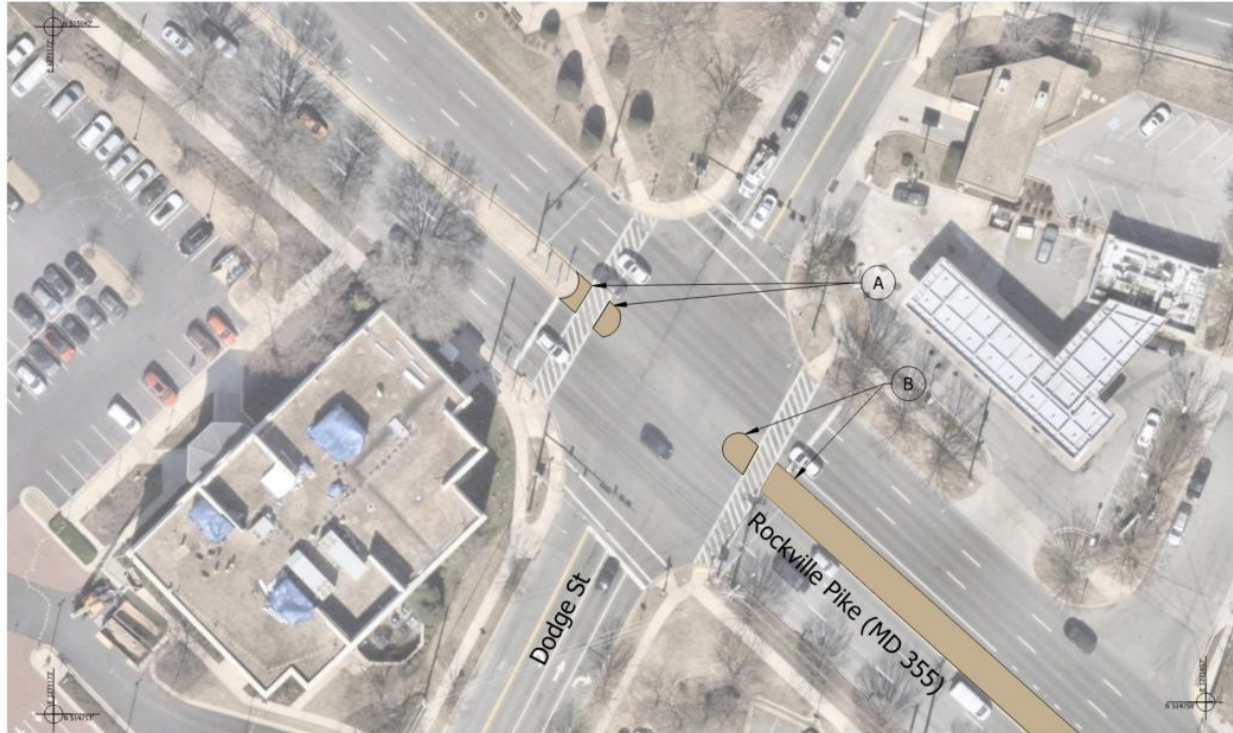
Table 179. Planning-Level Cost Estimate at Intersection #23 - Rockville Pike (MD 355) & Richard Montgomery Street

| Item | Description | Unit | Unit Cost | Quantity | Cost |
|------------------|--|------|-----------|----------|--------------------|
| Pavement Marking | 24" Stop Bar | LF | \$21.75 | 105 | \$2,283.75 |
| Pavement Marking | 12" Crosswalk | LF | \$6.19 | 410 | \$2,537.12 |
| Pavement Marking | 5" solid marking (yellow) | LF | \$7.00 | 79 | \$553.00 |
| Pavement Marking | Turn arrow marking | EACH | \$395.15 | 4 | \$1,580.60 |
| Pavement Marking | Shared through-turn arrow marking | EACH | \$395.15 | 2 | \$790.30 |
| Pavement Marking | ONLY' marking (letter) | EACH | \$375.23 | 2 | \$750.46 |
| Pavement Marking | Pavement Marking Removal | LF | \$6.00 | 46 | \$276.00 |
| Pavement Marking | 'SCHOOL' marking | EACH | \$375.23 | 1 | \$375.23 |
| Sign | New sign post | EACH | \$193.76 | 6 | \$1,162.56 |
| Sign | Parking regulation sign [R7-1] | EACH | \$120.00 | 2 | \$240.00 |
| Sign | Turning Traffic Stop to Peds sign [R10-15 (1)] | EACH | \$600.00 | 3 | \$1,800.00 |
| Sign | Object marker sign [OM1-3] | EACH | \$180.00 | 2 | \$360.00 |
| Sign | 'No Turn On Red' sign [R10-11b] | EACH | \$320.00 | 1 | \$320.00 |
| Sign | Left Turn Yield on Green' sign [R10-12] | EACH | \$400.00 | 1 | \$400.00 |
| Other | Flex Post | EACH | \$39.67 | 14 | \$555.40 |
| Total: | | | | | \$13,984.41 |

LONG-TERM RECOMMENDATIONS

Figure 154 illustrates the proposed long-term capital improvements for the Rockville Pike (MD 355) & Richard Montgomery Street intersection. The long-term concept focuses on improving safety for those walking by creating pedestrian refuge islands on the north and south legs (Table 180).

Figure 154. Long-Term Recommendations for Intersection #23 - Rockville Pike (MD 355) & Richard Montgomery Street



LEGEND

- (A) Extend median with a pedestrian refuge island
- (B) Extend and widen median (lane reconfiguration or narrowing may be necessary) with a pedestrian refuge island

Table 180. Long-Term Recommendations for Intersection #23 - Rockville Pike (MD 355) & Richard Montgomery Street

| Rec. ID | Recommendation | Safety issue(s) addressed |
|---------|---|------------------------------|
| 23-L-1 | Consider extending the median on the north and south legs for a pedestrian refuge island. | 23-B, 23-C, 23-D, 23-E, 23-I |

#24 - FREDERICK ROAD (MD 355) & RIDGEMONT AVENUE

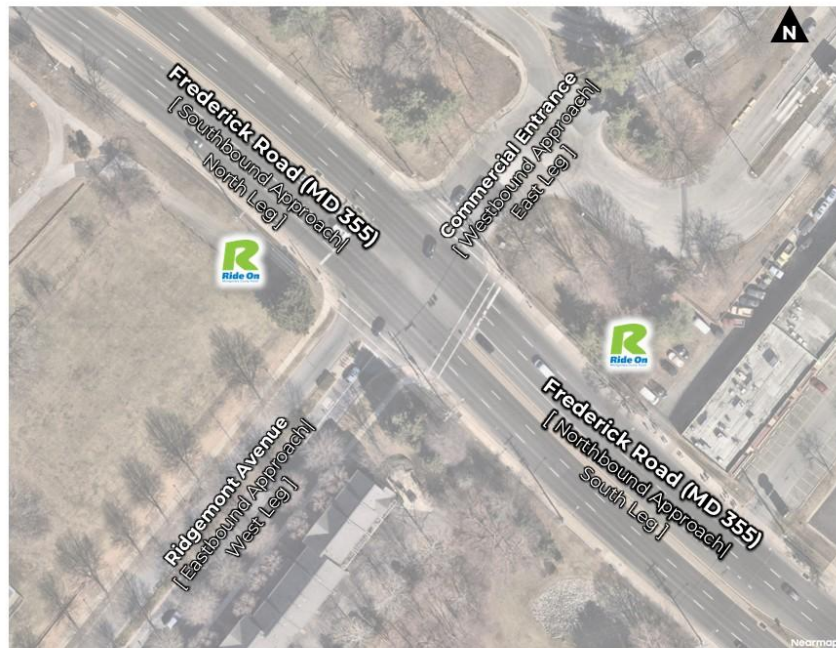
Existing Conditions

INTERSECTION DESCRIPTION

The intersection of Frederick Road (MD 355) & Ridgemont Avenue is shown in Figure 155. Frederick Road is classified as a principal arterial with a speed limit of 40 MPH and six lanes in addition to one designated northbound left-turn lane and one designated southbound left-turn lane. Ridgemont Avenue is classified as a local road with a speed limit of 25 MPH, two lanes, a designated left-turn lane on the eastbound approach, and a designated right-turn lane on the westbound approach³. The intersection is signalized. In 2024, Annual Average Daily Traffic (AADT) on Frederick Road was 39,320 and was not measured on Ridgemont Avenue¹.

According to the Rockville Comprehensive Land Use Policy Map², land use immediately to the north of the intersection is “Civic and Public Institutional,” containing the Montgomery County Shady Grove Transfer Station and Recycling Center. To the west is “Service Industrial,” immediately to the south is “Residential Multiple Unit,” and immediately to the east is “Public Park,” containing a community garden. There is a RideOn bus stop north of the intersection serving routes 55, 59, and 67 southbound and another bus stop south of the intersection serving routes 55, 59, and 67 northbound. There is access to the Shady Grove Metro station one block to the southeast. There are sidewalks on all legs of the intersection, and crosswalks on the northwest, southeast, and southwest legs.

Figure 155. #24 - Frederick Road (MD 355) & Ridgemont Avenue Intersection



SAFETY REVIEW

A total of 17 crashes were recorded at the intersection during the three-year period from 2022 to 2024. The reported crashes exclusively involved automobiles, with no pedestrian or cyclist-related crashes. Most of the crashes resulted in property-damage-only (PDO) outcomes, with three (3) minor injury crashes and two (2) possible injury crashes reported over the study period.

Table 181 summarizes the crash characteristics, including collision types, lighting conditions, and roadway surface conditions.

Table 181. Summary of Three-Year (2022-24) Crashes at Intersection #24 - Frederick Road (MD 355) & Ridgemont Avenue

| Total Crashes | Total Crashes by Year | | | Total Crashes by User | | |
|---------------|-----------------------|------|------|-----------------------|---------|------------|
| 17 | 2022 | 2023 | 2024 | Auto | Cyclist | Pedestrian |
| | | 3 | 7 | 7 | 17 | 0 |

| Total Crashes by Severity | | | | |
|---------------------------|---------|-------|-----------------|-----------------|
| Fatal | Serious | Minor | Possible Injury | Property Damage |
| 0 | 0 | 3 | 2 | 12 |

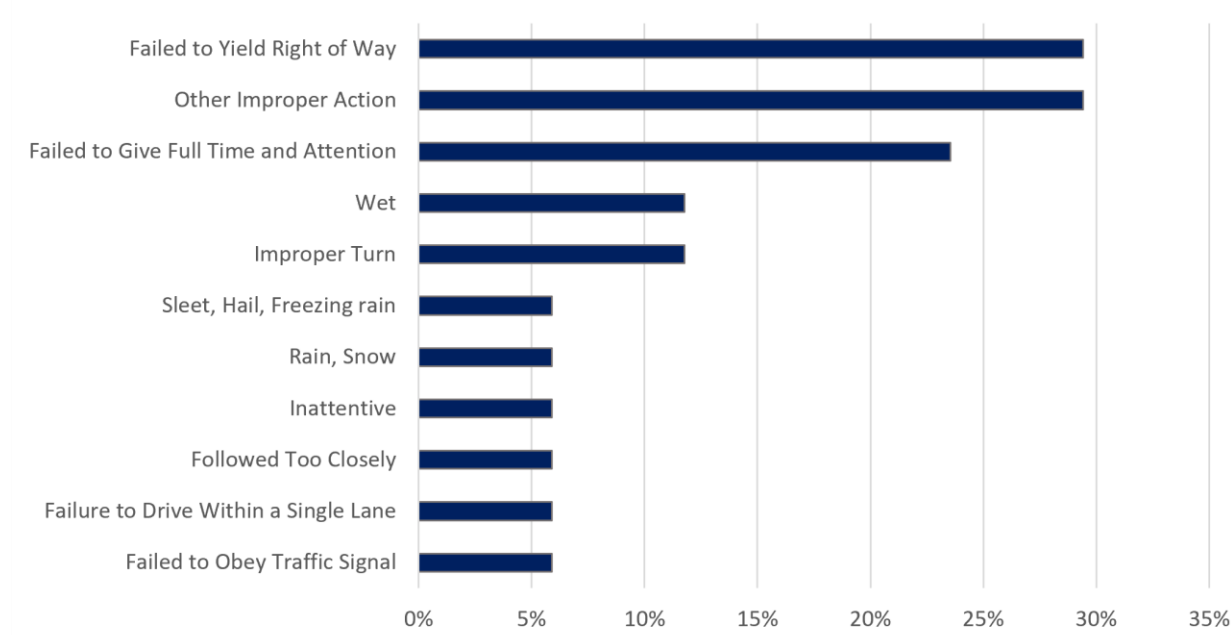
| Head On Left Turn | Angle | Front to Rear | Front to Front | Same Direction Right Turn | Sideswipe, Same Direction | Single Vehicle |
|-------------------|-------|---------------|----------------|---------------------------|---------------------------|----------------|
| 5 | 4 | 4 | 1 | 1 | 1 | 1 |

| | | | Road Surface | |
|----------|----------------|----------------|--------------|-----|
| Daylight | Dark Lights On | Dark No Lights | Dry | Wet |
| 10 | 6 | 1 | 13 | 4 |

Note: Crash summaries are based on the available crash data reviewed for this study. Reported crash totals and locations may vary across source datasets due to differences in reporting methods, geocoding, and intersection buffers.

Figure 156 illustrates the percentage of crashes accounting for each contributing circumstance associated with crashes at the intersection during the 2022–2024 study period. A single crash may involve multiple contributing circumstances, as documented in the crash reports. As shown in the figure, most contributing circumstances were related to driver behavior, with the most common being failure to yield right-of-way and other improper actions, followed by failure to give full time and attention. Other contributing factors included wet roadway conditions, improper turning movements, and various weather-related conditions, as well as additional driver-related behaviors such as inattentiveness, following too closely, and failure to obey traffic control devices, each occurring less frequently.

Figure 156. Percentage of Crashes Accounting for Each Contributing Circumstance at Intersection #24 - Frederick Road (MD 355) & Ridgemont Avenue



NEAR-MISS VIDEO ANALYSIS

Post-Encroachment Time (PET), which measures the temporal separation between two users occupying the same conflict area, was used to assess the severity of these interactions and is calculated only when both users pass through the same conflict point. Based on 24-hour video observations at the Frederick Road (MD 355) & Ridgemont Avenue intersection, a total of 129 near-miss events were identified, including 101 vehicle-to-vehicle conflicts, 26 vehicle-to-pedestrian conflicts, and 2 vehicle-to-bicyclist conflicts, as summarized in Table 182. Vehicle-to-vehicle interactions were the most common, though vulnerable road users remain present. Most (113) observed conflicts fall within the 2.0–3.0 second PET range. Conflicts with a PET of less than 2 seconds are generally considered indicative of a higher risk of crash. A total of 16 conflicts fall within this range at the intersection. Notably, a smaller portion of these higher-risk conflicts (4 out of 16) involved pedestrians or bicyclists, indicating moderate conflict exposure for vulnerable road users at the intersection.

Table 182. Summary of Near Misses for a Day (24-hours) at Intersection #24 - Frederick Road (MD 355) & Ridgemont Avenue

| Post Encroachment Time (PET) | Vehicle-Vehicle | Vehicle-Pedestrian | Vehicle-Bicyclist | Total |
|------------------------------|-----------------|--------------------|-------------------|------------|
| 0.0 - 1.5s | 1 | 0 | 0 | 1 |
| 1.5 - 2.0s | 11 | 3 | 1 | 15 |
| 2.0 - 3.0s | 89 | 23 | 1 | 113 |
| Total | 101 | 26 | 2 | 129 |

Based on video analysis of near-miss events, Table 183 summarizes the most frequent conflict types observed at the intersection. The highest number of conflicts (53) occurred between southbound left-turning vehicles and northbound through vehicles. The second highest conflict (44) involved northbound left-turning vehicles and southbound through vehicles, indicating a substantial number of conflicts associated with opposing left-turn and through movements. The third most frequent conflict involved south leg (SL) pedestrians interacting with westbound left-turning vehicles (4 conflicts). Pedestrian-related conflicts account for four (4) occurrences, indicating some level of risk for pedestrians at the south leg crosswalk. In addition, the dominance of conflicts involving turning vehicles suggests that turning movements are a key safety concern at the intersection.

Table 183. Top Three Conflict Types by Movements based on Near Miss Video Analysis at Intersection #24 - Frederick Road (MD 355) & Ridgemont Avenue.

| Conflict Rank | Movement 1 | Movement 2 | Conflicts |
|---------------|----------------------|--------------------|-----------|
| 1. | Southbound Left | Northbound Through | 53 |
| 2. | Northbound Left | Southbound Through | 44 |
| 3. | South Leg Pedestrian | Westbound Left | 4 |

EXISTING TRAFFIC OPERATIONS

Table 184 shows the results of traffic operations analysis for this intersection based on existing lane configurations, peak-hour traffic volumes, and signal timing parameters. The northbound and southbound approaches experience low delays, while drivers on the eastbound and westbound approaches experience moderate delays.

Table 184. Results of Traffic Operation Analysis at Intersection #24 - Frederick Road (MD 355) & Ridgemont Avenue

| Approach | Movement | Weekday AM Peak Hour | | | Weekday PM Peak Hour | | |
|-----------------------------|-------------------------|----------------------|----------|----------------------------|----------------------|----------|----------------------------|
| | | Delay (sec) | LOS | 95th Percentile Queue (ft) | Delay (sec) | LOS | 95th Percentile Queue (ft) |
| Eastbound | Eastbound Left | 71.3 | E | 85 | 72.8 | E | 111 |
| | Eastbound Through | 65.5 | E | 41 | 63.4 | E | 42 |
| | Overall Approach | 68.5 | E | | 68.8 | E | |
| Westbound | Westbound Left | 67.2 | E | 47 | 65.9 | E | 65 |
| | Westbound Through | 65.4 | E | 0 | 63.5 | E | 52 |
| | Overall Approach | 65.9 | E | | 64.2 | E | |
| Northbound | Northbound Left | 11.0 | B | 38 | 3.6 | A | 15 |
| | Northbound Through | 4.8 | A | 130 | 7.6 | A | 363 |
| | Overall Approach | 5.1 | A | | 7.6 | A | |
| Southbound | Southbound Left | 2.6 | A | 18 | 6.0 | A | 21 |
| | Southbound Through | 8.5 | A | 513 | 6.2 | A | 228 |
| | Overall Approach | 8.4 | A | | 6.2 | A | |
| Overall Intersection | | 9.8 | A | | 10.3 | B | |

LOS = Level of Service

= 95th percentile volume exceeds capacity, queue may be longer

SITE VISIT OBSERVATIONS

A site visit was conducted on 5/18/2026 to document existing conditions for people walking, people biking, and people driving. Photos from the site visit are included in Appendix F and in Figure 157 and Figure 158.

During the site visit, it was noted that there are no pedestrian push buttons on the eastbound or westbound approach crossings. Drivers approaching the intersection from the southbound direction do so on a downward-sloping curve, which may obstruct their visibility of drivers waiting for gaps in traffic to perform eastbound right turns.

Figure 157. Missing pedestrian push buttons on the westbound approach at Intersection #24 - Frederick Road (MD 355) & Ridgemont Avenue



Figure 158. Missing crosswalk on the southbound approach at Intersection #24 - Frederick Road (MD 355) & Ridgemont Avenue



IDENTIFIED SAFETY ISSUES

Key safety issues and other findings are shown in Table 185 and described below.

Table 185. Key Safety Issues for Intersection #24 - Frederick Road (MD 355) & Ridgemont Avenue

| Issue ID | Safety Issue | Safety Issue Type | Crash Data | Near-Miss Video | Site Visit |
|-------------|--|---|------------|-----------------|------------|
| 24-A | Northbound and southbound permissive left-turning vehicles conflict with multiple lanes of high-speed through traffic. There is a high frequency of left-turn crashes at this intersection. | 2 Conflicts Between Users | ✓ | | ✓ |
| 24-B | Turning vehicles were observed to encroach on pedestrians' right of way within crosswalks at this intersection. | 2 Conflicts Between Users | | ✓ | |
| 24-C | There are no pedestrian push buttons available for the minor eastbound and westbound approach crosswalks. | 5.1 Pedestrian: Intersection Crossing | | | ✓ |
| 24-D | There are no 'Left Turn Only' pavement markings on the northbound and southbound left-turn lanes. | 9 Vehicle Movements | | | ✓ |
| 24-E | The crosswalk pavement markings are not high visibility, and are fading in some places. | 5.1 Pedestrian: Intersection Crossing | | | |
| 24-F | There are no object markers on the intersection medians. A collision occurred between a driver and the median on the southbound approach. | 3 Roadway Design | ✓ | | ✓ |
| 24-G | A slope on the northwest corner obstructs eastbound right-turning drivers' view of conflicting southbound traffic. | 3.1 Roadway Design: Inadequate Sight Distance (Lack of Driver Visibility) | | | ✓ |
| 24-H | There is no crosswalk on the southbound approach. | 5.1 Pedestrian: Intersection Crossing | | | ✓ |
| 24-I | All of the signals at this intersection are mounted on span wires, causing them to be less visible to drivers and sometimes sway in the wind. | 7 User Behavior | | | ✓ |

Bold indicates a priority safety issue.

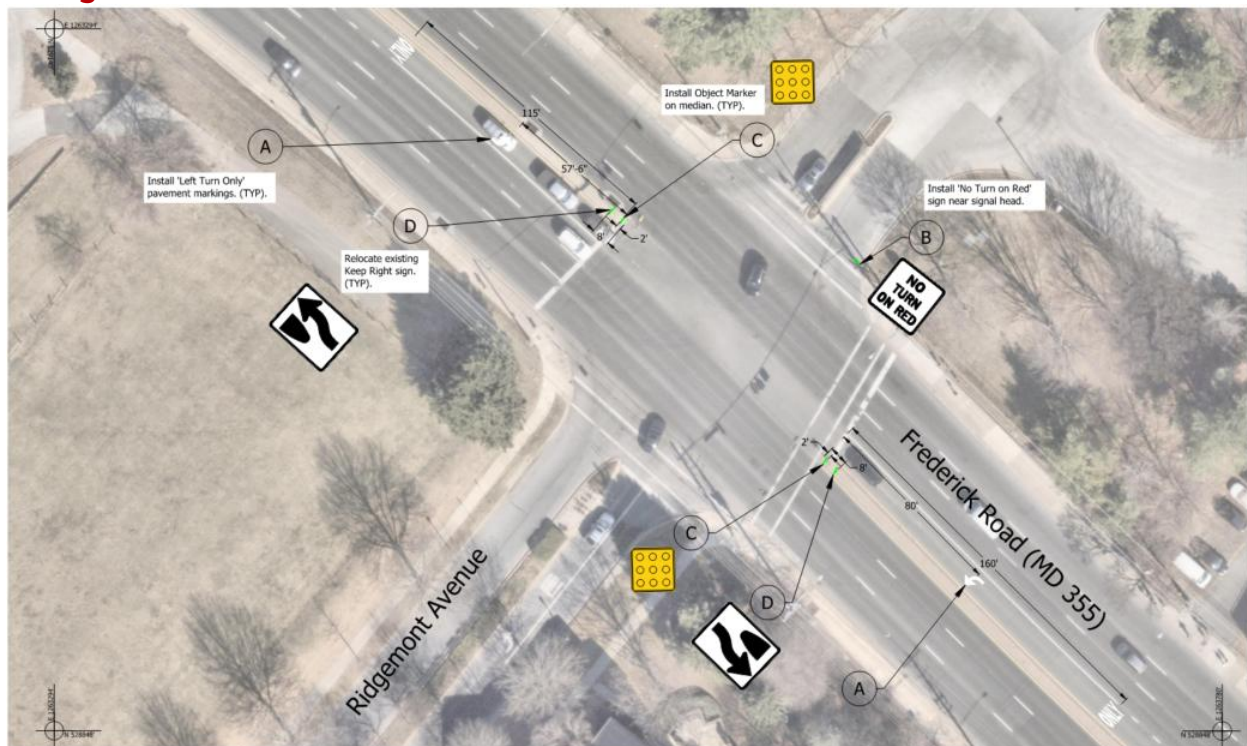
Recommendations

SHORT-TERM RECOMMENDATIONS

Figure 159 illustrates the proposed short-term, quick-build improvements for the Frederick Road (MD 355) & Ridgmont Avenue intersection, with additional detail provided in Table 186. The short-term concept focuses on adding a 'No Right On Red' sign to reduce potential conflicts.

These recommendations rely on low-cost, implementable treatments (signing, striping, and delineation) to reduce driver uncertainty, improve yielding compliance, and make pedestrian crossings more visible and predictable.

Figure 159. Short-Term Recommendations for Intersection #24 - Frederick Road (MD 355) & Ridgmont Avenue



LEGEND

- | | |
|--|---|
| A Proposed 'Left Turn Only' pavement markings | C Proposed Object Markers (OM1-1): 18"x18" |
| B Proposed 'No Turn on Red' sign (R10-11b): 36"x36" | D Relocated Keep Right signs (R4-7): 24"x30" |

Table 186. Short-Term Recommendations for Intersection #24 - Frederick Road (MD 355) & Ridgemont Avenue

| Rec. ID | Recommendation | Safety issue(s) addressed |
|---------------|--|---------------------------|
| 24-S-1 | Apply 'Left Turn Only' pavement markings on the northbound and southbound left-turning lanes. | 24-D |
| 24-S-2 | Install object markers on the medians. | 24-F |
| 24-S-3 | Explore installing a 'No Turn On Red' sign on the eastbound approach, prohibiting drivers from trying to find a gap in southbound through traffic, a view of which may be obstructed by the slope on the northwest corner. | 24-G |

COST ESTIMATE

Table 187 provides a planning-level cost estimate for the short-term recommendations, based on item quantities and recent Maryland SHA price index sheets, and excludes contingency and mobilization.

Table 187. Planning-Level Cost Estimate at Intersection #24 - Frederick Road (MD 355) & Ridgemont Avenue

| Item | Description | Unit | Unit Cost | Quantity | Cost |
|------------------|---------------------------------|------|-----------|----------|-------------------|
| Pavement Marking | Turn arrow marking | EACH | \$395.15 | 2 | \$790.30 |
| Pavement Marking | ONLY' marking (letter) | EACH | \$375.23 | 2 | \$750.46 |
| Sign | New sign post | EACH | \$193.76 | 3 | \$581.28 |
| Sign | Relocate sign post | EACH | \$79.54 | 2 | \$159.08 |
| Sign | Object marker sign [OM1-3] | EACH | \$180.00 | 2 | \$360.00 |
| Sign | 'No Turn On Red' sign [R10-11b] | EACH | \$320.00 | 1 | \$320.00 |
| Sign | 'Keep Right' sign [R4-7] | EACH | \$400.00 | 2 | \$800.00 |
| Other | Adjust signal timing | EACH | \$- | 1 | \$- |
| Total: | | | | | \$3,761.12 |

LONG-TERM RECOMMENDATIONS

Figure 160 illustrates the proposed long-term capital improvements for the Frederick Road (MD 355) & Ridgemont Avenue intersection. The long-term concept focuses on improving safety for people walking by installing high-visibility crosswalks and pedestrian push buttons, and mounting traffic signal heads (Table 188).

Figure 160. Long-Term Recommendations for Intersection #24 - Frederick Road (MD 355) & Ridgemont Avenue



LEGEND

- A Proposed high-visibility crosswalks

Table 188. Long-Term Recommendations for Intersection #24 - Frederick Road (MD 355) & Ridgemont Avenue

| Rec. ID | Recommendation | Safety issue(s) addressed |
|---------|---|---------------------------|
| 24-L-1 | Install pedestrian push buttons on all crosswalks. | 24-C |
| 24-L-2 | Explore installing a crosswalk on the southbound leg. | 24-H |
| 24-L-3 | Install high-visibility crosswalk pavement markings on all approaches. | 24-E |
| 24-L-4 | In future projects, adjust the traffic signals at this intersection to be mounted on mast arms instead of span wires. | 24-I |

#25 - HUNGERFORD DRIVE (MD 355) & BEALL AVENUE

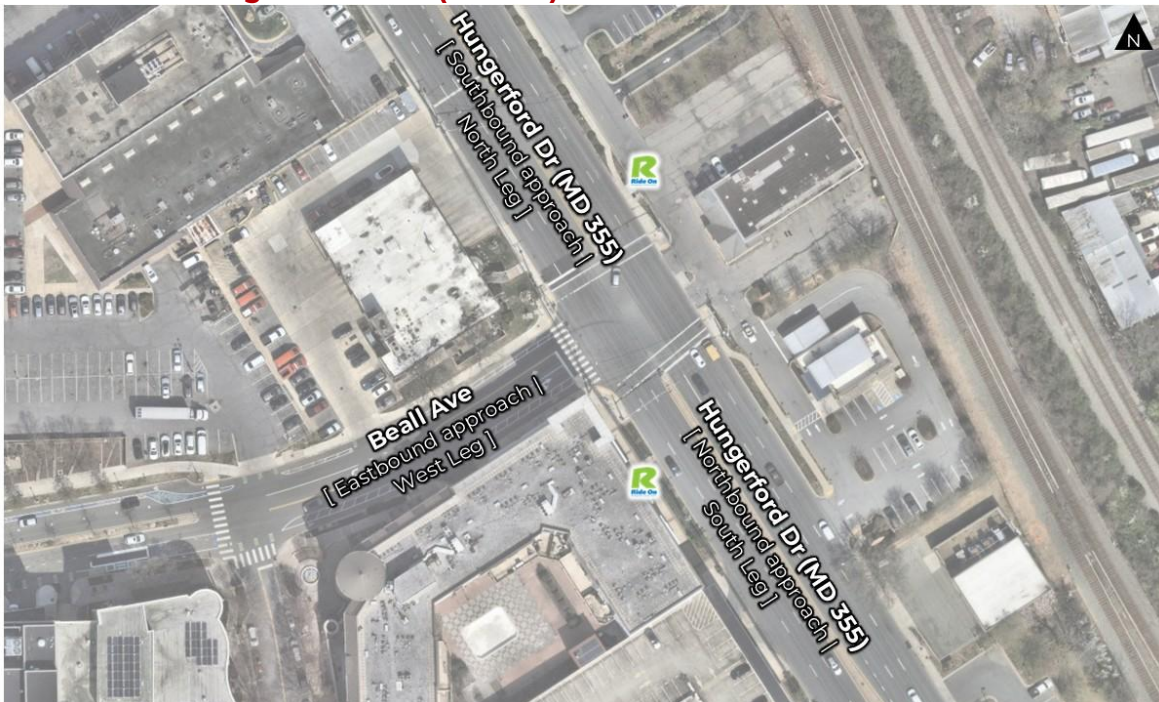
Existing Conditions

INTERSECTION DESCRIPTION

The intersection of Hungerford Drive (MD 355) & Beall Avenue is shown in Figure 161. Hungerford Drive is classified as a principal arterial with a speed limit of 35 MPH and six lanes in addition to designated northbound and southbound left-turn lanes. Beall Avenue is classified as a major collector with a speed limit of 25 MPH, three lanes on the west leg with protected bike lanes in both directions and a set of two driveways on the east side³. The intersection is signalized. In 2024, Annual Average Daily Traffic (AADT) on Hungerford Drive was 39,320 and 6,145 on Beall Avenue¹.

According to the Rockville Comprehensive Land Use Policy Map², land use to the east and northwest is “Office, Commercial and Residential Mix” and to the southwest is “Commercial and Residential Mix”. There is a fire station immediately northwest of the intersection, a library one block east, and retail shops and businesses. There is one RideOn bus stop on the south leg of the intersection serving Route 40 southbound and one bus stop on the north leg serving Route 40 northbound. There are sidewalks on all sides of the intersection and crosswalks on the west, south, and north legs.

Figure 161. #25 - Hungerford Drive (MD 355) & Beall Avenue Intersection



SAFETY REVIEW

A total of 10 crashes were recorded at the intersection during the three-year period from 2022 to 2024. The reported crashes primarily involved automobiles, with one (1) pedestrian-related crash and no cyclist-related crashes. Most of the crashes resulted in property-damage-only (PDO) outcomes, with one (1) possible injury crash and one (1) fatal crash reported over the study period. The only fatal crash involved a pedestrian.

Table 189 summarizes the crash characteristics, including collision types, lighting conditions, and roadway surface conditions.

Table 189. Summary of Three-Year (2022-24) Crashes at Intersection #25 - Hungerford Drive (MD 355) & Beall Avenue

| Total Crashes | Total Crashes by Year | | | Total Crashes by User | | |
|---------------|-----------------------|------|------|-----------------------|---------|------------|
| 10 | 2022 | 2023 | 2024 | Auto | Cyclist | Pedestrian |
| | | 1 | 6 | 3 | 9 | 0 |

| Total Crashes by Severity | | | | |
|---------------------------|---------|-------|-----------------|-----------------|
| Fatal | Serious | Minor | Possible Injury | Property Damage |
| 1 | 0 | 0 | 1 | 8 |

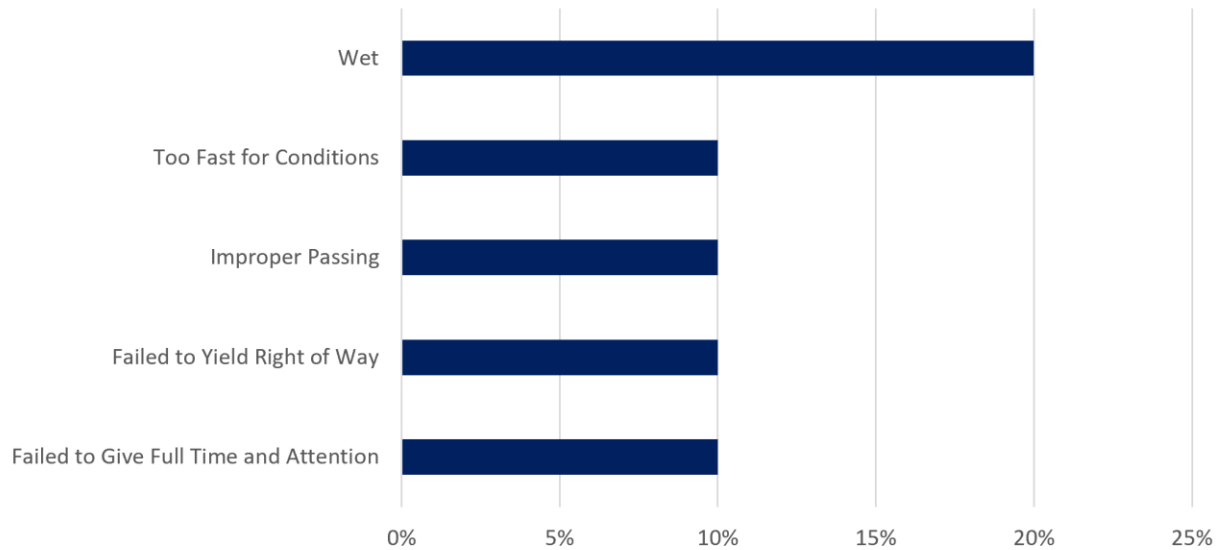
| Same Direction Rear End | Head On Left Turn | Single Vehicle | Other | Sideswipe, Opposite Direction |
|-------------------------|-------------------|----------------|-------|-------------------------------|
| 3 | 2 | 2 | 2 | 1 |

| Lighting | | Road Surface | | |
|----------|----------------|--------------|-----|---------|
| Daylight | Dark Lights On | Dry | Wet | Unknown |
| 7 | 3 | 5 | 4 | 1 |

Note: Crash summaries are based on the available crash data reviewed for this study. Reported crash totals and locations may vary across source datasets due to differences in reporting methods, geocoding, and intersection buffers.

Figure 162 illustrates the percentage of crashes accounting for each contributing circumstance associated with crashes at the intersection during the 2022–2024 study period. A single crash may involve multiple contributing circumstances, as documented in the crash reports. As shown in the figure, the most common contributing circumstance was wet roadway conditions, followed by several driver-related factors, including driving too fast for conditions, improper passing, failure to yield right-of-way, and failure to give full time and attention, each occurring once.

Figure 162. Percentage of Crashes Accounting for Each Contributing Circumstance at Intersection #25 - Hungerford Drive (MD 355) & Beall Avenue



NEAR-MISS VIDEO ANALYSIS

Post-Encroachment Time (PET), which measures the temporal separation between two users occupying the same conflict area, was used to assess the severity of these interactions and is calculated only when both users pass through the same conflict point. Based on 24-hour video observations at the Hungerford Drive (MD 355) & Beall Avenue intersection, a total of 169 near-miss events were identified, including 79 vehicle-to-vehicle conflicts, 88 vehicle-to-pedestrian conflicts, and 2 vehicle-to-bicyclist conflicts, as summarized in Table 190. Vehicle-to-pedestrian interactions were the most common, indicating that pedestrians were the most affected group. Most (141) observed conflicts fall within the 2.0–3.0 second PET range. Conflicts with a PET of less than 2 seconds are generally considered indicative of a higher risk of crash. A total of 28 conflicts fall within this range at the intersection. Notably, most of these higher-risk conflicts (19 out of 28) involved pedestrians or bicyclists, highlighting elevated conflict severity for vulnerable road users at the intersection.

Table 190. Summary of Near Misses for a Day (24-hours) at Intersection #25 - Hungerford Drive (MD 355) & Beall Avenue

| Post Encroachment Time (PET) | Vehicle-Vehicle | Vehicle-Pedestrian | Vehicle-Bicyclist | Total |
|------------------------------|-----------------|--------------------|-------------------|------------|
| 0.0 - 1.5s | 1 | 9 | 0 | 10 |
| 1.5 - 2.0s | 8 | 9 | 1 | 18 |
| 2.0 - 3.0s | 70 | 70 | 1 | 141 |
| Total | 79 | 88 | 2 | 169 |

Based on video analysis of near-miss events, Table 191 summarizes the most frequent conflict types observed at the intersection. The highest number of conflicts (73) occurred between northbound left-turning vehicles and southbound through vehicles. The next two most frequent conflicts involved west leg (WL) pedestrians interacting with northbound left-turning vehicles and north leg (NL) pedestrians interacting with eastbound left-turning vehicles, each with 13 conflicts. When combined, these pedestrian-related conflicts account for 26 occurrences, indicating a heightened risk for pedestrians across multiple crosswalks at the intersection. In addition, the concentration of conflicts involving left turning vehicles suggests that left turning movements are a key safety concern at the intersection.

Table 191. Top Three Conflict Types by Movements based on Near Miss Video Analysis at Intersection #25 - Hungerford Drive (MD 355) & Beall Avenue.

| Conflict Rank | Movement 1 | Movement 2 | Conflicts |
|---------------|----------------------|--------------------|-----------|
| 1. | Northbound Left | Southbound Through | 73 |
| 2. | West Leg Pedestrian | Northbound Left | 13 |
| 3. | North Leg Pedestrian | Eastbound Left | 13 |

EXISTING TRAFFIC OPERATIONS

Table 192 shows the results of traffic operations analysis for this intersection based on existing lane configurations, peak-hour traffic volumes, and signal timing parameters. The northbound and southbound approaches experience low delays, while drivers on the eastbound and westbound approaches experience moderate delays.

Table 192. Results of Traffic Operation Analysis at Intersection #25 - Hungerford Drive (MD 355) & Beall Avenue

| Approach | Movement | Weekday AM Peak Hour | | | Weekday PM Peak Hour | | |
|-----------------------------|-------------------------|----------------------|----------|----------------------------|----------------------|----------|----------------------------|
| | | Delay (sec) | LOS | 95th Percentile Queue (ft) | Delay (sec) | LOS | 95th Percentile Queue (ft) |
| Eastbound | Eastbound Through | 72.6 | E | 94 | 74.4 | E | 157 |
| | Eastbound Right | 64.8 | E | 61 | 60.1 | E | 65 |
| | Overall Approach | 67.4 | E | | 65.9 | E | |
| Westbound | Westbound Through | 65.5 | E | 40 | 63.9 | E | 91 |
| | Overall Approach | 65.5 | E | | 63.9 | E | |
| Northbound | Northbound Left | 5.4 | A | 48 | 7.9 | A | 89 |
| | Northbound Through | 4.8 | A | 146 | 7.1 | A | 217 |
| | Overall Approach | 4.9 | A | | 7.2 | A | |
| Southbound | Southbound Left | 4.9 | A | 5 | 7.3 | A | 7 |
| | Southbound Through | 5.9 | A | 202 | 8.5 | A | 223 |
| | Overall Approach | 5.9 | A | | 8.5 | A | |
| Overall Intersection | | 9.2 | A | | 13.6 | B | |

LOS = Level of Service

= 95th percentile volume exceeds capacity, queue may be longer

SITE VISIT OBSERVATIONS

A site visit was conducted on May 12, 2026. Multiple conflict points between modes were observed during the visit. At least one near miss was observed between a pedestrian on the west leg crosswalk and a northbound left-turning vehicle, and one near miss observed between a pedestrian on the crosswalk along the north leg with an eastbound left-turning vehicle. Additional potential user conflicts were noted on the eastbound approach, where a bike lane was observed to end abruptly within the intersection without signage, creating potential right-hook conflicts between bicyclists and turning vehicles. The east side of the intersection also includes two driveways that cross the sidewalk, where both vehicle and pedestrian activity were observed interacting in a constrained space, introducing additional points of conflict.

Several infrastructure and operational issues were also documented that may contribute to safety concerns. Crosswalk markings on the north and south legs were faded and lacked high-visibility patterns. Northbound left-turning vehicles were observed making quick turns during short gaps in southbound traffic, indicating potentially risky turning behavior. Additional conflicts included at least one near miss involving a northbound U-turning vehicle

and an eastbound right-turning vehicle. Pavement markings for northbound and southbound left-turn lanes were also missing directional arrows, limiting clarity for drivers.

Photos in Appendix F and Figure 163, Figure 164, and Figure 165 document observations from the site visit.

Figure 163. Near misses observed between pedestrians on the west leg crosswalk and northbound vehicles turning left #25 - Hungerford Drive (MD 355) & Beall Avenue



Figure 164. Long pedestrian crosswalks on the north and south legs with left-turn vehicles and deteriorated pavement markings lacking high visibility design #25 - Hungerford Drive (MD 355) & Beall Avenue



Figure 165. Unmarked pedestrian crosswalk over driveways on east leg #25 - Hungerford Drive (MD 355) & Beall Avenue



IDENTIFIED SAFETY ISSUES

Key safety issues and other findings are shown in Table 193 and described below.

Table 193. Key Safety Issues for Intersection #25 - Hungerford Drive (MD 355) & Beall Avenue

| Issue ID | Safety Issue | Safety Issue Type | Crash Data | Near-Miss Video | Site Visit |
|-------------|---|--|------------|-----------------|------------|
| 25-A | Several instances observed where northbound left-turn vehicles made quick left turns in short gaps between southbound through traffic | 1.2 Speeds, Severity, and Compliance: High-Speed Turns | | | ✓ |
| 25-B | One pedestrian crash from 2022 to 2024 | 2.2 Conflicts Between Users: Drivers and Pedestrians | ✓ | | |
| 25-C | Two instances of head on left turn crashes from 2022 to 2024 and 73 near misses between northbound left turn traffic and southbound through traffic between 2022 and 2024 | 8.2 Conflict Type: Left Turn | ✓ | ✓ | |
| 25-D | Thirteen near misses between pedestrians crossing the west leg and northbound left-turn vehicles | 2.1 Conflicts Between Users: Drivers Turning and Pedestrians | | ✓ | |
| 25-E | Thirteen near misses between pedestrians crossing the north leg and eastbound left-turn vehicles | 2.1 Conflicts Between Users: Drivers Turning and Pedestrians | | ✓ | |
| 25-F | Bike lane on eastbound approach ends abruptly in intersection with no signage | 2.3.1 Conflicts Between Users: Drivers and Bicyclists (Right Hook) | | | ✓ |
| 25-G | North leg and south leg crosswalk pavement markings are faded and lack high visibility pattern | 5.1 Pedestrian: Intersection Crossing | | | ✓ |
| 25-H | East leg pedestrian crossing is unmarked over two driveways | 5.1 Pedestrian: Intersection Crossing | | | ✓ |
| 25-I | At least one near miss observed between northbound U-turn vehicle and eastbound right-turn vehicle | 8.8 Conflict Type: U-Turn | | | ✓ |
| 25-J | Northbound and southbound left-turn lanes lack pavement marking arrows | Pavement Marking | | | ✓ |
| 25-K | Object markers are lacking on MD 355 | 3.4 Roadway Design: Night Time Visibility | | | ✓ |
| 25-L | Limited space for southbound trucks to make right-turns | 3 Roadway Design | | | ✓ |

Bold indicates a priority safety issue.

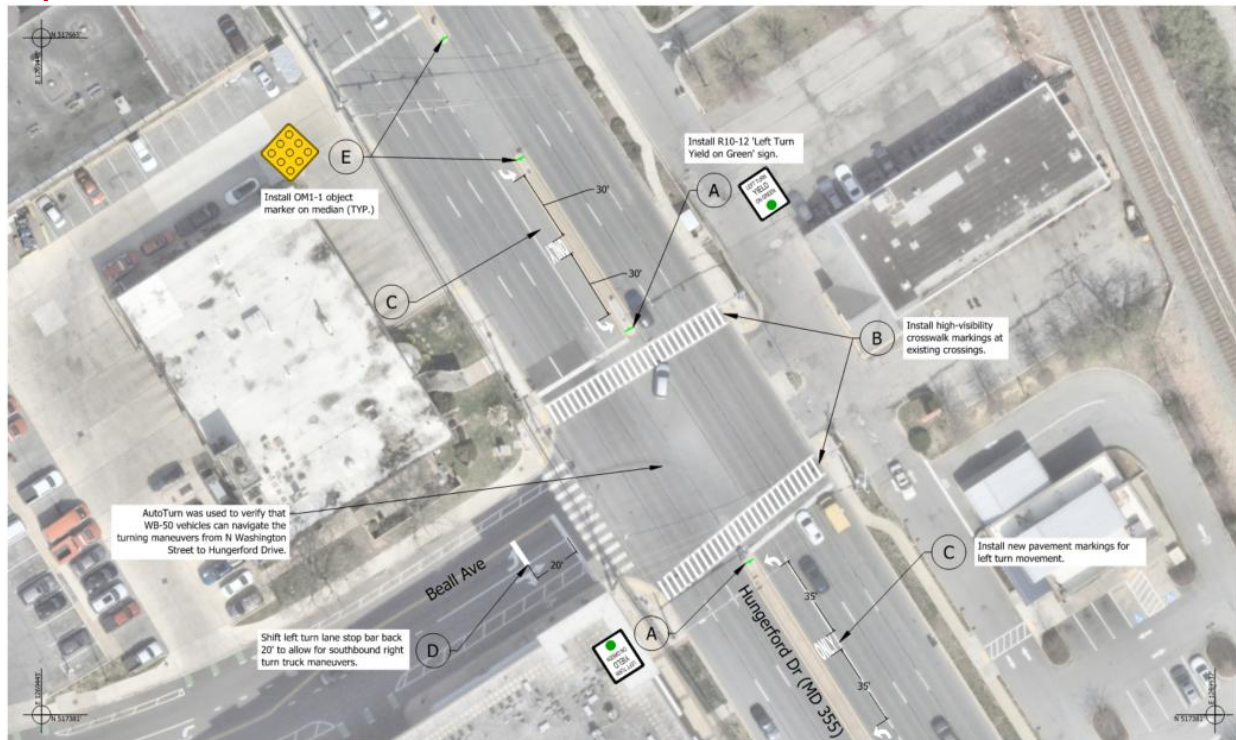
Recommendations

SHORT-TERM RECOMMENDATIONS

Figure 166 illustrates the proposed short-term, quick-build improvements for the Hungerford Drive (MD 355) & Beall Avenue intersection, with additional detail provided in Table 194.

These recommendations rely on low-cost, implementable treatments (signing, striping, and delineation) to reduce driver uncertainty, improve yielding compliance, and make pedestrian crossings more visible and predictable.

Figure 166. Short-Term Recommendations for Intersection #25 - Hungerford Drive (MD 355) & Beall Avenue



LEGEND

- (A) Proposed Left Turn Yield sign (R10-12); 30" x 36"
- (B) Proposed crosswalk markings. See Detail A.
- (C) Proposed turn lane pavement markings
- (D) Proposed left turn lane stop bar relocation
- (E) Proposed object markers (OM1-1); 18" x 18"

Table 194. Short-Term Recommendations for Intersection #25 - Hungerford Drive (MD 355) & Beall Avenue

| Rec. ID | Recommendation | Safety issue(s) addressed |
|---------|---|---------------------------|
| 25-S-1 | Install object Marker (OM1-3) on the median of MD-355 | 25-K |
| 25-S-2 | Install left arrow and ONLY letter pavement markings for lane configuration on northbound and southbound approaches | 25-J |
| 25-S-3 | Install LEFT TURN YIELD ON GREEN (R10-12) sign on northbound and southbound approach | 25-A, 25-C, 25-D |
| 25-S-4 | Upgrade crosswalks on north and south legs to high-visibility design | 25-B, 25-E, 25-G |
| 25-S-5 | Shift eastbound left-turn lane stop bar back to allow for southbound right-turn truck maneuvers | 25-L |

COST ESTIMATE

Table 195 provides a planning-level cost estimate for the short-term recommendations, based on item quantities and recent Maryland SHA price index sheets, and excludes contingency and mobilization.

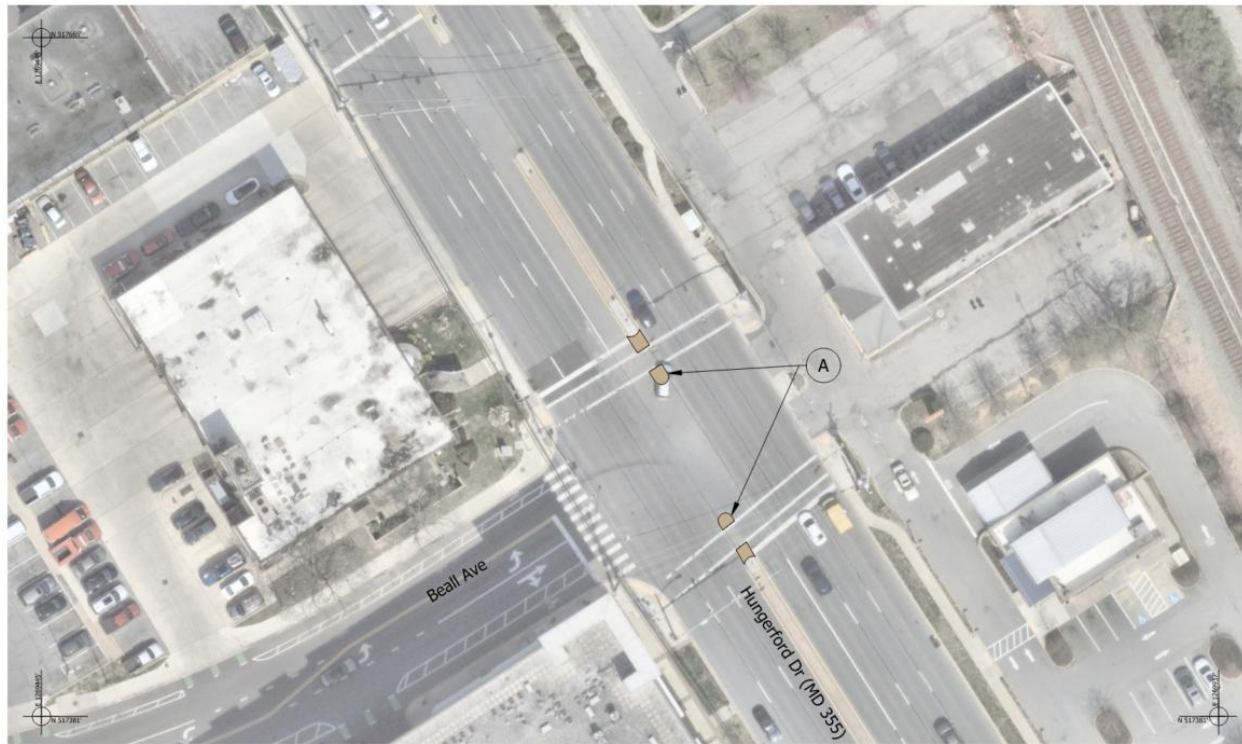
Table 195. Planning-Level Cost Estimate at Intersection #25 - Hungerford Drive (MD 355) & Beall Avenue

| Item | Description | Unit | Unit Cost | Quantity | Cost |
|------------------|---|------|-----------|----------|-------------------|
| Pavement Marking | 24" Stop Bar | LF | \$21.75 | 11 | \$239.25 |
| Pavement Marking | 12" Crosswalk | LF | \$6.19 | 563.33 | \$3,485.96 |
| Pavement Marking | Turn arrow marking | EACH | \$395.15 | 4 | \$1,580.60 |
| Pavement Marking | ONLY' marking (letter) | EACH | \$375.23 | 2 | \$750.46 |
| Pavement Marking | Pavement Marking Removal | LF | \$6.00 | 42 | \$252.00 |
| Sign | New sign post | EACH | \$193.76 | 4 | \$775.04 |
| Sign | Object marker sign [OM1-3] | EACH | \$180.00 | 2 | \$360.00 |
| Sign | Left Turn Yield on Green' sign [R10-12] | EACH | \$400.00 | 2 | \$800.00 |
| Total: | | | | | \$8,243.30 |

LONG-TERM RECOMMENDATIONS

Figure 167 illustrates the proposed long-term capital improvements for the Hungerford Drive (MD 355) & Beall Avenue intersection. The long-term concept focuses on improving safety for those walking by creating pedestrian refuge islands on the north and south legs (Table 196).

Figure 167. Long-Term Recommendations for Intersection #25 - Hungerford Drive (MD 355) & Beall Avenue



LEGEND

- A Extend the medians and add pedestrian refuge islands

Table 196. Long-Term Recommendations for Intersection #25 - Hungerford Drive (MD 355) & Beall Avenue

| Rec. ID | Recommendation | Safety issue(s) addressed |
|---------|---|---------------------------|
| 25-L-1 | Consider extend the median on the north and south legs for pedestrian refuge islands. | 25-B, 25-E |

#26 - ROCKVILLE PIKE (MD 355) & TALBOTT STREET

Existing Conditions

INTERSECTION DESCRIPTION

The intersection of Rockville Pike (MD 355) & Talbott Street is shown in Figure 168. Rockville Pike is classified as a principal arterial with a speed limit of 35 MPH and six lanes in addition to one designated northbound left-turn lane and one designated southbound left-turn lane. Talbott Street is classified as a local road with no posted speed limit, two lanes, with a designated left-turn lane³. The intersection is unsignalized, and vehicles on Talbott Street must stop and yield to traffic on Rockville Pike. In 2024, Annual Average Daily Traffic (AADT) on Rockville Pike was 48,215 and was not measured on Ridgemont Avenue¹.

According to the Rockville Comprehensive Land Use Policy Map², land use on all sides of the intersection is “Office, Commercial, and Residential Mix” containing shopping centers and a car dealership. There are RideOn bus stops on the north and south side of the intersection serving route 66. There are sidewalks on all legs of the intersection but no marked crosswalks.

Figure 168. #26 - Rockville Pike (MD 355) & Talbott Street Intersection



SAFETY REVIEW

A total of 12 crashes were recorded at the intersection during the three-year period from 2022 to 2024. The reported crashes primarily involved automobiles, with one (1) pedestrian-related crash and no cyclist-related crashes. Most of the crashes resulted in property-damage-only (PDO) outcomes, with two (2) minor injury crashes and one (1) fatal crash reported over the study period. The only fatal crash involved a pedestrian.

Table 197 summarizes the crash characteristics, including collision types, lighting conditions, and roadway surface conditions.

Table 197. Summary of Three-Year (2022-24) Crashes at Intersection #26 - Rockville Pike (MD 355) & Talbott Street

| Total Crashes | Total Crashes by Year | | | Total Crashes by User | | |
|---------------|-----------------------|------|------|-----------------------|---------|------------|
| 12 | 2022 | 2023 | 2024 | Auto | Cyclist | Pedestrian |
| | | 6 | 3 | 3 | 11 | 0 |

| Total Crashes by Severity | | | | |
|---------------------------|---------|-------|-----------------|-----------------|
| Fatal | Serious | Minor | Possible Injury | Property Damage |
| 1 | 0 | 2 | 0 | 9 |

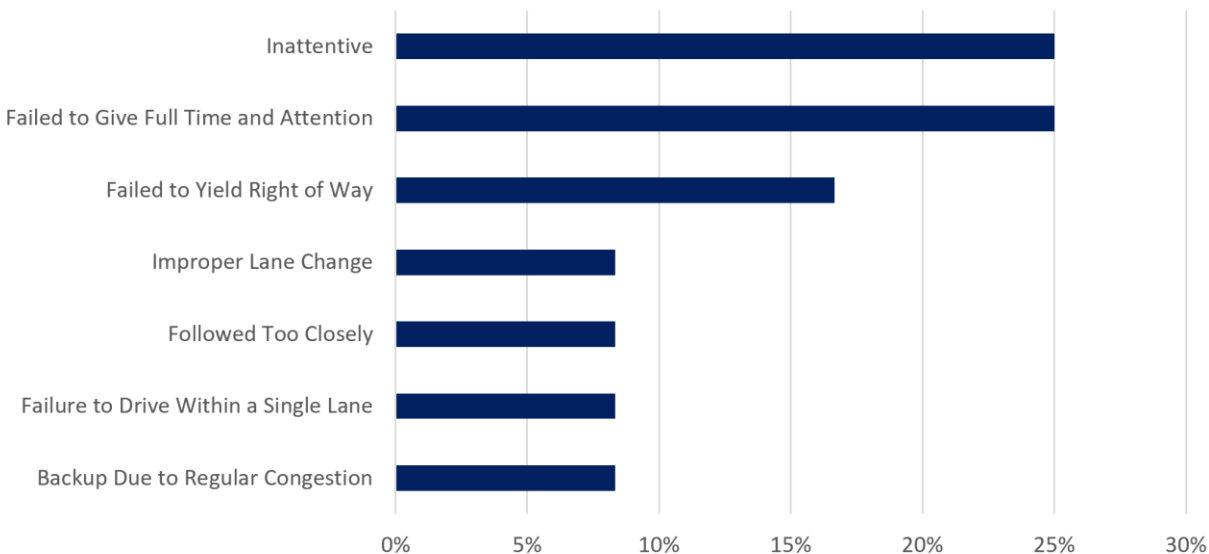
| Same Direction Rear End | Angle | Angle Meets Right Turn | Other |
|-------------------------|-------|------------------------|-------|
| 6 | 4 | 1 | 1 |

| Lighting | | Road Surface | | |
|----------|----------------|--------------|-----|---------|
| Daylight | Dark Lights On | Dry | Wet | Unknown |
| 7 | 5 | 9 | 2 | 1 |

Note: Crash summaries are based on the available crash data reviewed for this study. Reported crash totals and locations may vary across source datasets due to differences in reporting methods, geocoding, and intersection buffers.

Figure 169 illustrates the percentage of crashes accounting for each contributing circumstance associated with crashes at the intersection during the 2022–2024 study period. A single crash may involve multiple contributing circumstances, as documented in the crash reports. As shown in the figure, almost all contributing circumstances were related to driver behavior, with the most common being inattentive driving and failure to give full time and attention, followed by failure to yield right-of-way. Other contributing factors included improper lane changes, following too closely, failure to drive within a single lane, and congestion-related conditions, each occurring less frequently.

Figure 169. Percentage of Crashes Accounting for Each Contributing Circumstance at Intersection #26 - Rockville Pike (MD 355) & Talbott Street



NEAR-MISS VIDEO ANALYSIS

Post-Encroachment Time (PET), which measures the temporal separation between two users occupying the same conflict area, was used to assess the severity of these interactions and is calculated only when both users pass through the same conflict point. Based on 24-hour video observations at the Rockville Pike (MD 355) & Talbott Street intersection, a total of 102 near-miss events were identified, including 69 vehicle-to-vehicle conflicts, 28 vehicle-to-pedestrian conflicts, and 5 vehicle-to-bicyclist conflicts, as summarized in Table 198. Vehicle-to-vehicle interactions were the most common, with relatively few conflicts involving vulnerable road users (pedestrians and bicyclists). Most (90) observed conflicts fall within the 2.0–3.0 second PET range. Conflicts with a PET of less than 2 seconds are generally considered indicative of a higher risk of crash. A total of 12 conflicts fall within this range at the intersection. Notably, half of these higher-risk conflicts (6 out of 12) involved pedestrians, indicating notable exposure for vulnerable road users at the intersection.

Table 198. Summary of Near Misses for a Day (24-hours) at Intersection #26 - Rockville Pike (MD 355) & Talbott Street

| Post Encroachment Time (PET) | Vehicle-Vehicle | Vehicle-Pedestrian | Vehicle-Bicyclist | Total |
|------------------------------|-----------------|--------------------|-------------------|------------|
| 0.0 - 1.5s | 0 | 0 | 0 | 0 |
| 1.5 - 2.0s | 6 | 6 | 0 | 12 |
| 2.0 - 3.0s | 63 | 22 | 5 | 90 |
| Total | 69 | 28 | 5 | 102 |

Based on video analysis of near-miss events, Table 199 summarizes the most frequent conflict types observed at the intersection. The highest number of conflicts (34) occurred between southbound left-turning vehicles and northbound through vehicles. The next two most frequent conflicts involved northbound left-turning vehicles interacting with southbound through vehicles (19 conflicts) and eastbound left-turning vehicles interacting with southbound through vehicles (14 conflicts). All of the top conflicts involve interactions between turning and opposing through movements, indicating a consistent pattern of conflict. In addition, the dominance of these movements suggests that turning vehicle operations, particularly left turns, are a key safety concern at the intersection.

Table 199. Top Three Conflict Types by Movements based on Near Miss Video Analysis at Intersection #26 - Rockville Pike (MD 355) & Talbott Street.

| Conflict Rank | Movement 1 | Movement 2 | Conflicts |
|---------------|-----------------|--------------------|-----------|
| 1. | Southbound Left | Northbound Through | 34 |
| 2. | Northbound Left | Southbound Through | 19 |
| 3. | Eastbound Left | Southbound Through | 14 |

EXISTING TRAFFIC OPERATIONS

Table 200 shows the results of traffic operations analysis for this intersection based on existing lane configurations and peak-hour traffic volumes. The northbound and southbound approaches run freely with no delay, while the eastbound and westbound stop-controlled approaches experience heavy delays.

Table 200. Results of Traffic Operation Analysis at Intersection #26 - Rockville Pike (MD 355) & Talbott Street

| Approach | Movement | Weekday AM Peak Hour | | | Weekday PM Peak Hour | | |
|-----------------------------|-------------------------|----------------------|----------|----------------------------|----------------------|----------|----------------------------|
| | | Delay (sec) | LOS | 95th Percentile Queue (ft) | Delay (sec) | LOS | 95th Percentile Queue (ft) |
| Eastbound | Eastbound Through | 416.3 | F | - | 1159.3 | F | - |
| | Overall Approach | 416.3 | F | | 1159.3 | F | |
| Westbound | Westbound Through | 101.1 | F | - | 200.0 | F | - |
| | Overall Approach | 101.1 | F | | 200.0 | F | |
| Northbound | Northbound Through | 0.0 | A | - | 0.0 | A | - |
| | Overall Approach | 0.8 | - | | 0.7 | - | |
| Southbound | Southbound Through | 0.0 | - | - | 0.0 | - | - |
| | Overall Approach | 1.0 | - | | 1.8 | - | |
| Overall Intersection | | 9.4 | D | | 27.0 | E | |

LOS = Level of Service

= 95th percentile volume exceeds capacity, queue may be longer

SITE VISIT OBSERVATIONS

A site visit was conducted on 5/18/2026 to document existing conditions for people walking, people biking, and people driving. Photos of the site visit are included in Appendix F and in Figure 170 and Figure 171.

During the site visit, the team observed that the transit stops on both sides of MD 355 generate pedestrian crossing demand, with at least one pedestrian observed crossing. Additionally, drivers making left turns from the eastbound or westbound minor approaches were observed waiting extended periods to find gaps in 3-4 lanes of conflicting high-speed traffic, with some of them "refuging" in the middle of the intersection to perform two-stage left turns.

Figure 170. Eastbound left-turning drivers waiting for a gap in traffic at Intersection #26 - Rockville Pike (MD 355) & Talbott Street



Figure 171. Drivers using the median as a 'refuge' at Intersection #26 - Rockville Pike (MD 355) & Talbott Street



IDENTIFIED SAFETY ISSUES

Key safety issues and other findings are shown in Table 201 and described below.

Table 201. Key Safety Issues for Intersection #26 - Rockville Pike (MD 355) & Talbott Street

| Issue ID | Safety Issue | Safety Issue Type | Crash Data | Near-Miss Video | Site Visit |
|-------------|---|---------------------------------------|------------|-----------------|------------|
| 26-A | Pedestrians are not provided a crosswalk at this intersection, or anywhere near it. Pedestrians were observed crossing here. A pedestrian fatality was recorded in the last three years. Transit stops on both sides of MD 355 contribute to pedestrian crossing demand here. | 5.1 Pedestrian: Intersection Crossing | ✓ | ✓ | ✓ |
| 26-B | Drivers making left turns from the eastbound or westbound minor approaches were observed to wait long periods to find gaps in 3-4 lanes of conflicting high-speed traffic. Multiple drivers were observed to 'refuge' in the middle of this intersection, performing two-stage left turns from the minor approaches. Vehicles staged here conflicted with other traffic on MD 355. | 2 Conflicts Between Users | ✓ | ✓ | ✓ |
| 26-C | There are no crosswalk pavement markings on the minor approaches. There is no stop sign or stop bar on the westbound approach. Near-miss videos show drivers encroaching on pedestrians as they cross the minor approaches. | 5.1 Pedestrian: Intersection Crossing | | ✓ | ✓ |
| 26-D | There are no object markers on the medians. Crashes have been recorded involving drivers colliding with medians. | 8.7 Conflict Type: Fixed Object | ✓ | | ✓ |

Bold indicates a priority safety issue.

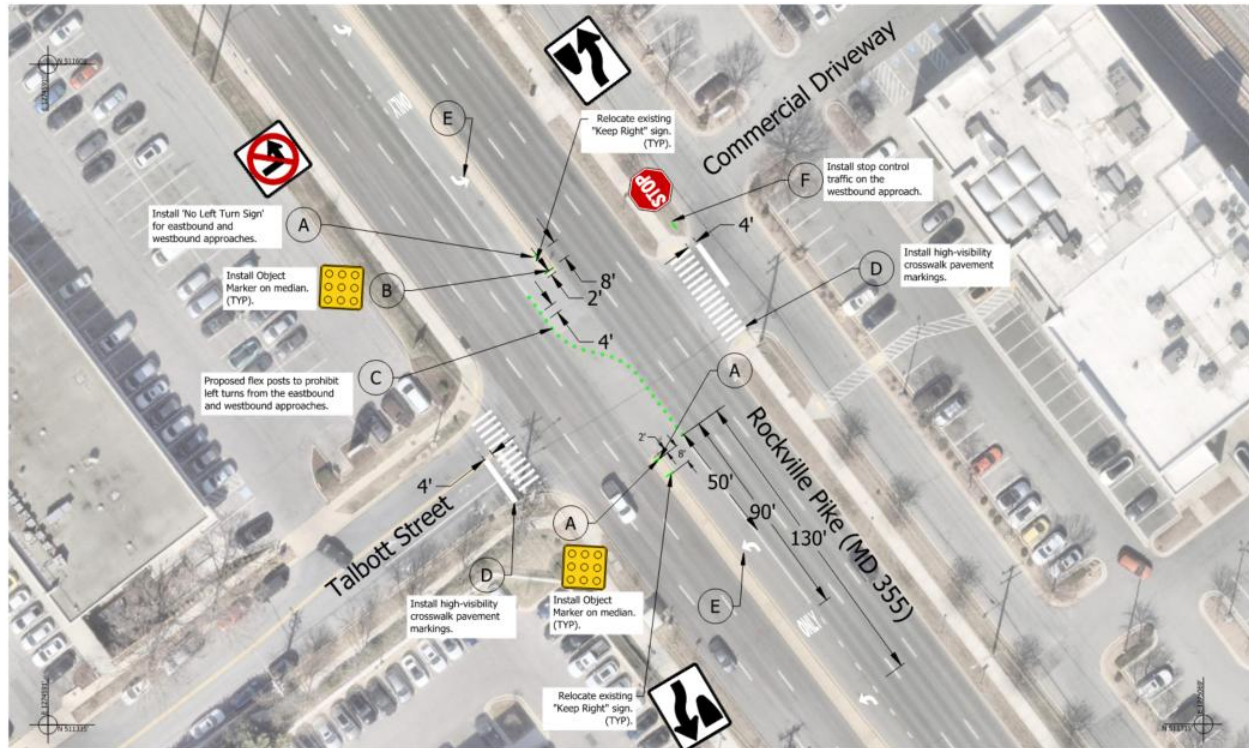
Recommendations

SHORT-TERM RECOMMENDATIONS

Figure 172 illustrates the proposed short-term, quick-build improvements for the Rockville Pike (MD 355) & Talbott Street intersection, with additional detail provided in Table 202. The short-term concept focuses on using flex posts to prohibit drivers from turning left from the eastbound and westbound approaches.

These recommendations rely on low-cost, implementable treatments (signing, striping, and delineation) to reduce driver uncertainty, improve yielding compliance, and make pedestrian crossings more visible and predictable.

Figure 172. Short-Term Recommendations for Intersection #26 - Rockville Pike (MD 355) & Talbott Street



LEGEND

- (A) Proposed "No Left Turn" (R3-2): 36" X 36"

(B) Proposed Object Markers (OM1-1): 18" X 18"

(C) Proposed flex post.
- (D) Proposed high-visibility crosswalk. (See Detail A)

(E) Proposed 'Left Turn Only' pavement markings.

(F) Proposed Stop Sign (R1-1): 30" X 30"

Table 202. Short-Term Recommendations for Intersection #26 - Rockville Pike (MD 355) & Talbott Street

| Rec. ID | Recommendation | Safety issue(s) addressed |
|---------|---|---------------------------|
| 26-S-1 | Install flex posts and requisite signs along the median to prohibit left turns from the minor approaches. | 26-B |
| 26-S-2 | Add a crosswalk to the eastbound approach. | 26-C |
| 26-S-3 | Add a crosswalk, stop bar, and stop sign to the westbound approach. | 26-C |
| 26-S-4 | Add object markers to the medians at this intersection. | 26-D |

COST ESTIMATE

Table 203 provides a planning-level cost estimate for the short-term recommendations, based on item quantities and recent Maryland SHA price index sheets, and excludes contingency and mobilization.

Table 203. Planning-Level Cost Estimate at Intersection #26 - Rockville Pike (MD 355) & Talbott Street

| Item | Description | Unit | Unit Cost | Quantity | Cost |
|------------------|-----------------------------------|------|-----------|----------|-------------------|
| Pavement Marking | 24" Stop Bar | LF | \$21.75 | 64 | \$1,392.00 |
| Pavement Marking | Turn arrow marking | EACH | \$395.15 | 4 | \$1,580.60 |
| Pavement Marking | ONLY' marking (letter) | EACH | \$375.23 | 2 | \$750.46 |
| Sign | New sign post | EACH | \$193.76 | 4 | \$775.04 |
| Sign | Left turns prohibited sign [R3-2] | EACH | \$320.00 | 1 | \$320.00 |
| Sign | Object marker sign [OM1-3] | EACH | \$180.00 | 2 | \$360.00 |
| Sign | Stop Sign [R1-1] | EACH | \$500.00 | 1 | \$500.00 |
| Total: | | | | | \$5,678.09 |

LONG-TERM RECOMMENDATIONS

Figure 173 illustrates the proposed long-term capital improvements for the Rockville Pike (MD 355) & Talbott Street intersection. The long-term concept focuses on adding a pedestrian hybrid beacon, prohibiting left turns off MD 355, and moving RideOn stops closer to signalized intersections (Table 204).

Figure 173. Long-Term Recommendations for Intersection #26 - Rockville Pike (MD 355) & Talbott Street



LEGEND

- A** Install a Pedestrian Hybrid Beacon (PHB), high-visibility crosswalk, and stop bars.

Table 204. Long-Term Recommendations for Intersection #26 - Rockville Pike (MD 355) & Talbott Street

| Rec. ID | Recommendation | Safety issue(s) addressed |
|---------|---|---------------------------|
| 26-L-1 | Explore adding a crosswalk and a pedestrian hybrid beacon (PHB) at this location. | 26-A |
| 26-L-2 | Consider relocating the transit stops here to be closer to a signalized intersection. | 26-A |

#27 - WEST MONTGOMERY AVENUE (MD 28) & HURLEY AVENUE

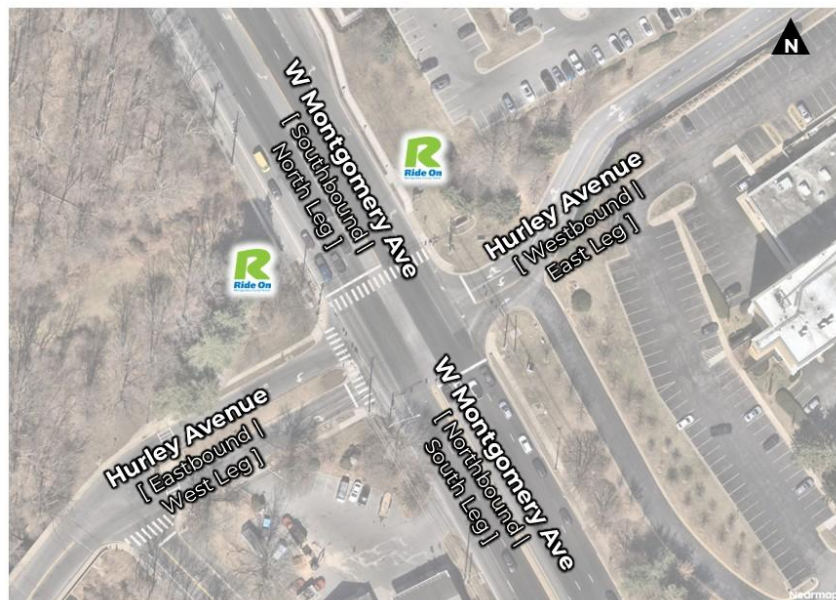
Existing Conditions

INTERSECTION DESCRIPTION

The intersection of West Montgomery Avenue (MD 28) & Hurley Avenue is shown in Figure 174. West Montgomery Avenue is classified as a principal arterial with a speed limit of 45 MPH and six lanes in addition to one designated northbound left-turn lane and one designated southbound left-turn lane. Hurley Avenue is classified as a minor collector with a speed limit of 25 MPH, two lanes, with a designated left-turn lane on the eastbound approach and a designated right-turn lane on the westbound approach³. This intersection is signalized. In 2024, Annual Average Daily Traffic (AADT) on West Montgomery Avenue was 44,330 and 5,805 on Hurley Avenue¹.

According to the Rockville Comprehensive Land Use Policy Map², land use immediately to the east of the intersection is “Office, Commercial, and Residential Mix,” immediately to the southwest is “Commercial,” and immediately to the northwest is “Public Park.” There are two RideOn bus stops north of the intersection serving routes 54 and 63 and two other bus stops west of the intersection serving route 45. There are sidewalks on all legs of the intersection, and crosswalks on the north and west legs.

Figure 174. #27 - West Montgomery Avenue (MD 28) & Hurley Avenue Intersection



SAFETY REVIEW

A total of 15 crashes were recorded at the intersection during the three-year period from 2022 to 2024. The reported crashes primarily involved automobiles, with one (1) pedestrian-related crash and no cyclist-related crashes. Most of the crashes resulted in property-damage-only (PDO) outcomes, with three (3) possible injury crashes reported over the study period.

Table 205 summarizes the crash characteristics, including collision types, lighting conditions, and roadway surface conditions.

Table 205. Summary of Three-Year (2022-24) Crashes at Intersection #27 - West Montgomery Avenue (MD 28) & Hurley Avenue

| Total Crashes | Total Crashes by Year | | | Total Crashes by User | | |
|---------------|-----------------------|------|------|-----------------------|---------|------------|
| 15 | 2022 | 2023 | 2024 | Auto | Cyclist | Pedestrian |
| | | 3 | 5 | 7 | 14 | 0 |

| Total Crashes by Severity | | | | |
|---------------------------|---------|-------|-----------------|-----------------|
| Fatal | Serious | Minor | Possible Injury | Property Damage |
| 0 | 0 | 0 | 3 | 12 |

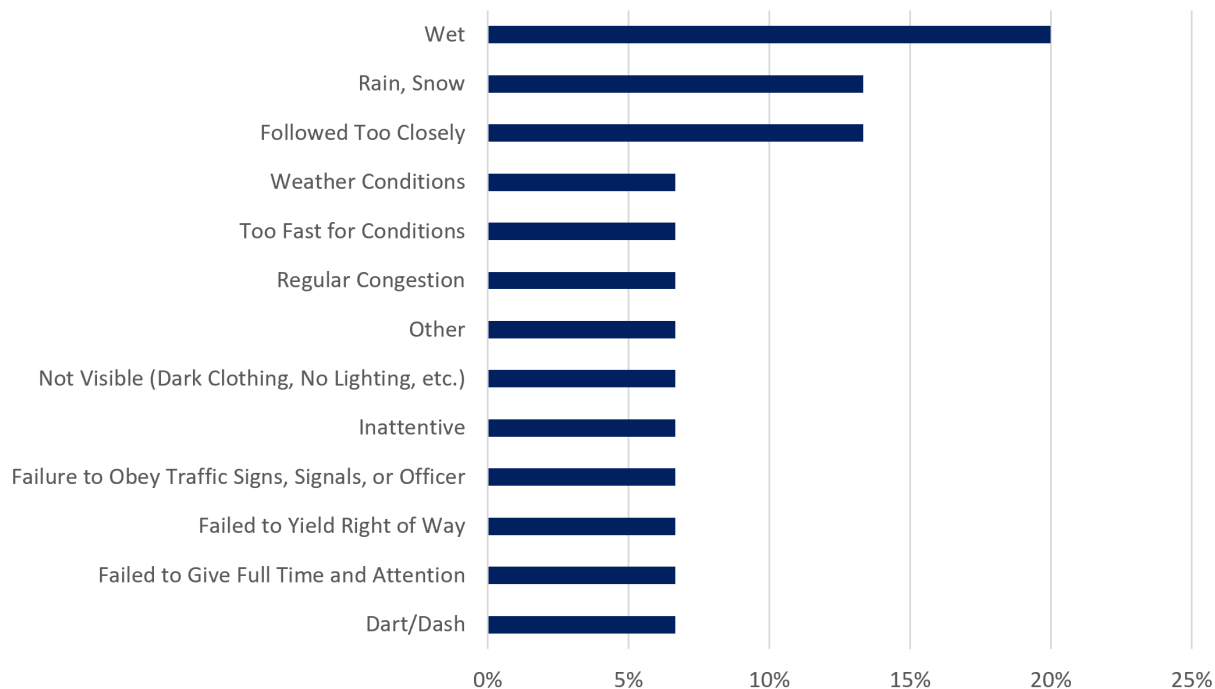
| Same Direction Rear End | Angle | Sideswipe, Same Direction | Single Vehicle | Other |
|-------------------------|-------|---------------------------|----------------|-------|
| 5 | 3 | 3 | 2 | 2 |

| | | | Road Surface | |
|----------|----------------|------|--------------|-----|
| Daylight | Dark Lights On | Dusk | Dry | Wet |
| 10 | 4 | 1 | 11 | 4 |

Note: Crash summaries are based on the available crash data reviewed for this study. Reported crash totals and locations may vary across source datasets due to differences in reporting methods, geocoding, and intersection buffers.

Figure 175 illustrates the percentage of crashes accounting for each contributing circumstance associated with crashes at the intersection during the 2022–2024 study period. A single crash may involve multiple contributing circumstances, as documented in the crash reports. As shown in the figure, the most common contributing circumstance was wet roadway conditions, followed by rain/snow conditions and following too closely. Other contributing factors included general weather conditions, driving too fast for conditions, and regular congestion, as well as various driver-related behaviors such as inattentiveness, failure to yield right-of-way, and failure to obey traffic control devices, each occurring less frequently.

Figure 175. Percentage of Crashes Accounting for Each Contributing Circumstance at Intersection #27 - West Montgomery Avenue (MD 28) & Hurley Avenue



NEAR-MISS VIDEO ANALYSIS

Post-Encroachment Time (PET), which measures the temporal separation between two users occupying the same conflict area, was used to assess the severity of these interactions and is calculated only when both users pass through the same conflict point. Based on 24-hour video observations at the West Montgomery Avenue (MD 28) & Hurley Avenue intersection, a total of 91 near-miss events were identified, including 66 vehicle-to-vehicle conflicts, 23 vehicle-to-pedestrian conflicts, and 2 vehicle-to-bicyclist conflicts, as summarized in Table 206. Vehicle-to-vehicle interactions were the most common, with relatively few conflicts involving vulnerable road users (pedestrians and bicyclists). Most (81) observed conflicts fall within the 2.0–3.0 second PET range. Conflicts with a PET of less than 2 seconds are generally considered indicative of a higher risk of crash. A total of 10 conflicts fall within this range at the intersection. Notably, half of these higher-risk conflicts (5 out of 10) involved pedestrians, indicating notable exposure for vulnerable road users at the intersection.

Table 206. Summary of Near Misses for a Day (24-hours) at Intersection #27 - West Montgomery Avenue (MD 28) & Hurley Avenue

| Post Encroachment Time (PET) | Vehicle-Vehicle | Vehicle-Pedestrian | Vehicle-Bicyclist | Total |
|------------------------------|-----------------|--------------------|-------------------|-----------|
| 0.0 - 1.5s | 0 | 1 | 0 | 1 |
| 1.5 - 2.0s | 5 | 4 | 0 | 9 |
| 2.0 - 3.0s | 61 | 18 | 2 | 81 |
| Total | 66 | 23 | 2 | 91 |

Based on video analysis of near-miss events, Table 207 summarizes the most frequent conflict types observed at the intersection. The highest number of conflicts (26) occurred between westbound left-turning vehicles and eastbound through vehicles. The next two most frequent conflicts involved southbound left-turning vehicles interacting with northbound through vehicles (22 conflicts) and northbound left-turning vehicles interacting with southbound through vehicles (12 conflicts). All of the top conflicts involve interactions between turning and opposing through movements, indicating a consistent pattern of conflict. In addition, the dominance of these movements suggests that turning vehicle operations, particularly left turns, are a key safety concern at the intersection.

Table 207. Top Three Conflict Types by Movements based on Near Miss Video Analysis at Intersection #27 - West Montgomery Avenue (MD 28) & Hurley Avenue.

| Conflict Rank | Movement 1 | Movement 2 | Conflicts |
|---------------|-----------------|--------------------|-----------|
| 1. | Westbound Left | Eastbound Through | 26 |
| 2. | Southbound Left | Northbound Through | 22 |
| 3. | Northbound Left | Southbound Through | 12 |

EXISTING TRAFFIC OPERATIONS

Table 208 shows the results of traffic operations analysis for this intersection based on existing lane configurations, peak-hour traffic volumes, and signal timing parameters. Drivers at this intersection experience light-to-moderate delays, particularly on the eastbound and westbound approaches.

Table 208. Results of Traffic Operation Analysis at Intersection #27 - West Montgomery Avenue (MD 28) & Hurley Avenue

| Approach | Movement | Weekday AM Peak Hour | | | Weekday PM Peak Hour | | |
|-----------------------------|-------------------------|----------------------|----------|----------------------------|----------------------|----------|----------------------------|
| | | Delay (sec) | LOS | 95th Percentile Queue (ft) | Delay (sec) | LOS | 95th Percentile Queue (ft) |
| Eastbound | Eastbound Through | 52.7 | D | 115 | 54.9 | D | 151 |
| | Eastbound Right | 41.8 | D | 151 | 32.3 | C | 96 |
| | Overall Approach | 45.2 | D | | 42.5 | D | |
| Westbound | Westbound Through | 56.3 | E | 137 | 63.4 | E | 203 |
| | Westbound Right | 44.7 | D | 0 | 39.9 | D | 4 |
| | Overall Approach | 54.7 | D | | 58.8 | E | |
| Northbound | Northbound Left | 11.6 | B | 71 | 30.7 | C | 146 |
| | Northbound Through | 6.6 | A | 281 | 10.2 | B | 397 |
| | Overall Approach | 6.9 | A | | 11.8 | B | |
| Southbound | Southbound Left | 12.6 | B | 24 | 18.3 | B | 23 |
| | Southbound Through | 14.7 | B | 417 | 20.7 | C | 486 |
| | Overall Approach | 14.7 | B | | 20.6 | C | |
| Overall Intersection | | 14.3 | B | | 19.2 | B | |

LOS = Level of Service
 # = 95th percentile volume exceeds capacity, queue may be longer

SITE VISIT OBSERVATIONS

A site visit was conducted on 5/18/2026 to document existing conditions for people walking, people biking, and driving. Photos of the site visit are included in Appendix F and in Figure 176.

During the site visit, the team observed that southbound left-turning drivers must find gaps in three lanes of northbound traffic, creating a challenging maneuver. There is no crosswalk on the northbound approach, and the westbound approach lacks crosswalk pavement markings and pedestrian signal heads despite ramps directing pedestrians to cross this leg. Additionally, a protected eastbound right-turn signal phase overlaps with a northbound left protected turning phase, creating potential conflicts with U-turning drivers.

Figure 176. Missing crosswalk on the westbound approach at Intersection #27 - West Montgomery Avenue (MD 28) & Hurley Avenue



IDENTIFIED SAFETY ISSUES

Key safety issues and other findings are shown in Table 209 and described below.

Table 209. Key Safety Issues for Intersection #27 - West Montgomery Avenue (MD 28) & Hurley Avenue

| Issue ID | Safety Issue | Safety Issue Type | Crash Data | Near-Miss Video | Site Visit |
|----------|---|---------------------------------------|------------|-----------------|------------|
| 27-A | Southbound left-turning drivers must find a gap in three lanes of northbound traffic to navigate this intersection. | 2 Conflicts Between Users | | | ✓ |
| 27-B | There is no crosswalk pavement markings or pedestrian signal heads on the westbound approach, despite ramps leading pedestrians across this leg. | 5.1 Pedestrian: Intersection Crossing | | | ✓ |
| 27-C | A protected eastbound right-turn signal phase overlaps with a northbound left protected turning phase, causing potential conflicts with northbound U-turning drivers. The sign that is in place to warn these u-turning drivers of this conflict may be confusing. | 2 Conflicts Between Users | | | ✓ |
| 27-D | There are no object markers on the northbound approach median. Crashes have been recorded involving drivers colliding with this median. | 8.7 Conflict Type: Fixed Object | ✓ | | ✓ |
| 27-E | There is no crosswalk on the northbound approach. | 5.1 Pedestrian: Intersection Crossing | | | ✓ |
| 27-F | The northwest and southeast corners have wide radii. Drivers were observed to make high-speed southbound right turns. | 3 Roadway Design | | | ✓ |
| 27-G | All of the signals at this intersection are mounted on span wires, causing them to be less visible to drivers and sometimes sway in the wind. | 7 User Behavior | | | ✓ |

Bold indicates a priority safety issue.

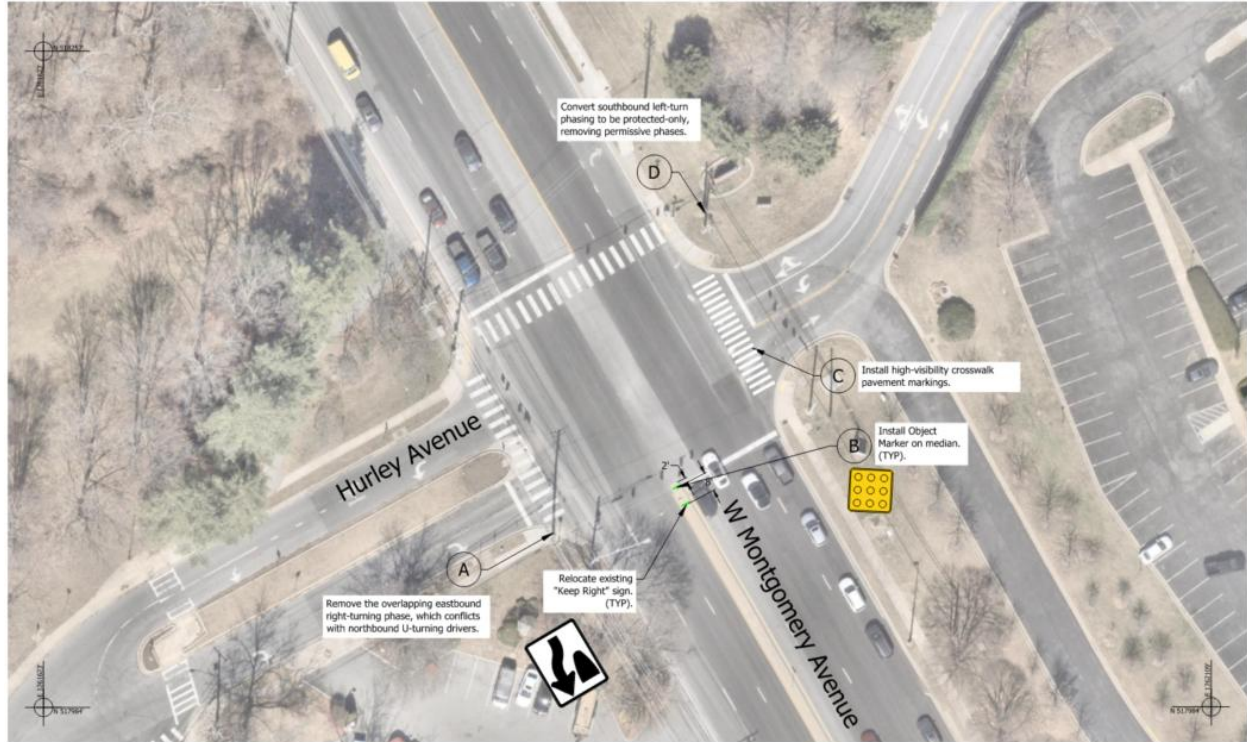
Recommendations

SHORT-TERM RECOMMENDATIONS

Figure 177 illustrates the proposed short-term, quick-build improvements for the West Montgomery Avenue (MD 28) & Hurley Avenue intersection, with additional detail provided in Table 210. The short-term concept focuses on adding crosswalk pavement markings to the westbound approach and adjusting the signal timing to reduce potential conflicts.

These recommendations rely on low-cost, implementable treatments (signing, striping, and delineation) to reduce driver uncertainty, improve yielding compliance, and make pedestrian crossings more visible and predictable.

Figure 177. Short-Term Recommendations for Intersection #27 - West Montgomery Avenue (MD 28) & Hurley Avenue



LEGEND

- (A)** Proposed high-visibility crosswalk
- (C)** Proposed high-visibility crosswalk. (See Detail A)
- (B)** Proposed Object Markers (OM1-1): 18" X 18"
- (D)** Proposed left-turn phasing to be protected-only.

Table 210. Short-Term Recommendations for Intersection #27 - West Montgomery Avenue (MD 28) & Hurley Avenue

| Rec. ID | Recommendation | Safety issue(s) addressed |
|---------------|--|---------------------------|
| 27-S-1 | Install high-visibility crosswalk pavement markings on the westbound approach. | 27-B |
| 27-S-2 | Remove the overlapping protected eastbound right-turning phase, which conflicts with northbound U-turning drivers. | 27-C |
| 27-S-3 | Install an object marker on the northbound approach median. | 27-D |
| 27-S-4 | Adjust the left-turn signal timing for the SBL movement to be protected-only, removing the permissive phase. | 27-A |

COST ESTIMATE

Table 211 provides a planning-level cost estimate for the short-term recommendations, based on item quantities and recent Maryland SHA price index sheets, and excludes contingency and mobilization.

Table 211. Planning-Level Cost Estimate at Intersection #27 - West Montgomery Avenue (MD 28) & Hurley Avenue

| Item | Description | Unit | Unit Cost | Quantity | Cost |
|------------------|----------------------------|------|-----------|----------|-------------------|
| Pavement Marking | 24" Stop Bar | LF | \$21.75 | 140 | \$3,045.00 |
| Sign | New sign post | EACH | \$193.76 | 1 | \$193.76 |
| Sign | Object marker sign [OM1-3] | EACH | \$180.00 | 1 | \$180.00 |
| Other | Flex Post | EACH | \$39.67 | 23 | \$912.44 |
| Other | Adjust signal timing | EACH | \$- | 1 | \$- |
| Total: | | | | | \$4,331.20 |

TRAFFIC IMPACT ANALYSIS

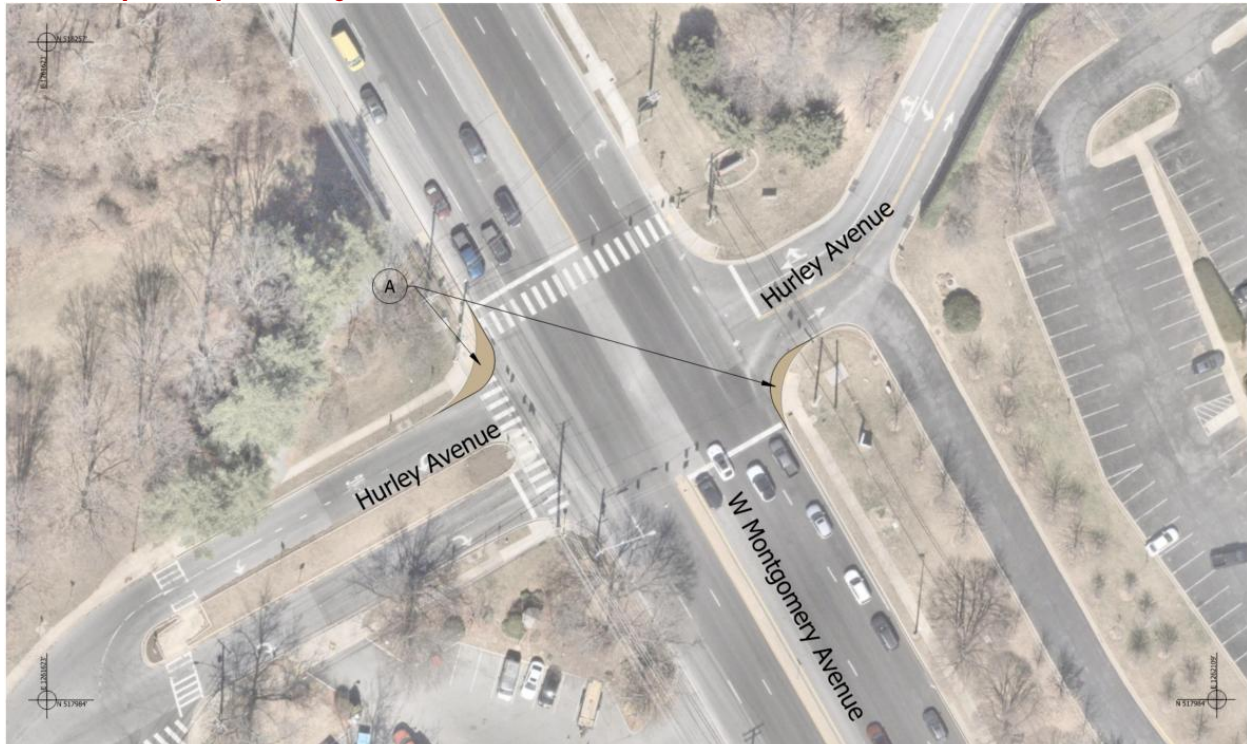
It was recommended that the left-turn signal timing for the northbound left movement to be adjusted to be protected-only, removing the permissive phase. Included below is the anticipated increase in delay (in seconds) for the southbound left-turn movement. While the delays do increase substantially, this adjustment is justifiable considering only 13 and 11 vehicles perform this movement in the AM and PM peaks, respectively.

- AM Peak: 12.6 → 15.2
- PM Peak: 18.3 → 21.1

LONG-TERM RECOMMENDATIONS

Figure 178 illustrates the proposed long-term capital improvements for the West Montgomery Avenue (MD 28) & Hurley Avenue intersection. The long-term concept focuses on improving safety for people walking by installing accessible pedestrian signals and reducing turn radii. Additional considerations include mounting signals on mast arms and changing southbound left-turn movements to protected-only by removing the permissive phase (Table 212).

Figure 178. Long-Term Recommendations for Intersection #27 - West Montgomery Avenue (MD 28) & Hurley Avenue



LEGEND

- (A) Tighten curb radii

Table 212. Long-Term Recommendations for Intersection #27 - West Montgomery Avenue (MD 28) & Hurley Avenue

| Rec. ID | Recommendation | Safety issue(s) addressed |
|---------|---|---------------------------|
| 27-L-1 | Install pedestrian push buttons and signals for the crosswalk on the westbound approach. | 27-B |
| 27-L-2 | Consider redesigning the northwest and southeast corners to have reduced radii. | 27-F |
| 27-L-3 | In future projects, adjust the traffic signals at this intersection to be mounted on mast arms instead of span wires. | 27-G |

#28 - HUNGERFORD DRIVE (MD 355) & FREDERICK AVENUE

Existing Conditions

INTERSECTION DESCRIPTION

The intersection of Hungerford Drive (MD 355) & Frederick Avenue is shown in Figure 179. Hungerford Drive is classified as a principal arterial with a speed limit of 35 MPH and six lanes in addition to designated northbound and southbound left-turn lanes. Frederick Avenue is classified as local with a speed limit of 25 MPH and two lanes on the east leg³. The intersection is signalized, and there is no west leg. In 2024, Annual Average Daily Traffic (AADT) on Hungerford Drive was 39,320¹.

According to the Rockville Comprehensive Land Use Policy Map², land use on all sides surrounding the intersection is “Office, Commercial and Residential Mix.” There are RideOn bus stops on the north and south legs of the intersection serving Routes 40, 45, 46, and 55. There are sidewalks on all sides of the intersection and crosswalks on the west, south, and north legs.

Figure 179. #28 - Hungerford Drive (MD 355) & Frederick Avenue Intersection



SAFETY REVIEW

A total of 16 crashes were recorded at the intersection during the three-year period from 2022 to 2024. The reported crashes primarily involved automobiles, with one (1) pedestrian-related crash and one (1) cyclist-related crash. Most of the crashes resulted in property-damage-only (PDO) outcomes, with three (3) minor injury crashes, three (3) possible injury crashes, and one (1) serious injury crash reported over the study period.

Table 213 summarizes the crash characteristics, including collision types, lighting conditions, and roadway surface conditions.

Table 213. Summary of Three-Year (2022-24) Crashes at Intersection #28 - Hungerford Drive (MD 355) & Frederick Avenue

| Total Crashes | Total Crashes by Year | | | Total Crashes by User | | |
|---------------|-----------------------|------|------|-----------------------|---------|------------|
| 16 | 2022 | 2023 | 2024 | Auto | Cyclist | Pedestrian |
| | 5 | 7 | 4 | 14 | 1 | 1 |

| Total Crashes by Severity | | | | |
|---------------------------|---------|-------|-----------------|-----------------|
| Fatal | Serious | Minor | Possible Injury | Property Damage |
| 0 | 1 | 3 | 3 | 9 |

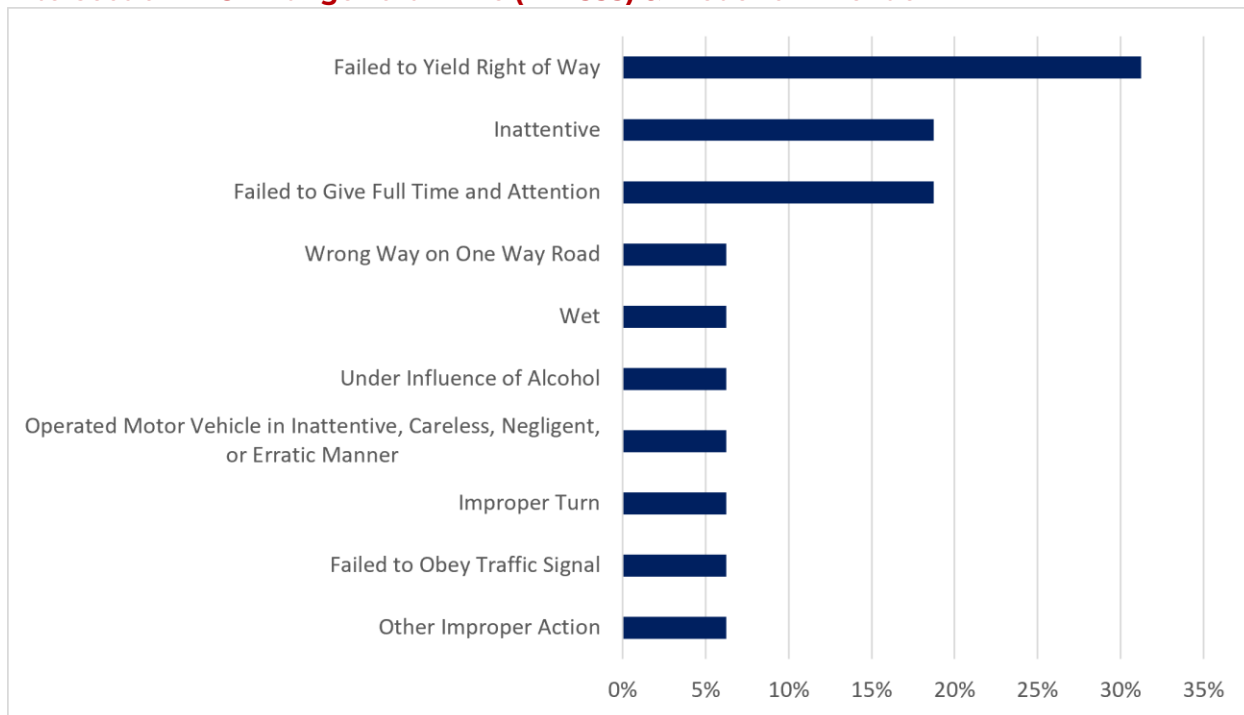
| Same Direction Rear End | Head On Left Turn | Same Direction Right Turn | Sideswipe, Same Direction | Angle | Other |
|-------------------------|-------------------|---------------------------|---------------------------|-------|-------|
| 4 | 3 | 1 | 1 | 1 | 6 |

| Lighting | | Road Surface | | |
|----------|----------------|--------------|-----|---------|
| Daylight | Dark Lights On | Dry | Wet | Unknown |
| 15 | 1 | 13 | 1 | 2 |

Note: Crash summaries are based on the available crash data reviewed for this study. Reported crash totals and locations may vary across source datasets due to differences in reporting methods, geocoding, and intersection buffers.

Figure 180 illustrates the percentage of crashes accounting for each contributing circumstance associated with crashes at the intersection during the 2022–2024 study period. A single crash may involve multiple contributing circumstances, as documented in the crash reports. As shown in the figure, the most common contributing circumstance was failure to yield right-of-way, followed by inattentive driving and failure to give full time and attention. Other contributing factors included wrong-way driving on a one-way road, wet roadway conditions, and various driver-related behaviors such as impairment, improper turning, and failure to obey traffic signals, each occurring less frequently.

Figure 180. Percentage of Crashes Accounting for Each Contributing Circumstance at Intersection #28 - Hungerford Drive (MD 355) & Frederick Avenue



NEAR-MISS VIDEO ANALYSIS

Post-Encroachment Time (PET), which measures the temporal separation between two users occupying the same conflict area, was used to assess the severity of these interactions and is calculated only when both users pass through the same conflict point. Based on 24-hour video observations at the Hungerford Drive (MD 355) & Frederick Avenue intersection, a total of 203 near-miss events were identified, including 67 vehicle-to-vehicle conflicts, 126 vehicle-to-pedestrian conflicts, and 10 vehicle-to-bicyclist conflicts, as summarized in Table 214. Vehicle-to-pedestrian interactions were the most common, indicating that pedestrians were the most affected group. Most (158) observed conflicts fall within the 2.0–3.0 second PET range. Conflicts with a PET of less than 2 seconds are generally considered indicative of a higher risk of crash. A total of 45 conflicts fall within this range at the intersection. Notably, a substantial majority of these higher-risk conflicts (33 out of 45) involved pedestrians or bicyclists, highlighting elevated conflict severity for vulnerable road users at the intersection.

Table 214. Summary of Near Misses for a Day (24-hours) at Intersection #28 - Hungerford Drive (MD 355) & Frederick Avenue

| Post Encroachment Time (PET) | Vehicle-Vehicle | Vehicle-Pedestrian | Vehicle-Bicyclist | Total |
|------------------------------|-----------------|--------------------|-------------------|------------|
| 0.0 - 1.5s | 3 | 13 | 0 | 16 |
| 1.5 - 2.0s | 9 | 19 | 1 | 29 |
| 2.0 - 3.0s | 55 | 94 | 9 | 158 |
| Total | 67 | 126 | 10 | 203 |

Based on video analysis of near-miss events, Table 215 summarizes the most frequent conflict types observed at the intersection. The highest number of conflicts (59) occurred between southbound left-turning vehicles and northbound through vehicles. The next two most frequent conflicts involved south leg pedestrians interacting with westbound left-turning vehicles (16 conflicts) and north leg pedestrians interacting with eastbound left-turning vehicles (14 conflicts). When combined, these pedestrian-related conflicts account for 30 occurrences, indicating a heightened risk for pedestrians across multiple crosswalks at the intersection. In addition, the presence of conflicts involving left turning vehicles suggests that left turning movements are a key safety concern at the intersection.

Table 215. Top Three Conflict Types by Movements based on Near Miss Video Analysis at Intersection #28 - Hungerford Drive (MD 355) & Frederick Avenue.

| Conflict Rank | Movement 1 | Movement 2 | Conflicts |
|---------------|----------------------|--------------------|-----------|
| 1. | Southbound Left | Northbound Through | 59 |
| 2. | South Leg Pedestrian | Westbound Left | 16 |
| 3. | North Leg Pedestrian | Eastbound Left | 14 |

EXISTING TRAFFIC OPERATIONS

Table 216 shows the results of traffic operations analysis for this intersection based on existing lane configurations, peak-hour traffic volumes, and signal timing parameters. The northbound and southbound approaches experience low delays, while drivers on the eastbound and westbound approaches experience moderate delays.

Table 216. Results of Traffic Operation Analysis at Intersection #28 - Hungerford Drive (MD 355) & Frederick Avenue

| Approach | Movement | Weekday AM Peak Hour | | | Weekday PM Peak Hour | | |
|-----------------------------|-------------------------|----------------------|----------|----------------------------|----------------------|----------|----------------------------|
| | | Delay (sec) | LOS | 95th Percentile Queue (ft) | Delay (sec) | LOS | 95th Percentile Queue (ft) |
| Eastbound | Eastbound Left | 68.5 | E | 31 | 65.3 | E | 61 |
| | Eastbound Through | 67.3 | E | 32 | 62.9 | E | 32 |
| | Overall Approach | 68.0 | E | | 64.3 | E | |
| Westbound | Westbound Left | 70.7 | E | 55 | 73.3 | E | 119 |
| | Westbound Through | 67.4 | E | 24 | 63.1 | E | 39 |
| | Overall Approach | 69.6 | E | | 69.9 | E | |
| Northbound | Northbound Left | 3.0 | A | 7 | 3.8 | A | 26 |
| | Northbound Through | 4.1 | A | 105 | 7.3 | A | 290 |
| | Overall Approach | 4.1 | A | | 7.1 | A | |
| Southbound | Southbound Left | 2.2 | A | 11 | 5.4 | A | 28 |
| | Southbound Through | 5.4 | A | 242 | 6.3 | A | 200 |
| | Overall Approach | 5.4 | A | | 6.3 | A | |
| Overall Intersection | | 6.1 | A | | 9.5 | A | |

LOS = Level of Service

= 95th percentile volume exceeds capacity, queue may be longer

SITE VISIT OBSERVATIONS

A site visit was conducted on May 12, 2026. It was noted that there were recent changes to the intersection infrastructure, including upgraded curb ramps, signals, and crosswalk pavement marking. Despite this, there were several instances observed where pedestrians crossed the intersection and stopped in the middle of the roadway between moving vehicles due to long crossing distances, including one pedestrian positioned in the middle of the south leg and another in a similar position on the north leg. Bicyclists were observed navigating around constrained sidewalk areas near curb ramps and bus stops on both the east and west sides.

Infrastructure and marking deficiencies were also noted during the visit. Crosswalks on all legs were observed to lack transverse lines, and existing markings were faded. Pavement markings for northbound and southbound left-turn lanes were missing directional arrows, limiting clarity for drivers and potentially contributing to observed conflicts. Overall, the combination of turning conflicts, long pedestrian crossings without refuge, bicyclists

operating in constrained spaces, and inadequate pavement markings suggests a need for targeted improvements to enhance safety and better define space for all users.

Photos in Appendix F and in Figure 181, Figure 182, and Figure 183 document observations from the site visit.

Figure 181. Long pedestrian crosswalks across Hungerford Drive #28 - Hungerford Drive (MD 355) & Frederick Avenue



Figure 182. Pedestrian crossing south leg without signal and caught in the middle of the Hungerford Drive #28 - Hungerford Drive (MD 355) & Frederick Avenue



Figure 183. Steady pedestrian activity boarding and deboarding buses at northbound and southbound bus stops #28 - Hungerford Drive (MD 355) & Frederick Avenue



IDENTIFIED SAFETY ISSUES

Key safety issues and other findings are shown in Table 217 and described below.

Table 217. Key Safety Issues for Intersection #28 - Hungerford Drive (MD 355) & Frederick Avenue

| Issue ID | Safety Issue | Safety Issue Type | Crash Data | Near-Miss Video | Site Visit |
|-------------|--|---|------------|-----------------|------------|
| 28-A | One pedestrian crash from 2022 to 2024 | 2.2 Conflicts Between Users: Drivers and Pedestrians | ✓ | | |
| 28-B | One cyclist crash from 2022 to 2024 | 2.3 Conflicts Between Users: Drivers and Bicyclists | ✓ | | |
| 28-C | Three instances of head on left turn crashes from 2022 to 2024 and 59 instances of near misses between southbound left-turn vehicles and northbound through vehicles | 8.2 Conflict Type: Left Turn | ✓ | ✓ | |
| 28-D | East leg, north leg, west leg, and south leg pedestrian crosswalk lack transverse lines and high visibility pavement marking is faded | 5.1 Pedestrian: Intersection Crossing | | | ✓ |
| 28-E | At least one pedestrian observed in the middle of south leg crosswalk between northbound and southbound through vehicles and one pedestrian in similar position in north leg crosswalk | 5.1.1 Pedestrian: Intersection Crossing (Long Crossing) | | | ✓ |
| 28-F | Multiple bicyclists observed maneuvering around sidewalk area near curb ramps and bus stops on east side and west side | 6.2 Bicyclist: Insufficient bicycle facilities | | | ✓ |
| 28-G | Northbound and southbound left-turn lanes lack pavement marking arrows | 3 Roadway Design | | | ✓ |
| 28-H | No parking sign is missing on east leg | 3.2 Roadway Design: Pedestrian Visibility | | | ✓ |
| 28-I | East leg stop bar is not parallel with crosswalk | 3.2 Roadway Design: Pedestrian Visibility | | | ✓ |
| 28-J | Curb cut for driveway on north leg is close to intersection, presenting potential conflicts between vehicles and pedestrians | 2.2 Conflicts Between Users: Drivers and Pedestrians | | | ✓ |

Bold indicates a priority safety issue.

Recommendations

SHORT-TERM RECOMMENDATIONS

Figure 184 illustrates the proposed short-term, quick-build improvements for the Hungerford Drive (MD 355) & Frederick Avenue intersection, with additional detail provided in Table 218. The short-term concept focuses on

These recommendations rely on low-cost, implementable treatments (signing, striping, and delineation) to reduce driver uncertainty, improve yielding compliance, and make pedestrian crossings more visible and predictable.

Figure 184. Short-Term Recommendations for Intersection #28 - Hungerford Drive (MD 355) & Frederick Avenue



LEGEND

- (A)** Proposed parking restriction signs (R7-1): 12" x 30"
- (B)** Realign stop bar
- (C)** Proposed turn lane pavement markings
- (D)** Proposed dedicated SBL signal phase

Table 218. Short-Term Recommendations for Intersection #28 - Hungerford Drive (MD 355) & Frederick Avenue

| Rec. ID | Recommendation | Safety issue(s) addressed |
|---------|---|---------------------------|
| 28-S-1 | Install left arrow and ONLY letter pavement markings for lane configuration on southbound and northbound approaches | 28-G |
| 28-S-2 | Upgrade all existing crosswalks to high-visibility pavement markings (with transverse lines) | 28-D |
| 28-S-3 | Realign the stop bar to parallel the crosswalk on east leg | 28-I |
| 28-S-4 | Install No Parking sign near intersection on east leg | 28-H |
| 28-S-5 | Add a protected left-turn phase for the southbound left-turn traffic | 28-C |

COST ESTIMATE

Table 219 provides a planning-level cost estimate for the short-term recommendations, based on item quantities and recent Maryland SHA price index sheets, and excludes contingency and mobilization.

Table 219. Planning-Level Cost Estimate at Intersection #28 - Hungerford Drive (MD 355) & Frederick Avenue

| Item | Description | Unit | Unit Cost | Quantity | Cost |
|------------------|--------------------------------|------|-----------|----------|-------------------|
| Pavement Marking | 24" Stop Bar | LF | \$21.75 | 23 | \$500.25 |
| Pavement Marking | 5" double yellow marking | LF | \$4.60 | 9 | \$41.40 |
| Pavement Marking | Turn arrow marking | EACH | \$395.15 | 3 | \$1,185.45 |
| Pavement Marking | ONLY' marking (letter) | EACH | \$375.23 | 2 | \$750.46 |
| Pavement Marking | Pavement Marking Removal | LF | \$6.00 | 20 | \$120.00 |
| Sign | New sign post | EACH | \$193.76 | 1 | \$193.76 |
| Sign | Parking regulation sign [R7-1] | EACH | \$120.00 | 1 | \$120.00 |
| Other | Adjust signal timing | EACH | \$- | 1 | \$- |
| Total: | | | | | \$2,911.32 |

LONG-TERM RECOMMENDATIONS

Figure 185 illustrates the proposed long-term capital improvements for the Hungerford Drive (MD 355) & Frederick Avenue intersection. The long-term concept focuses on creating pedestrian refuge islands and closing a gas station curb cut near to the north leg of the intersection (Table 220).

Figure 185. Long-Term Recommendations for Intersection #28 - Hungerford Drive (MD 355) & Frederick Avenue



LEGEND

- A** Extend the medians and add pedestrian refuge islands on existing high-visibility crosswalk
- B** Consider closing curb cut to remove entrance/exit driveway

Table 220. Long-Term Recommendations for Intersection #28 - Hungerford Drive (MD 355) & Frederick Avenue

| Rec. ID | Recommendation | Safety issue(s) addressed |
|---------|--|---------------------------|
| 28-L-1 | Consider extending the median for a pedestrian refuge island on north and south 28-A, 28-B, 28-legs. | E |
| 28-L-2 | Consider closing curb cut on north leg near intersection. | 28-J |

#29 - VEIRS MILL ROAD (MD 586) & WOODBURN ROAD

Existing Conditions

INTERSECTION DESCRIPTION

The intersection of Veirs Mill Road (MD 586) & Woodburn Road is shown in Figure 186. Veirs Mill Road is classified as a principal arterial with a speed limit of 35 MPH and four lanes, plus one eastbound left-turn lane. Veirs Mill Road is also served by a westbound one-way frontage road at the intersection. Woodburn Road is classified as a local road with a speed limit of 25 MPH and two lanes³. This intersection is unsignalized. In 2024, Annual Average Daily Traffic (AADT) on Veirs Mill Road was 25,090 and was not measured on Woodburn Road¹.

According to the Rockville Comprehensive Land Use Policy Map², land use immediately surrounding all sides of the intersection is “Residential Attached.” There are two RideOn bus stops west of the intersection serving route 40 in either direction. There are sidewalks on all legs of the intersection, and a crosswalk on the east leg. There is a civic center one block to the north.

Figure 186. #29 - Veirs Mill Road (MD 586) & Woodburn Road Intersection



SAFETY REVIEW

Only one (1) crash was recorded at the intersection during the three-year period from 2022 to 2024. The reported crash involved an automobile and resulted in a property-damage-only (PDO) outcome. Table 221 summarizes the crash characteristics, including collision types, lighting conditions, and roadway surface conditions. There were no reported contributing circumstances related to the one crash at the intersection.

Table 221. Summary of Three-Year (2022-24) Crashes at Intersection #29 - Veirs Mill Road (MD 586) & Woodburn Road

| Total Crashes | Total Crashes by Year | | | Total Crashes by User | | |
|---------------|-----------------------|------|------|-----------------------|---------|------------|
| 1 | 2022 | 2023 | 2024 | Auto | Cyclist | Pedestrian |
| | 0 | 0 | 1 | 1 | 0 | 0 |

| Total Crashes by Severity | | | | |
|---------------------------|---------|-------|-----------------|-----------------|
| Fatal | Serious | Minor | Possible Injury | Property Damage |
| 0 | 0 | 0 | 0 | 1 |

| Total Crashes by Collision Type | Lighting | Road Surface |
|---------------------------------|----------|--------------|
| Sideswipe, Same Direction | Daylight | Dry |
| 1 | 1 | 1 |

Note: Crash summaries are based on the available crash data reviewed for this study. Reported crash totals and locations may vary across source datasets due to differences in reporting methods, geocoding, and intersection buffers.

NEAR-MISS VIDEO ANALYSIS

Post-Encroachment Time (PET), which measures the temporal separation between two users occupying the same conflict area, was used to assess the severity of these interactions and is calculated only when both users pass through the same conflict point. Based on 24-hour video observations at the Veirs Mill Road (MD 586) & Woodburn Road intersection, a total of 32 near-miss events were identified, including 13 vehicle-to-vehicle conflicts, 17 vehicle-to-pedestrian conflicts, and 2 vehicle-to-bicyclist conflicts, as summarized in Table 222. Vehicle-to-pedestrian interactions were the most common, indicating that pedestrians were the most affected group. Most (29) observed conflicts fall within the 2.0–3.0 second PET range. Conflicts with a PET of less than 2 seconds are generally considered indicative of a higher risk of crash. A total of 3 conflicts fall within this range at the intersection. Notably, all of these higher-risk conflicts (3 out of 3) involved pedestrians or bicyclists, highlighting elevated conflict severity for vulnerable road users at the intersection.

Table 222. Summary of Near Misses for a Day (24-hours) at Intersection #29 - Veirs Mill Road (MD 586) & Woodburn Road

| Post Encroachment Time (PET) | Vehicle-Vehicle | Vehicle-Pedestrian | Vehicle-Bicyclist | Total |
|------------------------------|-----------------|--------------------|-------------------|-----------|
| 0.0 - 1.5s | 0 | 0 | 0 | 0 |
| 1.5 - 2.0s | 0 | 2 | 1 | 3 |
| 2.0 - 3.0s | 13 | 15 | 1 | 29 |
| Total | 13 | 17 | 2 | 32 |

Based on video analysis of near-miss events, Table 223 summarizes the most frequent conflict types observed at the intersection. The highest number of conflicts (10) occurred

between eastbound left-turning vehicles and westbound through vehicles. The next two most frequent conflicts involved eastbound through vehicles interacting with east leg (EL) pedestrians (9 conflicts) and westbound through vehicles interacting with east leg pedestrians (7 conflicts). When combined, these pedestrian-related conflicts account for 16 occurrences, indicating a heightened risk for pedestrians at the east leg crosswalk. The top conflict movement pairs indicate that conflicts are not limited to a single movement type but are widespread across both turning and through vehicle movements, reflecting broader operational safety concerns at the intersection.

Table 223. Top Three Conflict Types by Movements based on Near Miss Video Analysis at Intersection #29 - Veirs Mill Road (MD 586) & Woodburn Road.

| Conflict Rank | Movement 1 | Movement 2 | Conflicts |
|---------------|-------------------|---------------------|-----------|
| 1. | Eastbound Left | Westbound Through | 10 |
| 2. | Eastbound Through | East Leg Pedestrian | 9 |
| 3. | Westbound Through | East Leg Pedestrian | 7 |

EXISTING TRAFFIC OPERATIONS

Table 224 shows the results of traffic operations analysis for this intersection based on existing lane configurations and peak-hour traffic volumes. The eastbound and westbound approaches run freely with no delay, while the northbound and southbound stop-controlled approaches experience heavy delays.

Table 224. Results of Traffic Operation Analysis at Intersection #29 - Veirs Mill Road (MD 586) & Woodburn Road

| Approach | Movement | Weekday AM Peak Hour | | | Weekday PM Peak Hour | | |
|-----------------------------|-------------------------|----------------------|----------|----------------------------|----------------------|----------|----------------------------|
| | | Delay (sec) | LOS | 95th Percentile Queue (ft) | Delay (sec) | LOS | 95th Percentile Queue (ft) |
| Eastbound | Eastbound Through | 0.0 | B | - | 0.0 | C | - |
| | Overall Approach | 0.1 | B | | 0.3 | C | |
| Westbound | Westbound Through | 0.0 | - | - | 0.0 | - | - |
| | Overall Approach | 0.0 | - | | 0.0 | - | |
| Southbound | Southbound Left | 13.9 | - | - | 17.4 | - | - |
| | Overall Approach | 13.9 | - | | 17.4 | - | |
| Overall Intersection | | 0.2 | A | | 0.3 | B | |

LOS = Level of Service

= 95th percentile volume exceeds capacity, queue may be longer

SITE VISIT OBSERVATIONS

A site visit was conducted on 5/18/2026 to document existing conditions for people walking, people biking, and people driving. Site visit photos are available in Appendix F and in Figure 187.

During the site visit, the team observed that the crosswalk across Veirs Mill Road is located at the crest of a hill, significantly reducing drivers' ability to see crossing pedestrians as they approach at high speeds. This visibility issue is compounded by a landscaped median that may further obstruct sight lines. The intersection also lacks crosswalk and stop bar pavement markings on the southbound minor approach, as well as stop bars for the mainline crosswalk and pedestrian crossing warning signs on the westbound approach.

Figure 187. Uncontrolled crosswalk near the crest of a hill at Intersection #29 - Veirs Mill Road (MD 586) & Woodburn Road



IDENTIFIED SAFETY ISSUES

Key safety issues and other findings are shown in Table 225 and described below.

Table 225. Key Safety Issues for Intersection #29 - Veirs Mill Road (MD 586) & Woodburn Road

| Issue ID | Safety Issue | Safety Issue Type | Crash Data | Near-Miss Video | Site Visit |
|-------------|---|---|------------|-----------------|------------|
| 29-A | Pedestrians crossing Veirs Mill Road at this intersection must find a gap in 4 lanes of high-speed traffic, plus cross the frontage road. There are transit stops on both sides of this crosswalk that contribute to a demand for pedestrians crossings on this crosswalk. | 5.1 Pedestrian: Intersection Crossing | | | ✓ |
| 29-B | The crosswalk across Veirs Mill Road is at the crest of a hill, reducing the visibility of crossing pedestrians to drivers climbing the hill on either side at high speeds. | 3.1 Roadway Design: Inadequate Sight Distance (Lack of Driver Visibility) | | | ✓ |
| 29-C | There are no crosswalk or stop bar pavement markings on the southbound minor approach. | 5.1 Pedestrian: Intersection Crossing | | | ✓ |
| 29-D | The landscaped median may block sight lines of crossing pedestrians. | 3.1 Roadway Design: Inadequate Sight Distance (Lack of Driver Visibility) | | | ✓ |
| 29-E | There are no stop bars accompanying the mainline crosswalk at this intersection. | 5.1 Pedestrian: Intersection Crossing | | | ✓ |
| 29-F | There are no pedestrian crossing warning signs on the westbound approach. | 5.1 Pedestrian: Intersection Crossing | | | ✓ |
| 29-G | In order to turn onto Veirs Mill Road, drivers performing southbound left turns must find a gap in multiple lanes of high-speed traffic. | 2 Conflicts Between Users | | | ✓ |

Bold indicates a priority safety issue.

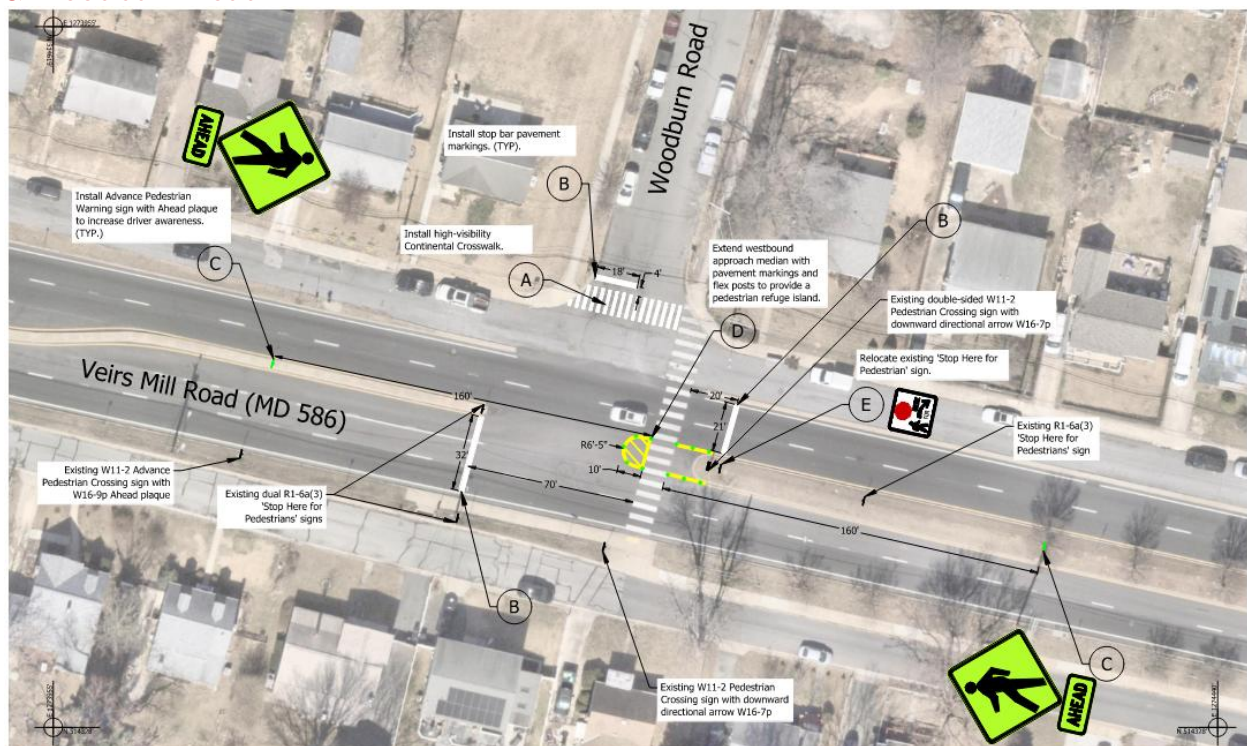
Recommendations

SHORT-TERM RECOMMENDATIONS

Figure 188 illustrates the proposed short-term, quick-build improvements for the Veirs Mill Road (MD 586) & Woodburn Road intersection, with additional detail provided in Table 226. The short-term concept focuses on adding a pedestrian refuge island to the westbound approach.

These recommendations rely on low-cost, implementable treatments (signing, striping, and delineation) to reduce driver uncertainty, improve yielding compliance, and make pedestrian crossings more visible and predictable.

Figure 188. Short-Term Recommendations for Intersection #29 - Veirs Mill Road (MD 586) & Woodburn Road



LEGEND

- | | | |
|---|--|--|
| <p>(A) Proposed Continental Crosswalk (See Detail A)</p> <p>(B) Proposed stop bar pavement markings</p> | <p>(C) Proposed Advance Pedestrian Warning sign (W11-2): 36"x36" with Ahead plaque (W16-9p): 24"x12"</p> <p>(D) Proposed striped median extension with flex posts (See Detail C)</p> | <p>(E) Relocated Stop Here for Pedestrian sign (R1-6a(3)): 30"x30"</p> |
|---|--|--|

Table 226. Short-Term Recommendations for Intersection #29 - Veirs Mill Road (MD 586) & Woodburn Road

| Rec. ID | Recommendation | Safety issue(s) addressed |
|---------|---|---------------------------|
| 29-S-1 | Install high-visibility crosswalk pavement markings on the southbound approach. | 29-C |
| 29-S-2 | Add stop bar pavement markings on both eastbound and westbound approaches. | 29-A |
| 29-S-3 | Install additional advanced pedestrian crossing warning signs on the eastbound and westbound approaches. | 29-F |
| 29-S-4 | Use flex posts and pavement markings to extend the median on the westbound approach to create a pedestrian refuge island. | 29-A |

COST ESTIMATE

Table 227 provides a planning-level cost estimate for the short-term recommendations, based on item quantities and recent Maryland SHA price index sheets, and excludes contingency and mobilization.

Table 227. Planning-Level Cost Estimate at Intersection #29 - Veirs Mill Road (MD 586) & Woodburn Road

| Item | Description | Unit | Unit Cost | Quantity | Cost |
|------------------|--|------|-----------|----------|-------------------|
| Pavement Marking | 24" Stop Bar | LF | \$21.75 | 71 | \$1,544.25 |
| Pavement Marking | 12" Crosswalk | LF | \$6.19 | 120 | \$742.57 |
| Pavement Marking | 5" double yellow marking | LF | \$4.60 | 72 | \$331.20 |
| Pavement Marking | 5" solid marking (yellow) | LF | \$7.00 | 24 | \$168.00 |
| Sign | New sign post | EACH | \$193.76 | 2 | \$387.52 |
| Sign | Relocate sign post | EACH | \$79.54 | 1 | \$79.54 |
| Sign | Advance Pedestrian Warning sign [W11-2] | EACH | \$180.00 | 2 | \$360.00 |
| Sign | Stop Here for Pedestrians sign [R1-6a (3)] | EACH | \$500.00 | 1 | \$500.00 |
| Sign | 'Ahead' plaque (under school zone sign) [W16-9P] | EACH | \$160.00 | 2 | \$320.00 |
| Other | Flex Post | EACH | \$39.67 | 11 | \$436.39 |
| Total: | | | | | \$4,869.47 |

LONG-TERM RECOMMENDATIONS

Figure 189 illustrates the proposed long-term capital improvements for the Veirs Mill Road (MD 586) & Woodburn Road intersection. The long-term concept focuses on adding a pedestrian hybrid beacon and replacing landscaping elements to improve visibility (Table 228).

Figure 189. Long-Term Recommendations for Intersection #29 - Veirs Mill Road (MD 586) & Woodburn Road



Table 228. Long-Term Recommendations for Intersection #29 - Veirs Mill Road (MD 586) & Woodburn Road

| Rec. ID | Recommendation | Safety issue(s) addressed |
|---------|---|---------------------------|
| 29-L-1 | Explore installing a pedestrian hybrid beacon (PHB) at this intersection. | 29-A |
| 29-L-2 | Consider replacing the trees on the westbound approach median with other landscaping elements that do not block visibility. | 29-D |

#30 - ROCKVILLE PIKE (MD 355) & MT. VERNON PLACE

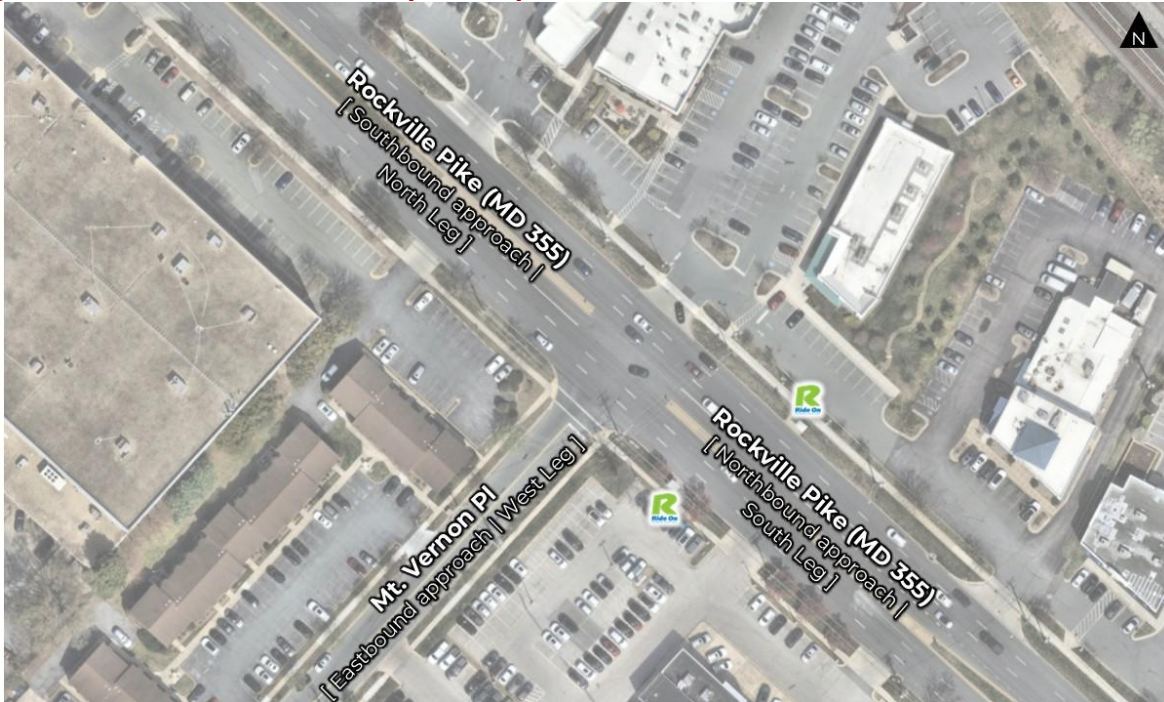
Existing Conditions

INTERSECTION DESCRIPTION

The intersection of Rockville Pike (MD 355) & Mt. Vernon Place is shown in Figure 190. Rockville Pike is classified as a principal arterial with a speed limit of 35 MPH and six lanes in addition to designated northbound and southbound left-turn lanes. Mount Vernon Place is classified as local with a speed limit of 25 MPH and two lanes on the southwest leg³. The intersection is a two-way stop-controlled. In 2024, Annual Average Daily Traffic (AADT) on Rockville Pike was 48,215 and on Mount Vernon Place was 3,075¹.

According to the Rockville Comprehensive Land Use Policy Map², land use on all sides surrounding the intersection is “Office, Commercial and Residential Mix.” There are RideOn bus stops on the north and south legs of the intersection serving Routes 46 and 81. There are sidewalks on all sides of the intersection and a crosswalk on the west leg.

Figure 190. #30 - Rockville Pike (MD 355) & Mt. Vernon Place Intersection



SAFETY REVIEW

A total of 8 crashes were recorded at the intersection during the three-year period from 2022 to 2024. The reported crashes primarily involved automobiles, with one (1) pedestrian-related crash and no cyclist-related crashes. Most of the crashes resulted in property-damage-only (PDO) outcomes, with one (1) possible injury crash reported over the study period.

Table 229 summarizes the crash characteristics, including collision types, lighting conditions, and roadway surface conditions.

Table 229. Summary of Three-Year (2022-24) Crashes at Intersection #30 - Rockville Pike (MD 355) & Mt. Vernon Place

| Total Crashes | Total Crashes by Year | | | Total Crashes by User | | |
|---------------|-----------------------|------|------|-----------------------|---------|------------|
| 8 | 2022 | 2023 | 2024 | Auto | Cyclist | Pedestrian |
| | 2 | 3 | 3 | 12 | 0 | 1 |

| Total Crashes by Severity | | | | |
|---------------------------|---------|-------|-----------------|-----------------|
| Fatal | Serious | Minor | Possible Injury | Property Damage |
| 0 | 0 | 0 | 1 | 7 |

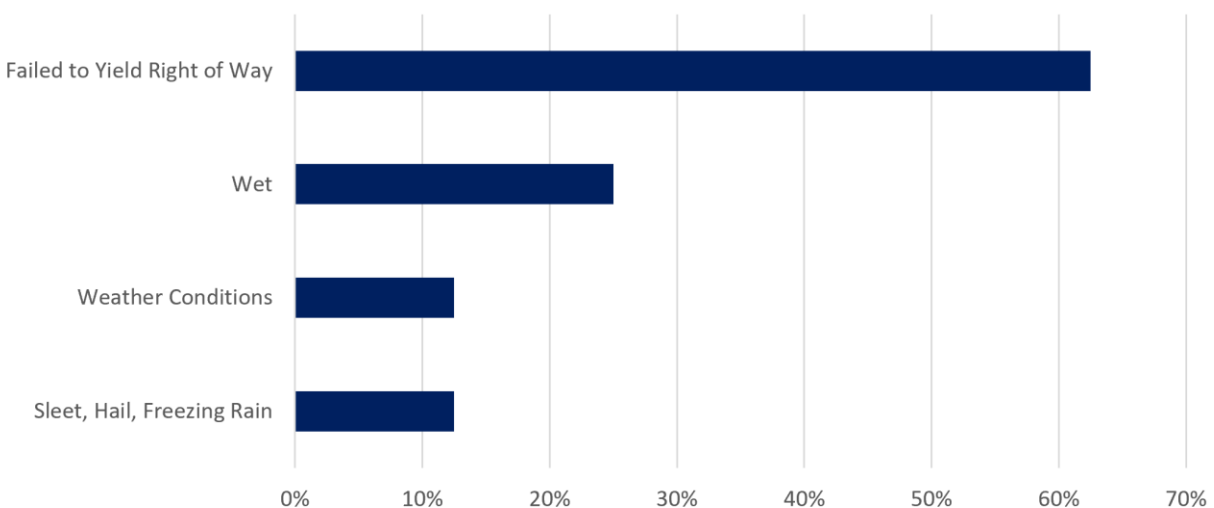
| Angle | Front to Rear | Head On Left Turn |
|-------|---------------|-------------------|
| 4 | 2 | 2 |

| Lighting | | Road Surface | | | |
|----------|------|--------------|-----|-------|---------|
| Daylight | Dusk | Dry | Wet | Slush | Unknown |
| 7 | 1 | 3 | 3 | 1 | 1 |

Note: Crash summaries are based on the available crash data reviewed for this study. Reported crash totals and locations may vary across source datasets due to differences in reporting methods, geocoding, and intersection buffers.

Figure 191 illustrates the percentage of crashes accounting for each contributing circumstance associated with crashes at the intersection during the 2022–2024 study period. A single crash may involve multiple contributing circumstances, as documented in the crash reports. As shown in the figure, the most common contributing factor was failure to yield right-of-way, followed by wet roadway conditions. Other contributing factors included general weather conditions and sleet, hail, or freezing rain, each occurring less frequently.

Figure 191. Percentage of Crashes Accounting for Each Contributing Circumstance at Intersection #30 - Rockville Pike (MD 355) & Mt. Vernon Place



NEAR-MISS VIDEO ANALYSIS

Post-Encroachment Time (PET), which measures the temporal separation between two users occupying the same conflict area, was used to assess the severity of these interactions and is calculated only when both users pass through the same conflict point. Based on 24-hour video observations at the Rockville Pike (MD 355) & Mt. Vernon Place intersection, a total of 76 near-miss events were identified, including 55 vehicle-to-vehicle conflicts, 18 vehicle-to-pedestrian conflicts, and 3 vehicle-to-bicyclist conflicts, as summarized in Table 230. Vehicle-to-vehicle interactions were the most common, with relatively few conflicts involving vulnerable road users (pedestrians and bicyclists). Most (64) observed conflicts fall within the 2.0–3.0 second PET range. Conflicts with a PET of less than 2 seconds are generally considered indicative of a higher risk of crash. A total of 12 conflicts fall within this range at the intersection. Notably, a majority of these higher-risk conflicts (8 out of 12) involved pedestrians, indicating notable exposure for vulnerable road users at the intersection.

Table 230. Summary of Near Misses for a Day (24-hours) at Intersection #30 - Rockville Pike (MD 355) & Mt. Vernon Place

| Post Encroachment Time (PET) | Vehicle-Vehicle | Vehicle-Pedestrian | Vehicle-Bicyclist | Total |
|------------------------------|-----------------|--------------------|-------------------|-----------|
| 0.0 - 1.5s | 0 | 4 | 0 | 4 |
| 1.5 - 2.0s | 4 | 4 | 0 | 8 |
| 2.0 - 3.0s | 51 | 10 | 3 | 64 |
| Total | 55 | 18 | 3 | 76 |

Based on video analysis of near-miss events, Table 231 summarizes the most frequent conflict types observed at the intersection. The highest number of conflicts (29) occurred between northbound left-turning vehicles and southbound through vehicles. The next two most frequent conflicts involved eastbound left-turning vehicles interacting with southbound through vehicles (11 conflicts) and southbound left-turning vehicles interacting with northbound through vehicles (9 conflicts). All of the top conflicts involve interactions between turning and opposing through movements, indicating a consistent pattern of conflict. This pattern suggests that turning vehicle movements, particularly left turns, are a key safety concern at the intersection.

Table 231. Top Three Conflict Types by Movements based on Near Miss Video Analysis at Intersection #30 - Rockville Pike (MD 355) & Mt. Vernon Place.

| Conflict Rank | Movement 1 | Movement 2 | Conflicts |
|---------------|-----------------|--------------------|-----------|
| 1. | Northbound Left | Southbound Through | 29 |
| 2. | Eastbound Left | Southbound Through | 11 |
| 3. | Southbound Left | Northbound Through | 9 |

EXISTING TRAFFIC OPERATIONS

Table 232 shows the results of traffic operations analysis for this intersection based on existing lane configurations, peak-hour traffic volumes, and signal timing parameters. All

approaches operate with moderate delays, except for the northbound and southbound approaches during the PM peak, which experience heavy delays.

Table 232. Results of Traffic Operation Analysis at Intersection #30 - Rockville Pike (MD 355) & Mt. Vernon Place

| Approach | Movement | Weekday AM Peak Hour | | | Weekday PM Peak Hour | | |
|-----------------------------|-------------------------|----------------------|----------|----------------------------|----------------------|----------|----------------------------|
| | | Delay (sec) | LOS | 95th Percentile Queue (ft) | Delay (sec) | LOS | 95th Percentile Queue (ft) |
| Eastbound | Eastbound Through | 9.0 | A | - | 8.9 | A | - |
| | Overall Approach | 9.0 | A | | 8.9 | A | |
| Westbound | Westbound Through | 8.2 | A | - | 8.2 | A | - |
| | Overall Approach | 8.2 | A | | 8.2 | A | |
| Northbound | Northbound Through | 17.0 | B | - | 403.5 | F | - |
| | Overall Approach | 17.0 | B | | 403.5 | F | |
| Southbound | Southbound Through | 15.5 | B | - | 322.3 | F | - |
| | Overall Approach | 15.5 | B | | 322.3 | F | |
| Overall Intersection | | 15.8 | B | | 351.8 | F | |

LOS = Level of Service
 # = 95th percentile volume exceeds capacity, queue may be longer

SITE VISIT OBSERVATIONS

A site visit was conducted on May 12, 2026, to document the behavior and activities of people walking, biking, and driving. The team observed near misses between northbound and southbound left-turning vehicles and opposing through traffic, along with additional conflicts between eastbound left-turning vehicles and southbound through movements. At least one near miss was also observed between a northbound U-turning vehicle and an eastbound right-turning vehicle, highlighting the complexity of vehicle interactions. Vehicle speeds were noted to be elevated.

Pedestrian conditions also presented safety concerns during the site visit. Several pedestrians and bicyclists were observed crossing the west leg, weaving in front of and behind vehicles queued at the eastbound approach. One pedestrian was observed crossing the south leg outside of a marked crosswalk through active traffic, indicating a potential unmet crossing demand. Crosswalk conditions were observed to be substandard on the west leg, where markings were faded and lacked high-visibility treatments, reducing visibility for approaching drivers.

In addition, pavement markings for northbound and southbound left-turn lanes were missing directional arrows, limiting clarity for drivers and potentially contributing to the observed turning conflicts. Overall, the combination of frequent turning conflicts, elevated vehicle speeds, pedestrian activity outside of designated facilities, and faded or missing markings suggests a need for targeted improvements to enhance safety and operational clarity for all users.

Photos in Appendix F and in Figure 192 and Figure 193 document observations from the site visit.

Figure 192. Deteriorated pavement markings on the west leg pedestrian crosswalk and lacking high-visibility design at intersection #30 - Rockville Pike (MD 355) & Mt. Vernon Place



Figure 193. Permitted left turn from Mt. Vernon Place across four lanes of southbound Rockville Pike at intersection #30 - Rockville Pike (MD 355) & Mt. Vernon Place



IDENTIFIED SAFETY ISSUES

Key safety issues and other findings are shown in Table 233 and described below.

Table 233. Key Safety Issues for Intersection #30 - Rockville Pike (MD 355) & Mt. Vernon Place

| Issue ID | Safety Issue | Safety Issue Type | Crash Data | Near-Miss Video | Site Visit |
|-------------|--|---|------------|-----------------|------------|
| 30-A | One pedestrian crash from 2022 to 2024 | 2.2 Conflicts Between Users: Drivers and Pedestrians | ✓ | | |
| 30-B | Four instances of angle crashes from 2022 to 2024 | 8.5 Conflict Type: Angle | ✓ | | |
| 30-C | Two instances of head on left turn crashes from 2022 to 2024 | 8.4 Conflict Type: Left Turn | ✓ | | |
| 30-D | Twenty-nine instances of near misses between northbound left-turn vehicles and southbound through vehicles, | 8.4 Conflict Type: Left Turn | | ✓ | |
| 30-E | Eleven instances of near misses between eastbound left-turn vehicles and southbound through vehicles | 8.4 Conflict Type: Left Turn | | ✓ | |
| 30-F | Nine instances of near misses between southbound left-turn vehicles and northbound through vehicles | 8.4 Conflict Type: Left Turn | | ✓ | |
| 30-G | At least two near misses observed between northbound U-turn vehicles and eastbound right-turn vehicles | 8.8 Conflict Type: U-Turn | | | ✓ |
| 30-H | Northbound and southbound vehicles observed traveling above posted 30MPH | 1.1 Speeds, Severity, and Compliance: High Vehicle Speeds | | | ✓ |
| 30-I | At least one pedestrian observed crossing the south leg without a crosswalk between northbound and southbound through vehicles | 2.2 Conflicts Between Users: Drivers and Pedestrians | | | ✓ |
| 30-J | West leg crosswalk lacks high visibility pattern and pavement marking faded | 5.1 Pedestrian: Intersection Crossing | | | ✓ |
| 30-K | Northbound and southbound left-turn lanes lack pavement marking arrows | Pavement marking | | | ✓ |
| 30-L | Object markers are lacking on MD 355 | 3.4 Roadway Design: Night Time Visibility | | | ✓ |
| 30-M | Vegetation on northwest corner reduces sight distance | 3.1 Roadway Design: Inadequate Sight Distance (Lack of Driver Visibility) | | | ✓ |

Bold indicates a priority safety issue.

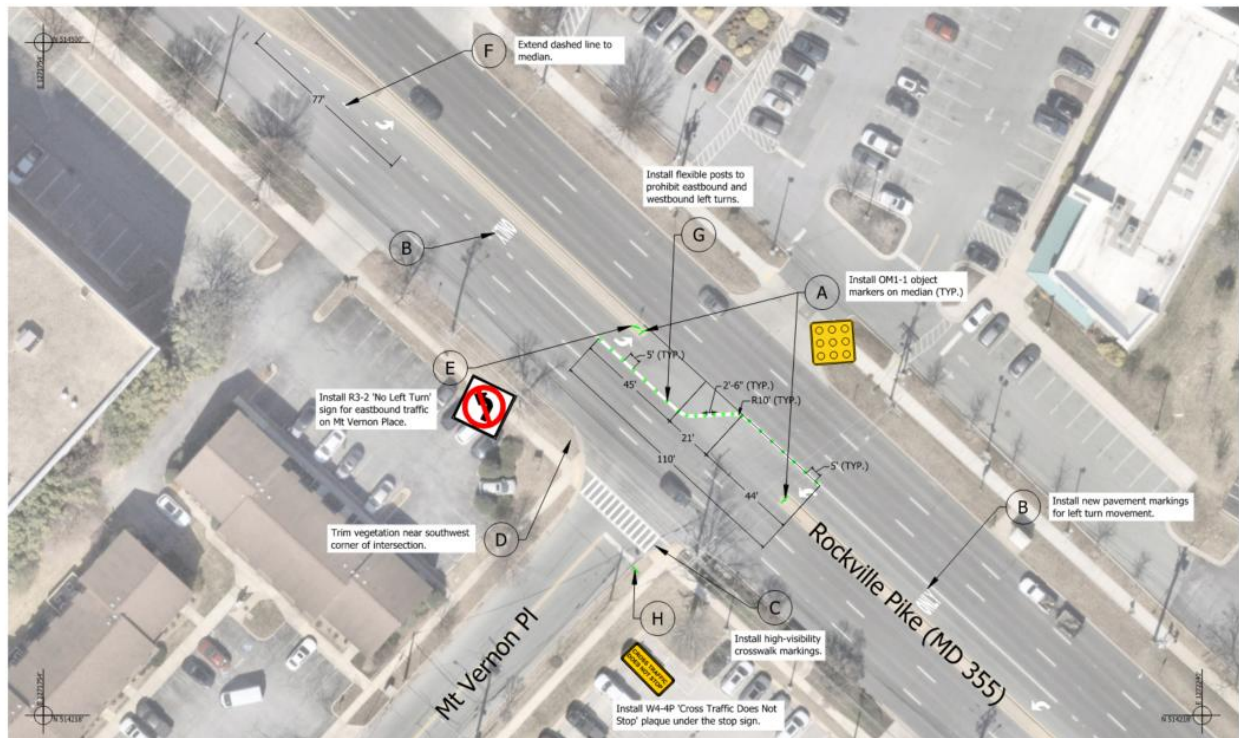
Recommendations

SHORT-TERM RECOMMENDATIONS

Figure 194 illustrates the proposed short-term, quick-build improvements for the Rockville Pike (MD 355) & Mt. Vernon Place intersection, with additional detail provided in Table 234. The short-term concept focuses on

These recommendations rely on low-cost, implementable treatments (signing, striping, and delineation) to reduce driver uncertainty, improve compliance with yield requirements, and make pedestrian crossings more visible and predictable.

Figure 194. Short-Term Recommendations for Intersection #30 - Rockville Pike (MD 355) & Mt. Vernon Place



LEGEND

- | | | |
|---|---|--|
| (A) Proposed object markers (OM1-1): 18" x 18" | (D) Vegetation maintenance for sight distance | (G) Install flexible posts as shown in drawing |
| (B) Proposed turn lane pavement markings | (E) Proposed No Left Turn sign (R3-2): 24" x 36" | (H) Install Cross Traffic Does not Stop plaque (W4-4P): 24" x 12" |
| (C) Proposed crosswalk markings. See Detail A. | (F) Proposed turn lane marking extension | |

Table 234. Short-Term Recommendations for Intersection #30 - Rockville Pike (MD 355) & Mt. Vernon Place

| Rec. ID | Recommendation | Safety issue(s) addressed |
|---------|---|---------------------------|
| 30-S-1 | Extend dashed lane line to where the median ends on southbound left-turn lane | 30-C, 30-D, 30-F, 30-K |
| 30-S-2 | Install flexible posts along the proposed location in the short-term figure as show | 30-E |
| 30-S-3 | Install left arrow and ONLY letter pavement markings for lane configuration on northbound and southbound approaches | 30-C, 30-D, 30-F, 30-K |
| 30-S-4 | Install a No Left Turn sign on the north leg median facing Mount Vernon Place | 30-E |
| 30-S-5 | Install Object Markers on the median of MD 355 | 30-L |
| 30-S-6 | Install Cross Traffic Does not Stop (W4-4P) plaque under the stop sign | 30-B, 30-H |
| 30-S-7 | Upgrade the existing crosswalk to a high visibility crosswalk on west leg | 30-J |
| 30-S-8 | Trim vegetation near the northwest corner to provide more sight distance | 30-M |

COST ESTIMATE

Table 235 provides a planning-level cost estimate for the short-term recommendations, based on item quantities and recent Maryland SHA price index sheets, and excludes contingency and mobilization.

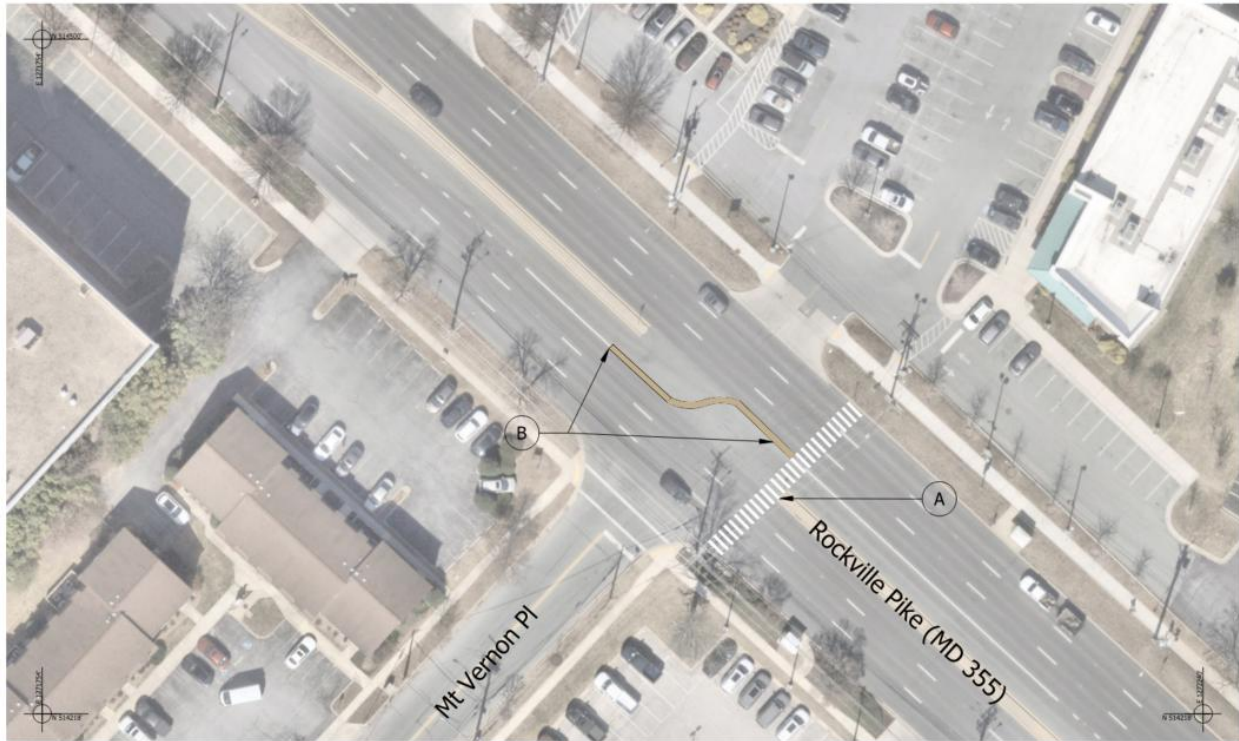
Table 235. Planning-Level Cost Estimate at Intersection #30 - Rockville Pike (MD 355) & Mt. Vernon Place

| Item | Description | Unit | Unit Cost | Quantity | Cost |
|------------------|-----------------------------------|------|-----------|----------|-------------------|
| Pavement Marking | 12" Crosswalk | LF | \$6.19 | 160 | \$990.09 |
| Pavement Marking | 5" solid marking (white) | LF | \$7.00 | 96 | \$672.00 |
| Pavement Marking | 5" dashed marking (white) | LF | \$1.75 | 14 | \$24.50 |
| Pavement Marking | Turn arrow marking | EACH | \$395.15 | 4 | \$1,580.60 |
| Pavement Marking | ONLY' marking (letter) | EACH | \$375.23 | 2 | \$750.46 |
| Sign | Left turns prohibited sign [R3-2] | EACH | \$320.00 | 1 | \$320.00 |
| Sign | Object marker sign [OM1-3] | EACH | \$180.00 | 2 | \$360.00 |
| Other | Flex Post | EACH | \$39.67 | 22 | \$872.77 |
| Total: | | | | | \$5,570.42 |

LONG-TERM RECOMMENDATIONS

Figure 195 illustrates the proposed long-term capital improvements for the Rockville Pike (MD 355) & Mt. Vernon Place intersection. The long-term concept focuses on either upgrading to a signalized intersection or extending the existing median to prohibit all left turns at the intersection, along with adding a high-visibility crosswalk and a pedestrian hybrid beacon (Table 236).

Figure 195. Long-Term Recommendations for Intersection #30 - Rockville Pike (MD 355) & Mt. Vernon Place



LEGEND

- (A)** Install high-visibility crosswalk paired with a PHB (HAWK) signal
- (B)** Install/extend concrete median to prohibit left turns at the intersection

Table 236. Long-Term Recommendations for Intersection #30 - Rockville Pike (MD 355) & Mt. Vernon Place

| Rec. ID | Recommendation | Safety issue(s) addressed |
|---------|--|---------------------------|
| 30-L-1 | Consider installing a high-visibility crosswalk at the south leg paired with a Pedestrian Hybrid Beacon (HAWK) signal. | 30-I |

References

| # | Reference | Link |
|---|--|---|
| 1 | MDOT SHA Annual Average Daily Traffic (AADT) Map | https://www.arcgis.com/apps/mapviewer/index.html?layers=77010abe7558425997b4fcdab02e2b64 |
| 2 | Rockville Comprehensive Land Use Policy Map | https://rockvillemd.maps.arcgis.com/apps/webappviewer/index.html?id=5f8f889535ec48c8a32fd9703e30cc7e |
| 3 | MDOT SHA Roadway Functional Classification | https://data.imap.maryland.gov/datasets/maryland::mdot-sha-roadway-functional-classification/explore?location=38.841470%2C-77.259997%2C8 |

Appendix A Improvement Matrix

Appendix B Crash Data

Appendix C Near-Miss Data

Appendix D Traffic Count Data

Appendix E Traffic
Operations
Analysis
Worksheets

Appendix F Site Visit
Comments &
Photos

Appendix G Maintenance Items

