VEIRS MILL ROAD

VISION ZERO INITIATIVE

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BACKGROUND

The Veirs Mill Vision Zero Initiative is a safety-focused study that is being conducted in parallel and in collaboration with the Veirs Mill Corridor Master Plan; the Initiative aligns with the east and west boundaries of the master plan, from Galt Avenue/ College View Drive to Twinbrook Parkway. The primary difference between the two projects is that the Vision Zero Initiative is narrowly focused on roadway safety, whereas the Veirs Mill Corridor Master Plan will create a comprehensive view of the land use, transportation and community facilities in the plan area, with a focus on neighborhood access to existing and anticipated transit, improved connectivity, a comprehensive streetscape, and limited potential redevelopment opportunities.

This report includes both Short-Term Safety interventions to improve safety quickly, and a Long-Term Concept for creating a safe Veirs Mill Road corridor.

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CHAPTER 1

VISION ZERO HISTORY AND METHODS

1.1 WHAT IS VISION ZERO?

According to the Vision Zero Network, "Vision Zero is a strategy to eliminate all traffic fatalities and severe injuries, while increasing safe, healthy, equitable mobility for all. First implemented in Sweden in the 1990s, Vision Zero has proved successful across Europe — and now it's gaining momentum in major American cities."[1] As shown in Exhibit 1, Montgomery County is one of the only suburban jurisdictions in the United States to have adopted Vision Zero.

Vision Zero seeks to use engineering, education, and enforcement (in some contexts) in order to prevent traffic fatalities and serious injuries. In the United States, traffic fatalities occur at a rate of approximately 34,000 per year. While the majority of people killed on US roadways are in motor vehicles, bicyclists and pedestrians have higher fatality rates. Consequently, in locations where there are pedestrians and bicyclists, Vision Zero measures focus on these vulnerable road users as well as drivers.

This approach has a proven track record from Sweden, where it was first introduced in 1997, and is credited with that country's reduction in traffic injuries and fatalities, even as more people are driving, biking, walking, and using transit.

1.1.1 HOW IS THE VISION ZERO APPROACH DIFFERENT?

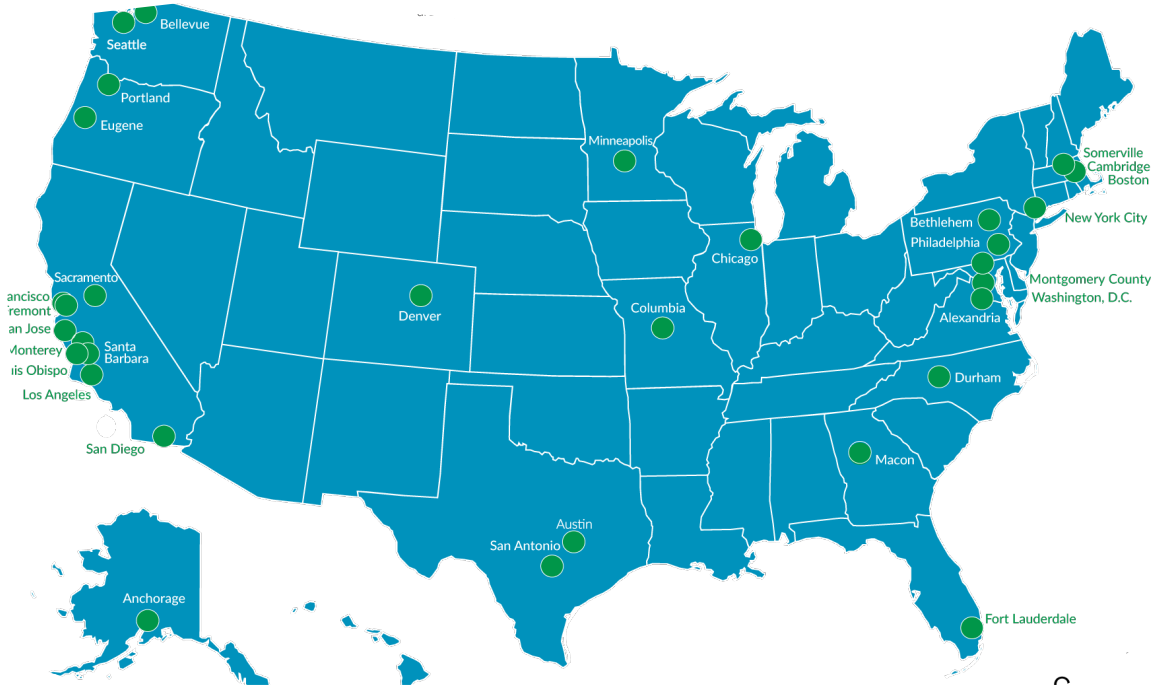
The following is paraphrased from the Vision Zero Network website to describe the differences between a traditional traffic approach to transportation safety and Vision Zero:

Traditional Approach

» Traffic deaths are inevitable

» Increase safety by perfecting human behavior

EXHIBIT 1. VISION ZERO JURISDICTIONS



Graphic from the Vision Zero Network showing the location of participating cities and counties, including Montgomery County, as of October, 2017. (https://visionzeronetwork.org/about/what-is-vision-zero).

[1] *https://visionzeronetwork.org/about/what-is-vision-zero/*

» Reduce the total number of collisions

» Emphasize individual responsibility for driver behavior

» Saving lives requires expensive engineering solutions

Vision Zero Approach

» Traffic deaths are preventable

» Human failings should be accounted for in design

» Reduce the severity of collisions

» Emphasize a systems approach

» Saving lives can be accomplished cost-effectively

1.1.2 A PARADIGM SHIFT

Adoption of a Vision Zero initiative represents a fundamental change in thinking about roadway planning and design priorities. Traditional approaches to intersection evaluation, which rely on vehicle level of service, may be replaced by measures that focus on safety of all users.

Reduction of motor vehicle speed is the single largest safety improvement that can be made on a street, especially for vulnerable road users; thus, practices that make it more difficult to reduce speeds must be reconsidered. Using the 85th percentile speed (the speed below which 85 percent of vehicles on a roadway travel) on a roadway to determine its speed limit is another example of a long-standing practice that is being challenged by safety advocates such as the National Transportation Safety Board in a recent report. Changes in speed limits should also be reinforced by both enforcement and a suite of engineering changes to change driver behavior to match safety priorities.

Maintenance and snow-clearing practices that favor roadways over bicycle and pedestrian facilities are also being challenged. Rendering these facilities impassible, even temporarily, can force these vulnerable road users to share space with much heavier and faster moving motor vehicles.

Specific categories of Vision Zero interventions will be introduced in the next section.

1.2 HOW IS SAFETY CREATED?

Roadway safety is increased by reducing the **frequency of crashes**, and the **severity of crashes**. The Veirs Mill Vision Zero Initiative is recommending both short- and long-term engineering solutions to accomplish both.

1.2.1 DECREASING CRASH FREQUENCY

Crash frequency describes how often crashes occur, on a per traveler basis. To decrease the frequency of crashes, interventions should reduce the number of conflicts that occur on a roadway and increase drivers' success in yielding when a conflict occurs.

DECREASING THE NUMBER OF CONFLICTS THAT OCCUR

Reducing conflicts is accomplished by providing clearly designated space for different road users, and using traffic signals and other traffic control measures to create predictability where different road users interact. Shortening crossing distances using curb extensions can help pedestrians judge how much time they will need to cross in front of oncoming vehicles, thus reducing how often they conflict with oncoming vehicles.

Designated, protected space for different travel modes can reduce conflict points, as shown above (Photo credit: NACTO)

INCREASING SAFE YIELDING

When conflicts do occur, drivers must successfully yield to the conflicting road user to prevent a crash. **Decreasing motor vehicle speed is key** to enabling safe yielding. Sufficient roadway lighting and visibility is also important.

1.2.2 DECREASING CRASH SEVERITY

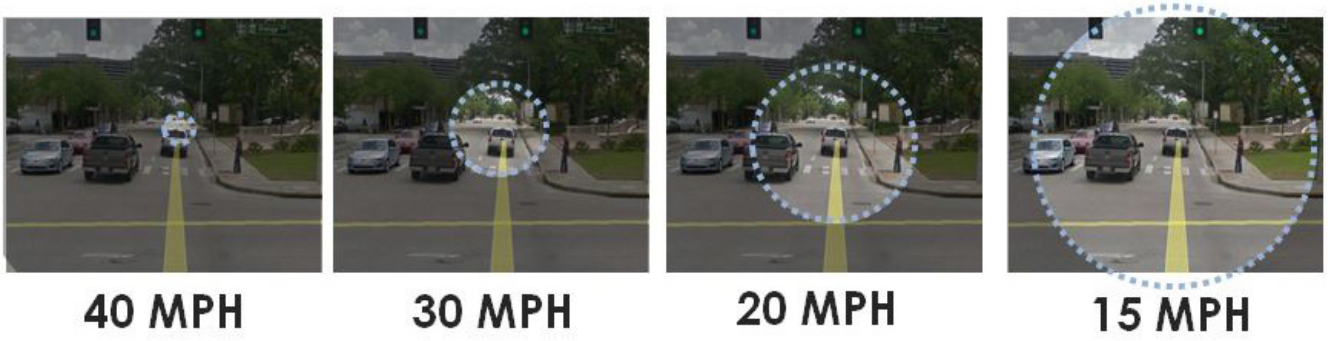
Crash severity describes how badly the people involved in a crash are hurt. While it is unlikely that any corridor will achieve zero crashes, it is possible to drastically reduce the severity of the crashes that do occur through conscientious engineering choices. Specifically, reducing vehicle speed is essential to reducing crash severity. Reducing vehicle speeds particularly improves safety for vulnerable road users such as pedestrians and bicyclists, since they have no physical protection.

Exhibit 2 illustrates the effect of vehicle speed on driver cone of vision. Exhibit 3 shows the mass differential between different road users, a key factor in the severity of crashes involving bicyclists and pedestrians, in particular. Exhibit 4 shows the rates of pedestrian fatality when hit by motor vehicles traveling at various speeds. These, taken together, account for why speed reduction is so crucial to reduction in both crash frequency and crash severity.

Recommendations to reduce and enforce a lower speed limit, or undertake engineering solutions to reduce the prevailing speed, on a roadway are often met with concerns about capacity and congestion. In reality, the capacity of most corridors is dictated by the signal timing. Anyone who has had a driver speed past them only to be stopped next to them at a red light has experienced this phenomenon. Average speed determines travel time, while reaching high speeds greatly increases crash severity.

Exhibit 5 shows that corridor capacity is largely determined by signal timing at intersections and thus speed reduction may have a smaller than anticipated impact on corridor capacity.

EXHIBIT 2. ILLUSTRATION OF DRIVER CONE OF VISION AT DIFFERENT SPEEDS

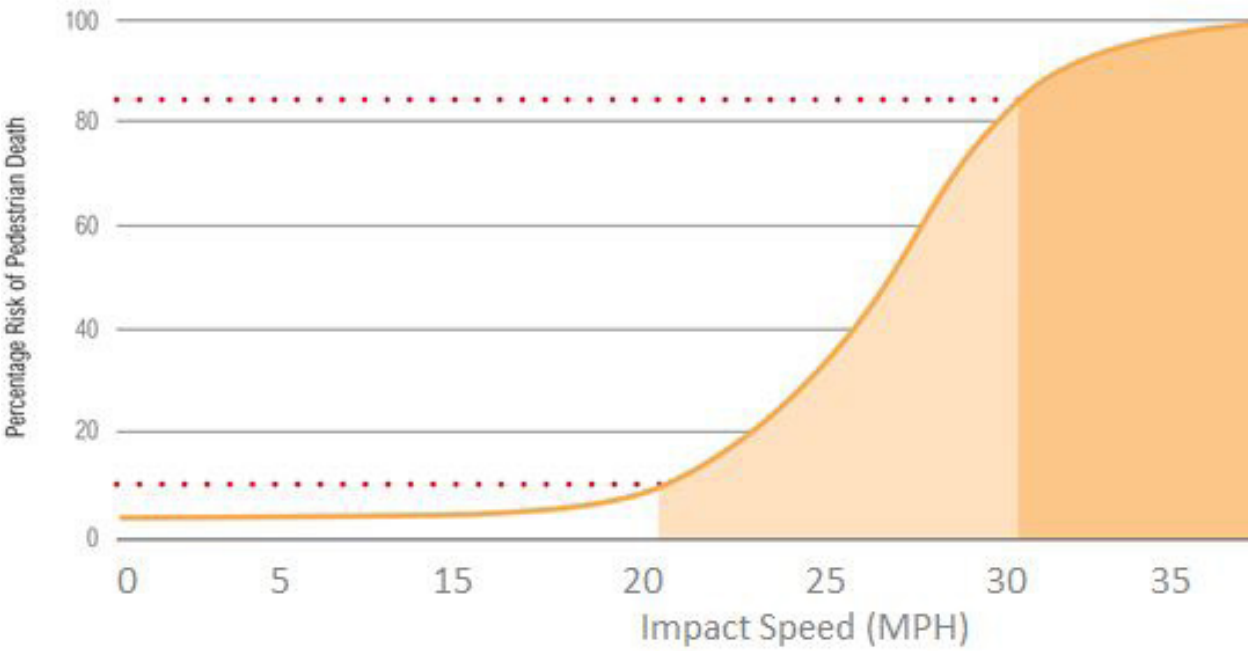


Graphic showing driver cone of vision at different speeds; lower speeds allow drivers to better see conflicts that might occur and increase their chances of successfully avoiding a crash.

EXHIBIT 3. MASS OF DIFFERENT ROAD USERS

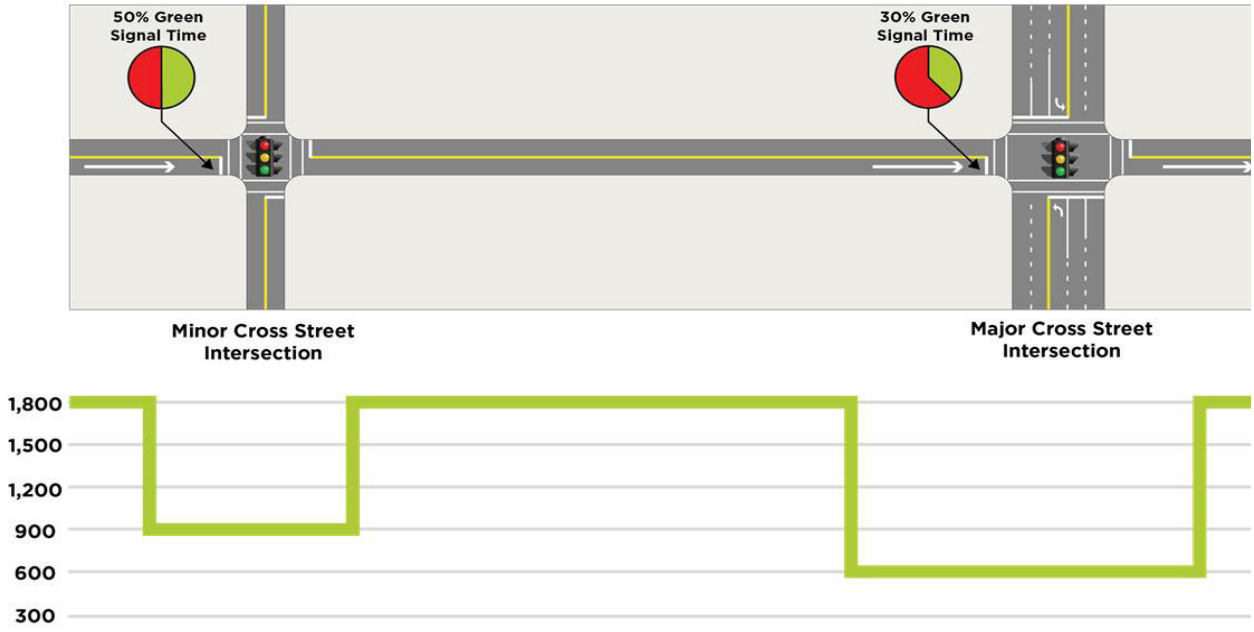
The comparative mass of different road users is one factor that contributes to crash severity. Additionally, the lower-mass road users also have little to no technology providing physical protection (Image Credit: NACTO).

EXHIBIT 4. RATES OF PEDESTRIAN FATALITY AT VARIOUS SPEEDS



Rates of pedestrian fatality when hit by a car traveling at various speeds (Image Credit: World Resource Institute).

EXHIBIT 5. CAPACITY ALONG THE LENGTH OF A CORRIDOR



As shown in the above figure, the amount of green-time dedicated to cross streets is a main contributor to a corridor's overall capacity.

1.3 HOW IS VISION ZERO APPLIED IN MONTGOMERY COUNTY?

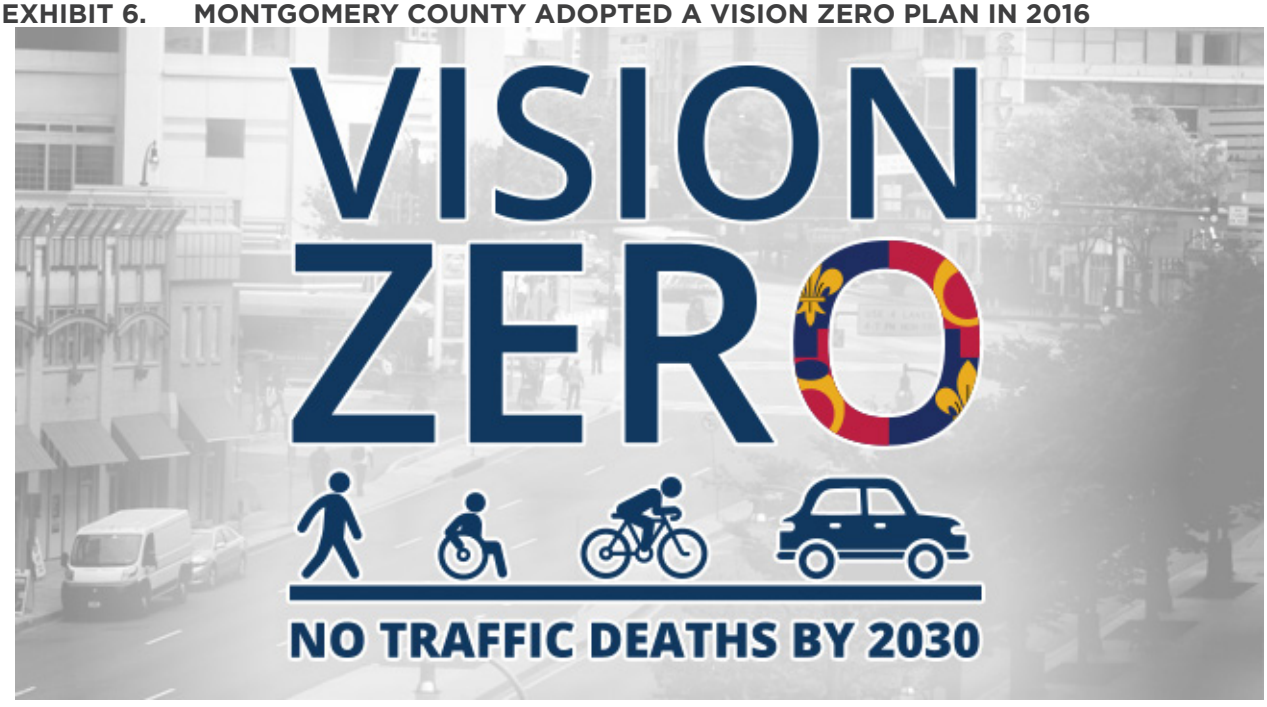
Montgomery County has adopted a resolution, and developed a two year Action Plan to move toward the ambitious goal of No Traffic Deaths by 2030.

The communication around these actions recognizes the paradigm shift that Vision Zero represents. The following represents Montgomery County's priorities for creating a Vision Zero environment: (from http://www.montgomerycountymd.gov/visionzero.)

Transportation-related deaths and severe injuries are preventable and unacceptable.

1. *Human life takes priority over mobility and other objectives of the road system. The road system should be safe for all users, for all modes of transportation, in all communities, and for people of all ages and abilities.*
2. *Human error is inevitable; the transportation system should be designed to anticipate error so the consequences are not severe injury or death. Advancements in vehicle design and technology, as well as roadway engineering advancements, personal electronic device innovations, etc., are necessary components for avoiding the impacts of human errors.*
3. *People are inherently vulnerable, and speed is a fundamental predictor of crash survival. The transportation system should be designed for speeds that protect human life.*
4. *Safe human behaviors, education, and enforcement are essential contributors to a safe system.*
5. *Policies at all levels of government need to align, making safety the highest priority for roadways.*

EXHIBIT 6. MONTGOMERY COUNTY ADOPTED A VISION ZERO PLAN IN 2016



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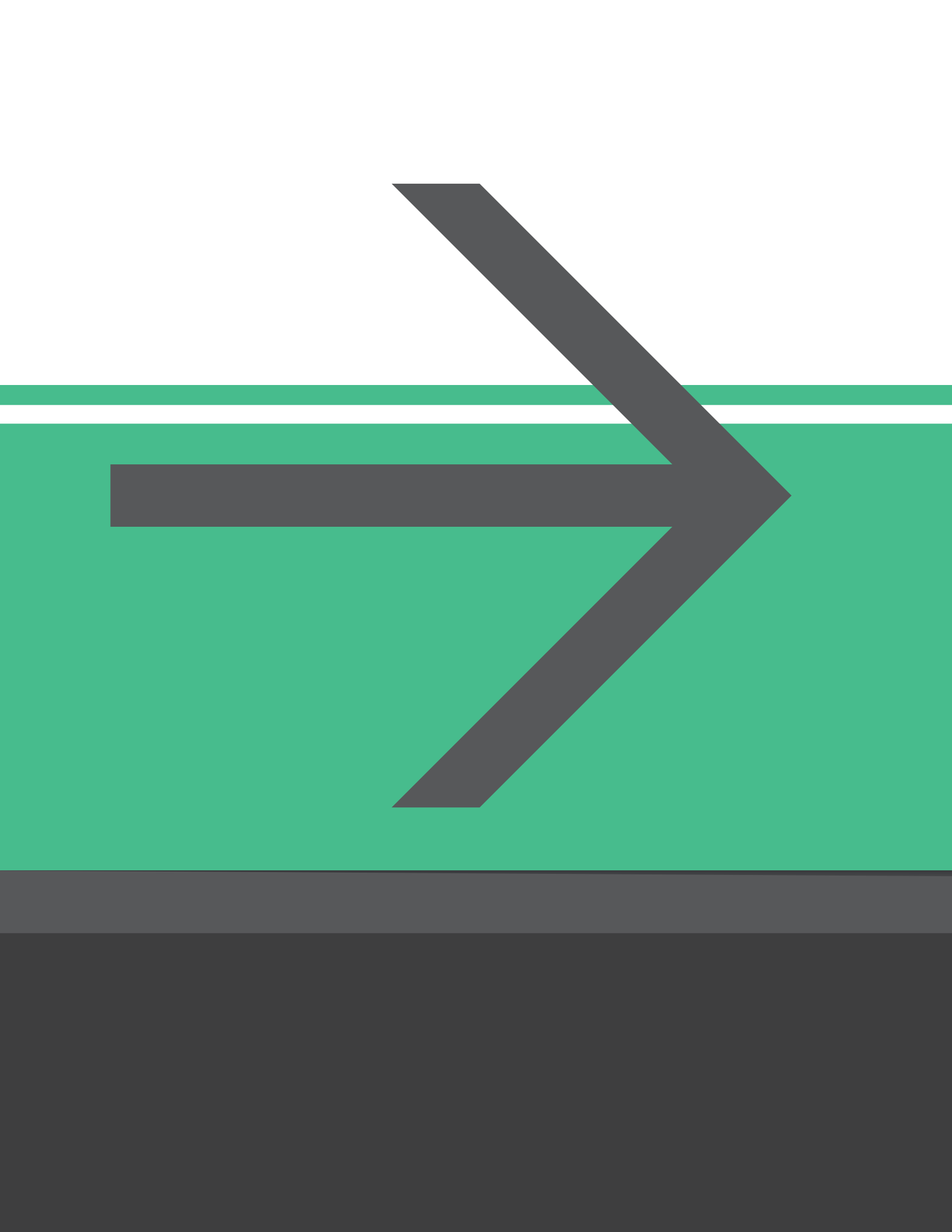


CHAPTER 2

IDENTIFYING PROBLEMS ON VEIRS MILL ROAD

2.1 WHY VEIRS MILL ROAD?

In 2016, when the Montgomery County Council adopted Vision Zero to demonstrate the county's commitment to eliminating traffic fatalities and severe injuries on county roads by 2030, it became one of the first suburban jurisdictions in the United States to adopt a Vision Zero Policy and Action Plan. This builds on previous efforts to address road safety issues including the 2002 Blue Ribbon Task Force on Pedestrian Safety and the 2007 Pedestrian Safety Initiative. The county released a two-year action plan in November 2017 and urged the State of Maryland to adopt Vision Zero for all state highways.

As a partner agency in the development and implementation of the two-year action plan, the Planning Department has a responsibility to support the Vision Zero approach in all policies, plans and projects. The Veirs Mill Corridor Master Plan, initiated in early 2017, is the first master plan to commence following the adoption of the Vision Zero Policy in Montgomery County. The Planning Department sees a unique opportunity to develop a Vision Zero case study within the context of the Veirs Mill Corridor Master Plan to develop short-term recommendations which address immediate safety concerns as well as a long-term concept for the corridor.

The county's two-year action plan identifies Veirs Mill Road as one of the highest risk roadways, with medium-to-high crash rates on Veirs Mill Road, and high crash rates at the intersection of Randolph Road at Veirs Mill Road. The action plan further identifies the communities adjacent to Veirs Mill Road as an equity emphasis area, which acknowledges that communities with higher rates of poverty, ethnic diversity, and younger residents experience higher rates of collisions.

In addition to these crash-related characteristics, Veirs Mill Road also has high rates of people who walk and people who use transit; there are also vehicles that are traveling above the speed limit, which increases the danger of severe crashes the current roadway. Veirs Mill Road is classified as a major highway, with average volumes of 35,000 to 40,000 vehicles per day. While it is classified as a major highway, it also serves as a residential street with a combination of residential service roads and direct driveway access.

Veirs Mill Road serves as a significant transit corridor, with bus service provided by the Washington Metropolitan Area Transit Authority's Metrobus and Montgomery County's Ride-On. WMATA considers Veirs Mill Road a high priority corridor, as the Veirs Mill routes (the C4 and Q routes) have some of the highest ridership in the Metrobus system. Based on the historic ridership volumes and the east-west connection that Veirs Mill Road provides, it is also identified as a future bus rapid transit corridor.

With existing high rates of people that use transit and high rates of people who walk combined with future enhanced bus service, and ultimately bus rapid transit, the number of people who walk is anticipated to grow. Continuous sidewalks and safe crossings, currently not present today, are needed to create safe conditions for walking. These conditions are explored in more depth in the Veirs Mill Corridor Master Plan.

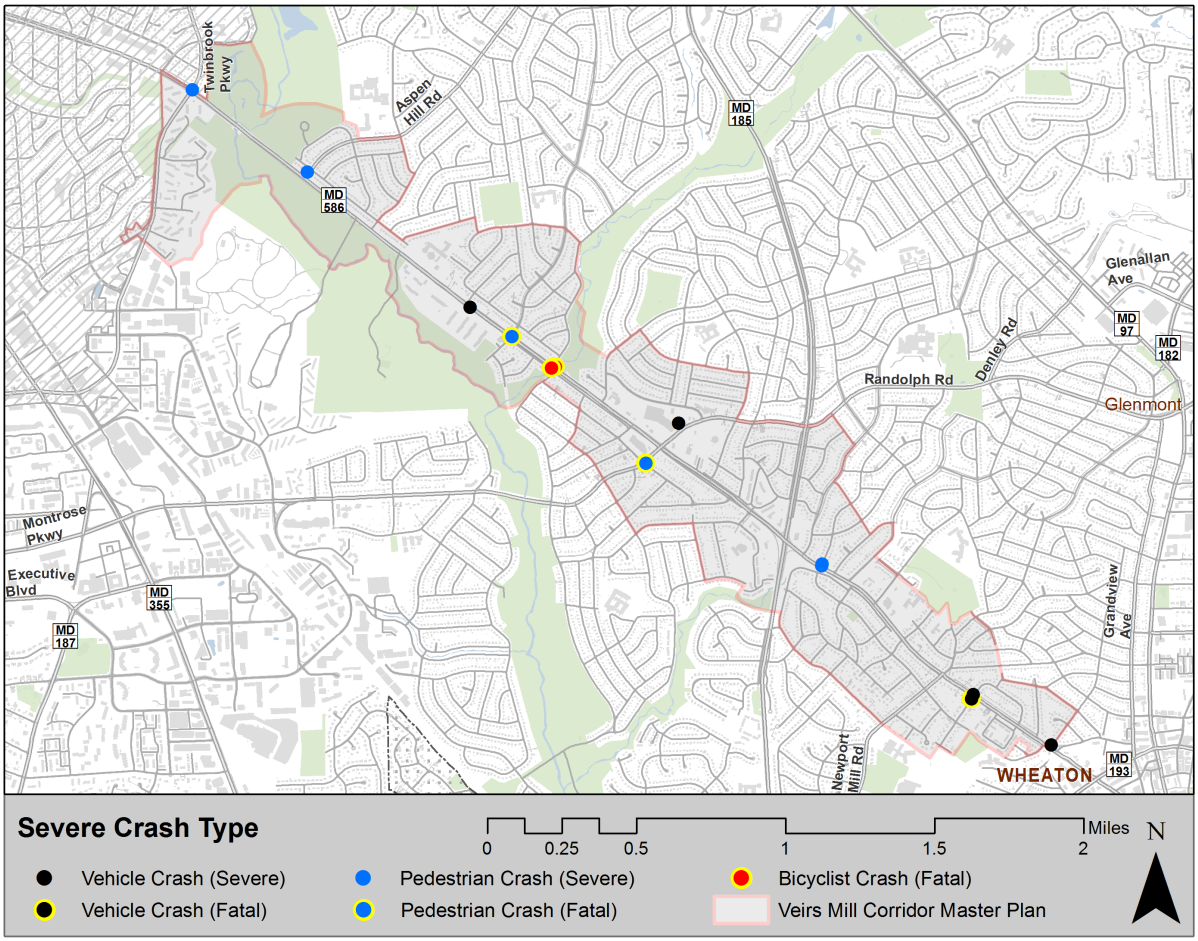
For people that bike, there are two significant trails which intersect Veirs Mill Road – the Rock Creek Trail and the Matthew Henson Trail – both of which serve pedestrians, bicyclists and recreational users. The existing at-grade crossing of the Matthew Henson Trail with Veirs Mill Road presents safety concerns. It is located at the bottom of two steep downslopes along Veirs Mill Road, and is the site of two fatalities since 2015. With the planned addition of Montrose Parkway opposite Parkland Drive, significant traffic increases are anticipated on Veirs Mill Road between Montrose Parkway and Randolph Road, and the number of people that bike are anticipated to increase on Veirs Mill Road.

While Veirs Mill Road is located within a

suburban land use context, the area has high transit ridership when compared to the county average. Although the corridor serves many users, the necessary infrastructure to accommodate each user is inadequate, and in many cases, absent. The corridor is designed to prioritize people that are driving single occupancy vehicles. Due to the competing roles of Veirs Mill Road, the recent severe and fatal crashes on the corridor, and the increased demand for all users in the future, the Planning Department believes that it is critical to approach the future of the Veirs Mill Corridor through a Vision Zero lens. This report focuses primarily on engineering solutions to creating safe conditions on Veirs Mill Road, both due to the roadway context and the scope of this study. However, speed enforcement is mentioned in the strategies toolbox, and there may be high pedestrian activity locations such as schools that could be appropriate sites for education initiatives, at the County's judgment.

Exhibit 7 shows the locations of transportation-related fatal and severe injury crashes that have occurred along Veirs Mill Road between 2015 and 2017. This data was compiled by County Stat, the agency responsible for developing the Vision Zero Action Plan. During this three-year time period there were five fatal and seven serious injury crashes. Even though travel by motor vehicle represents the majority of person trips along the corridor, pedestrian and bicyclists accounted for two-thirds of these crashes, including four fatalities and four serious injury crashes.

EXHIBIT 7. SEVERE AND FATAL CRASHES ALONG VEIRS MILL ROAD (2015 – 2017)



Source: County Stat, www.montgomerycountymd.gov/visionzero

2.2 THE PROBLEM LIST

A list of existing safety hazards on Veirs Mill Road was assembled using crash data, field visit observations, and public comments. These challenges fall under three broad categories:

- **Poor separation of road user groups**
- **Conflicts between road users at crossings**
- **Motor vehicle traffic is too fast and erratic**

While solving some of these issues entirely will take time and require significant funding, there are interim solutions that can provide immediate, low cost improvements. A toolbox of these improvements is included in the Toolbox section of this report, and the locations where they are applicable are mapped in Chapter 3.

This section shows the problem types observed and illustrative images. A full copy of the Problem List (which includes the specific observations that contributed to problem formulation) is included as an appendix to this report.

2.2.1 POOR SEPARATION OF ROAD USER GROUPS

One important way to minimize conflicts between road users is to provide each travel mode with clearly designated space on the corridor. Currently, Veirs Mill Road falls short of providing this for its length.

» The pedestrian environment is poorly separated from fast moving traffic, both where there is no sidewalk, or the sidewalk is directly adjacent to the roadway.

» Sidewalks are not continuous, including missing connections to bus stops.

» Driveways and pedestrian ramps are often not ADA compliant, which can force wheelchair users and pedestrians with reduced mobility into the roadway.

» Continuous right-turn lanes that function as through lanes bring fast/weaving traffic near to the edge of the roadway, where there is no buffer between pedestrians and the street

» Grade changes and uneven terrain adjacent to the roadway make walking where there is no sidewalk difficult even for able-bodied pedestrians

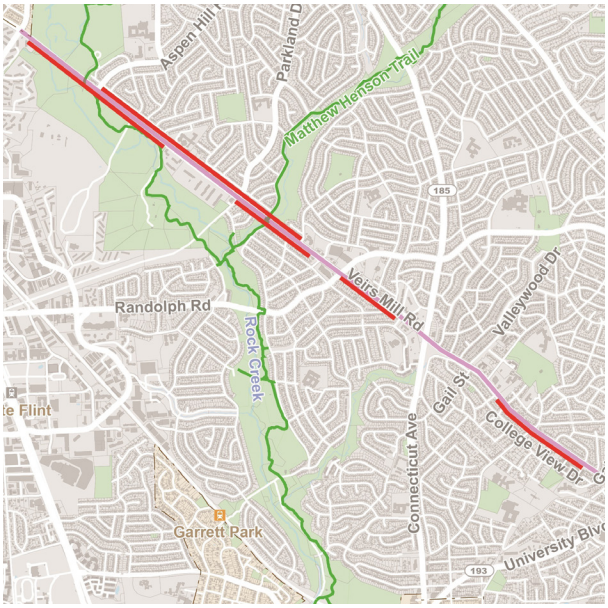
» Existing sidewalks are narrow and poorly maintained.

Incomplete sidewalk

Continuous turn lane and no sidewalk connection to bus stop

ADA non-compliant ramp

Sidewalk blocked with mowing debris

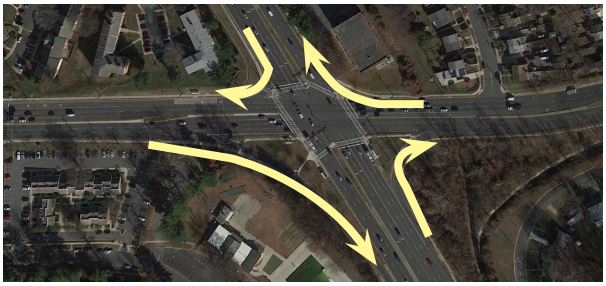


Current gaps in sidewalk network

2.2.2 CONFLICTS BETWEEN ROAD USERS AT CROSSINGS

Another important way to minimize conflicts between road users is to reduce conflicts at crossings. The following problems were found:

- Several locations along the corridor have very long distances between signalized crossings, including approximately a half mile distance, such as between Twinbrook Parkway and Aspen Hill Road.
- The length of the current Matthew Henson Trail crossing makes it difficult to cross in a single signal cycle; the signal pole reduces pedestrians' ability to see oncoming traffic while waiting to cross.
- The Connecticut Avenue intersection has long, sweeping channelized right turn lanes which both enable high speed motor vehicle turns and pose challenges for vision-impaired pedestrians; the speed enabled by the lane configuration means that any collision occurring in that crosswalk is likely to be severe.
- A large number of residential and commercial driveways open directly into a high speed roadway, increasing the risk of crashes as drivers pull into traffic.
- Many intersections lack a pedestrian refuge island, but require pedestrians to cross six or more lanes.
- Many bus stops, which are significant pedestrian destinations, lack an adjacent signalized crossing opportunity.
- The frontage roads connect to the main road in an irregular and inconsistent manner, causing unpredictable conflicts between road users.
- Pedestrian connections between frontage roads and transit stops are inconsistent or absent.
- Many bus stops lack sufficient waiting space, which can cause conflicts between waiting transit users and other sidewalk traffic, or even force them into the roadway.



Channelized turn lanes at Connecticut Avenue

Example of a long pedestrian crossing with no median refuge island at Randolph Road

2.2.3 MOTOR VEHICLE TRAFFIC IS TOO FAST AND ERRATIC

High vehicle speeds are a persistent problem along the length of Veirs Mill Road, and are likely a key contributor to the roadway's high crash rate.

» With a posted speed limit of 40 – 45 miles per hour on Veirs Mill Road, pedestrians and bicyclists that are struck by a vehicle are very likely to be killed.

» Significant weaving and merging were observed, particularly where lane configuration changes occurred.

» Continuous right-turn lanes and wide open shoulders make the corridor feel very open, inviting high speeds; using these spaces to pass aggressively was also observed.

Wide shoulder contributes to unconstrained-feeling corridor

2.3 TOOLBOX OF INTERVENTIONS

Many of the previously identified problems have engineering solutions that can be implemented at specific locations, where the need is presently demonstrated. These interventions are displayed in this section, organized by the primary safety function they serve:

- Decreasing crash frequency by providing designated roadway space for different user groups
- Decreasing crash frequency by reducing crossing conflicts
- Decreasing crash severity (and, secondarily, crash frequency) by reducing motor vehicle speeds.

Many of these interventions and best practices actually serve multiple functions, but they are organized by their primary purpose, and not repeated in multiple categories.

Many of these interventions are recommended in multiple locations; these locations are mapped in Chapter 3. This section is intended to build familiarity with the tools, and for referencing when considering each recommendation in its context on the corridor.

The components of each intervention are shown and labeled, as are corridor-wide best practices that are included in the concept as a recognition that they should be applied corridor-wide.

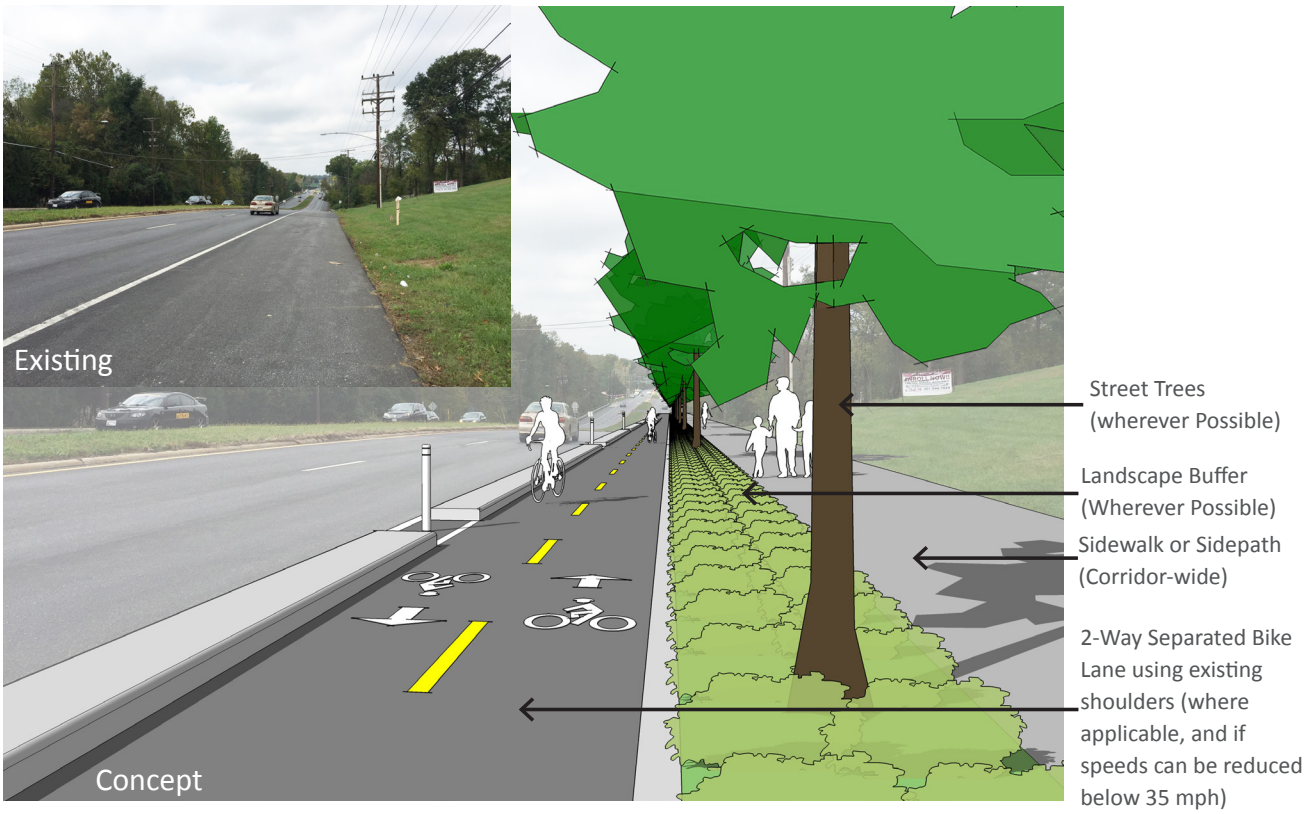
2.3.1 DECREASE CRASH FREQUENCY BY CREATING DESIGNATED SPACES FOR DIFFERENT ROAD USERS

Creating designated space for vulnerable road users enhances their safety, and also makes the corridor feel more comfortable. Where space allows, bicyclists and pedestrians should each have their own designated facility where space allows. Since they are both low-speed road users, and can share a sidepath, provided it is at least 8 feet wide.

CREATE CONTINUOUS SIDEWALK

Providing uninterrupted, ADA-compliant sidewalks is essential to allowing people to walk along the corridor safely. Best practices such as including a landscaped buffer with street trees are shown below. Exhibit 8 depicts a concept for a portion of the corridor that could accommodate a two-way separated bike lane; in more constrained portions of the corridor, a sidepath is the recommended bicycle and pedestrian treatment.

EXHIBIT 8. ACCOMMODATING CONTINUOUS SIDEWALKS



CREATE CONTINUOUS BIKE NETWORK

Bicyclists, like pedestrians, are vulnerable road users. Similarly, a corridor-wide network of bike facilities, either on or very near Veirs Mill Road, is essential to the safety of bicyclists. Exhibit 9 shows options for accommodating bike travel on frontage roads. Exhibit 10 shows a neighborhood greenway approach that is suitable for parallel local streets. Exhibit 11 shows a separated bike lane that could be suitable for portions of the corridor with a shoulder. Exhibit 12 shows a sidepath, which is the recommended treatment where space is more constrained and provides the most separation between bikes and motor vehicle traffic. In order to increase the safety and comfort of pedestrians, these sidepaths should be 12 feet wide, where space allows, and at least 8 feet wide, so there is enough room for all users to pass each other and interact comfortably.

EXHIBIT 9. FRONTAGE ROAD TREATMENTS

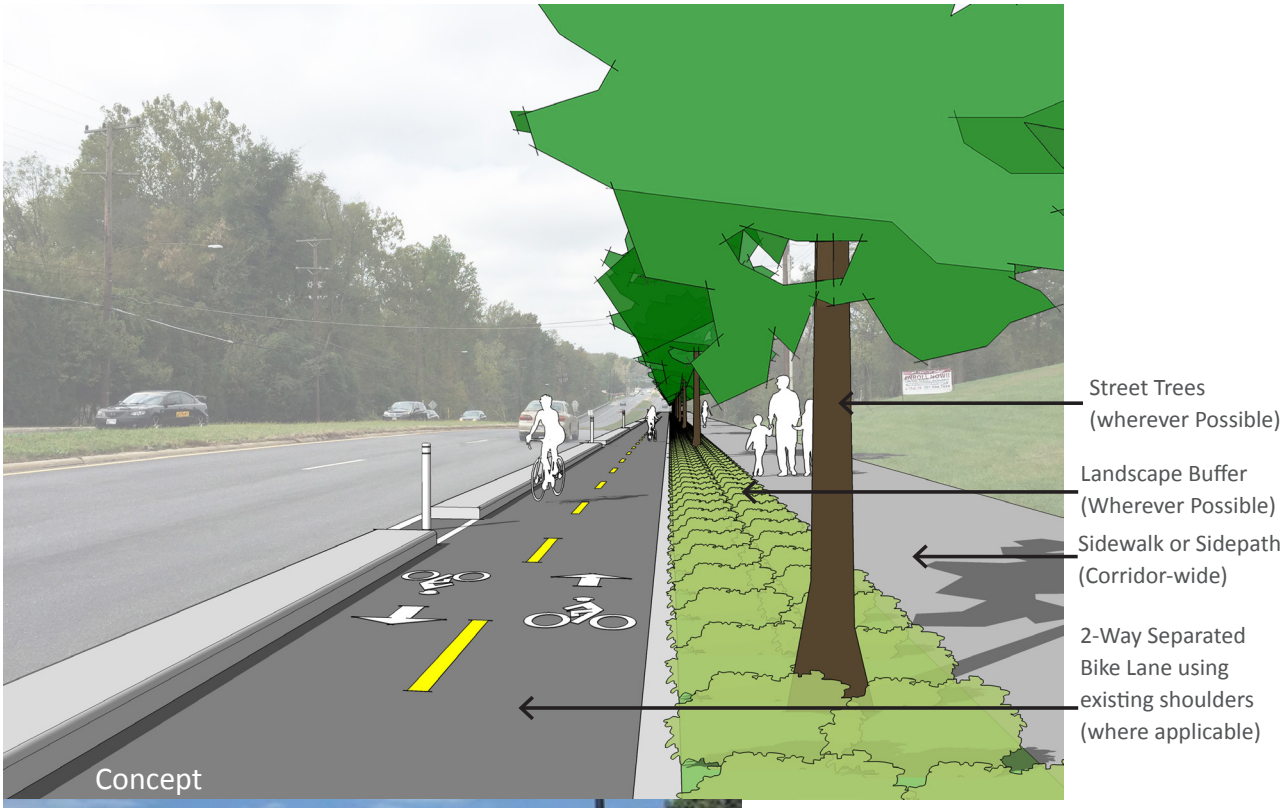
Alternative concept if it is determined that parking is not desired on any segments of the frontage roads

EXHIBIT 10. CREATE NEIGHBORHOOD GREENWAYS ON PARALLEL STREETS

Typical Parallel Residential Street to Veirs Mill Road

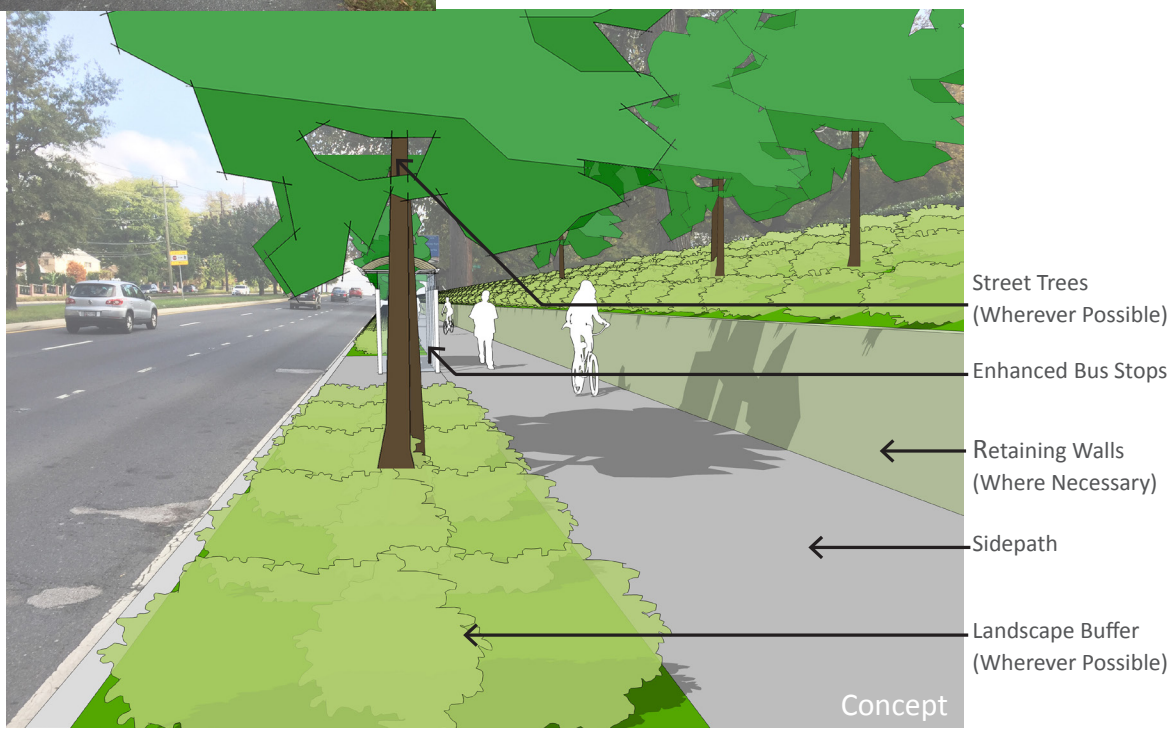
Example of a neighborhood greenway (Photo credit: NACTO).

EXHIBIT 11. CREATE A TWO-WAY SEPARATED BIKE LANE IN CURRENT SHOULDER



Cost-efficient rapid-implementation variation of a two way separated bike lane on Baseline Road in Boulder, CO.

EXHIBIT 12. CREATE SIDEPATHS WHERE RIGHT-OF-WAY IS NARROWER



2.3.2 DECREASE CRASH FREQUENCY BY REDUCING CROSSING CONFLICTS

Increasing safety at crossings requires both enhanced crossing opportunities and slowed vehicle speeds at crossing points so that interactions between motor vehicles and vulnerable road users happen at lower, safer speeds.

ENHANCING CROSSING FACILITIES

At both intersection and driveway crossings, vulnerable road users such as bicyclists and pedestrians need safe and accessible ways to cross the street that will decrease their chances of being struck by a motor vehicle. Treatments to accomplish this include enhanced and raised crosswalks, pedestrian refuge islands, full signals or beacons (e.g., a Modified HAWK signal such as at the Matthew Henson Trail crossing, or a HAWK signal if SHA policy allows), and the ADA-compliant retrofit of driveways and ramps.

Exhibit 13 shows how space can be reclaimed from a left turn lane to create a pedestrian refuge island to ease crossings. Exhibit 14 shows the "short ramp" method for easing crossings across driveways, particularly for wheelchair users. Exhibit 15 shows a concept for creating signalization and a refuge island at currently uncontrolled crossings; it also shows an opportunity for motor vehicles to make a U-turn that is separate from the bicycle and pedestrian crossing.

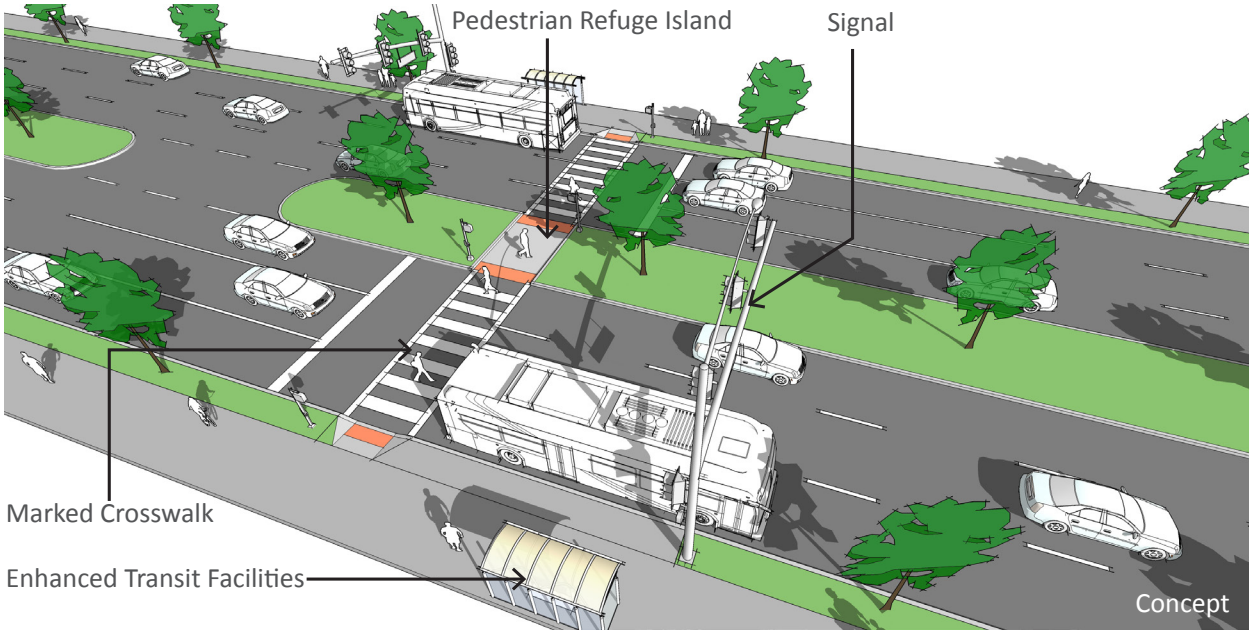
EXHIBIT 13. ADD PEDESTRIAN REFUGE ISLANDS

Pedestrian refuge islands allow pedestrians to recognize a safe gap in traffic for one direction at a time. It also allows pedestrians a safe space to wait if they are unable to complete their crossing in one signal phase. The minimum width of a pedestrian refuge island is 6 feet, but 8-10 feet is preferred (Recommendation source: NACTO).

EXHIBIT 14. CREATING A LEVEL SIDEWALK SURFACE ACROSS DRIVEWAYS

Note that steep ramps will cause turning vehicles to slow considerably before completing their turn. While this has safety benefits for sidewalk users, if it is applied in the wrong context, it could increase rear end crashes when trailing vehicles are unable to slow in response to the unexpected slow down. This risk can be mitigated by using this technique in appropriate contexts, such as downstream of curb extensions, and in conjunction with other interventions that will slow the prevailing roadway, speed, increasing the chances of trailing vehicles stopping in time.

EXHIBIT 15. SIGNALIZE UNCONTROLLED INTERSECTIONS



At each unsignalized intersection, study the feasibility of adding a traffic signal or crossing beacon. Consider adding signal controls to mid-block crossings and any new crossings, similar to the Matthew Henson Trail crossing (or a HAWK signal if SHA policy allows). Also consider adding new crossings, transit shelters, and other facilities at bus stops. All signalization changes will require a warrant study as specified in the MdMUTCD.

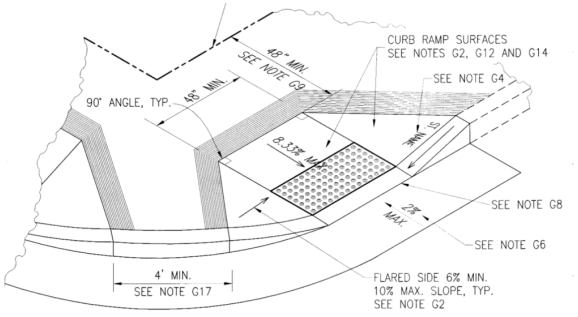
SLOWING VEHICLES AT CROSSINGS

Speed reduction is essential for enabling safe yielding by motor vehicle drivers. Interventions that slow vehicles at crossings take this approach and apply it at the locations where conflicts are most likely to occur. Exhibit 16 shows raised crossings, which can be used at many intersection and crossing types both to keep the sidewalk or sidepath level, and to slow motor vehicles using vertical deflection. When applied at channelized right turn lanes, raise crossings have the added benefit of providing a detectable crossing path for visually impaired pedestrians for whom the unpredictable angle of channelized turn lane crossings are particularly challenging. Exhibit 17 shows tightened turn radii which can be used to slow the speed of turning vehicles at any intersection. This traffic calming effect and the predictability of a single straight crossing are why standard intersection configurations with tightened curb radii are preferred. In all cases where tightening curb radii is considered, analyses that take into account the types of turning vehicles that will use the intersection must be conducted.

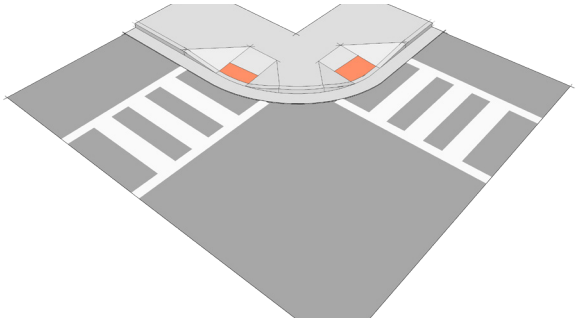
EXHIBIT 16. RAISED PEDESTRIAN CROSSING

The best option for channelized right-turn lanes is to close them. If traffic analysis shows that one or more lanes must be maintained, raised crossings can be used to slow turning vehicles and ease pedestrian crossings. Where feasible, these can be accompanied with an accessible pedestrian signal (a device that provides auditory cues on when it is safe to cross, to aid pedestrians with impaired vision), since crossings at channelized right turns are particularly challenging for pedestrians with impaired vision.

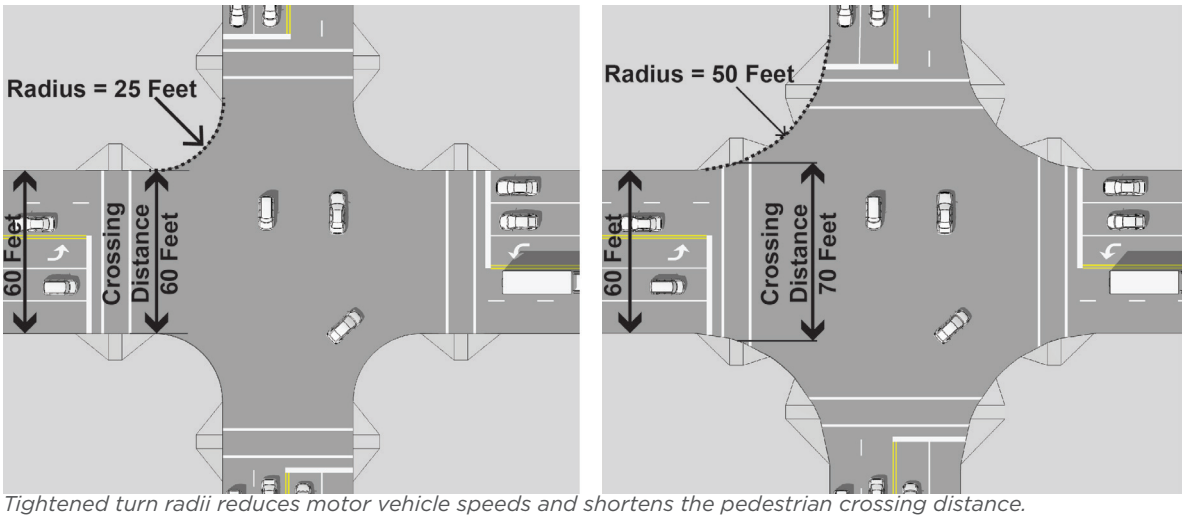
EXHIBIT 17. CURB RAMP AND TURNING RADII TO IMPROVE CROSSINGS



Typical ADA Compliant Pedestrian Curb Ramp.



Typical Bidirectional Pedestrian Curb Ramps.



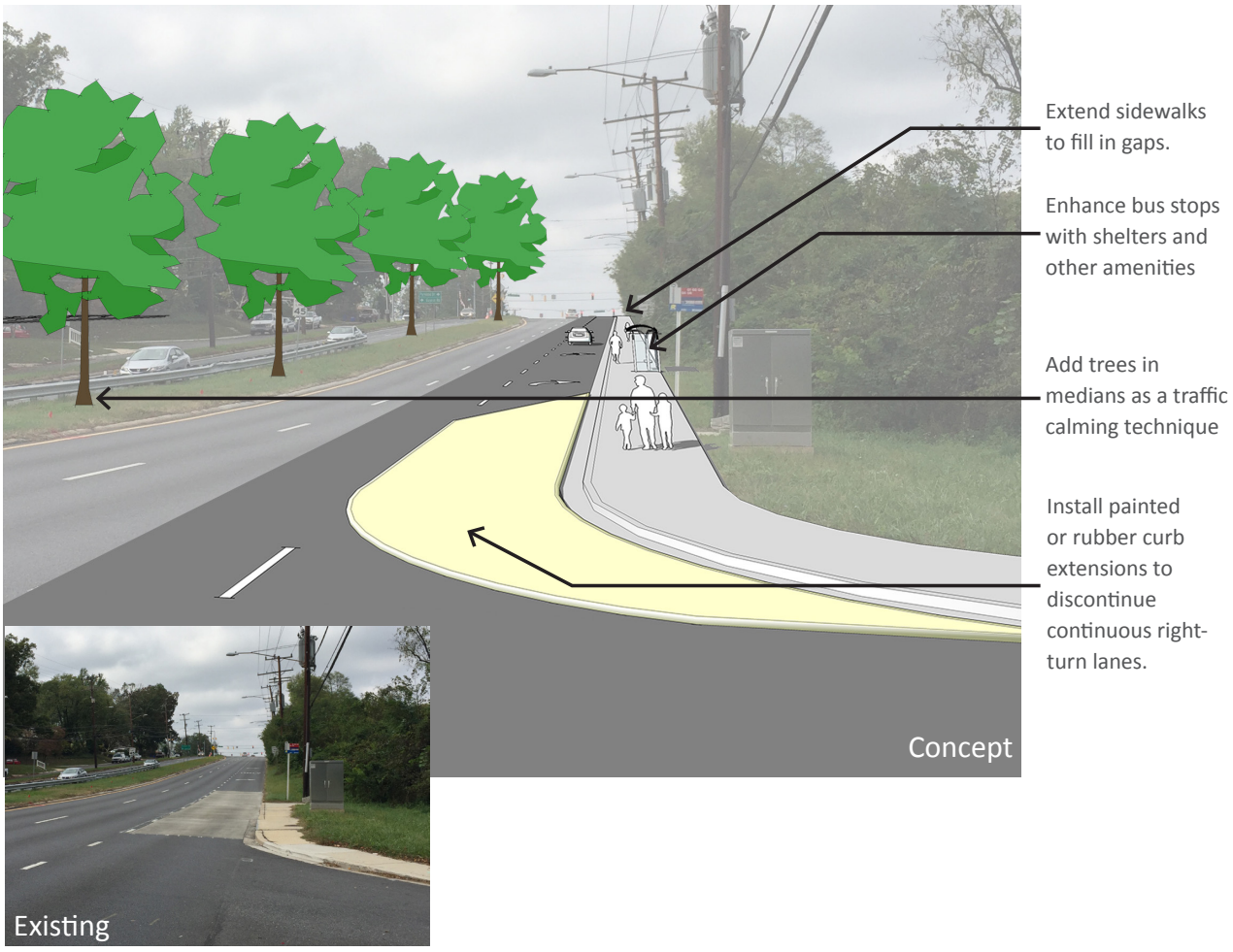
Tightened turn radii reduces motor vehicle speeds and shortens the pedestrian crossing distance.

2.3.3 DECREASE CRASH SEVERITY BY SLOWING MOTOR VEHICLE SPEEDS

Creating curb extensions to disrupt the continuous right turn lane, as shown in Exhibit 18, is the only spot-intervention shown with a primary purpose of reducing through speed. This is because each of the best practices such as planting street trees, and many of the other interventions all also serve a traffic calming purpose. Taken together as a suite, the recommendations will have a corridor-wide traffic calming effect. Table 1 on Page 27 also shows the multiple functions of each recommended improvement.

Where bus lanes are present, curb extensions must be placed to minimize the need for buses to pull back into traffic, thus experiencing reentry delay. Clearly marked and well-enforced bus lanes are another way to move high volumes of motor vehicle traffic away from the curb, but curb extensions are an interim solution, or appropriate for places where a bus lane is not viable.

EXHIBIT 18. CURB EXTENSIONS TO INTERRUPT CONTINUOUS TURN LANES



2.3.4 CORRIDOR-WIDE POLICIES AND BEST PRACTICES

Several interventions are not engineering interventions applied to a particular location, but are instead corridor-wide policies and management practices. The below best practices should be applied to the full corridor.

MAINTENANCE

The majority of the interventions described in the previous chapter are improvements to the bicycle and pedestrian realms. In addition to being road users who are vulnerable to injury, travelers using these modes are sensitive to the details of the conditions of their facilities. This means that relatively slight disruptions to grade, degradation of the surface quality, or blockage by debris can have a significant effect on how well the facility functions for these users. Consequently, as any bicycle or pedestrian realm intervention is designed and constructed, a plan should also be made for its maintenance. Policies and practices should be coordinated across agencies so that snow and brush removal happens in both a timely and satisfactory manner; in some cases, specialized plows and lawnmowers must be acquired to ensure that crews can complete appropriate maintenance.

Plowing a separated bike lane with a smaller plow in Washington, D.C. (Photo credit: District Department of Transportation)

Bicycle facilities that are within the portions of the roadway used by motor vehicles (such as on frontage roads, neighborhood greenways, and conventional bike lanes) should have higher standards of repair before calling for repaving, and should be subjected to more frequent inspection to establish satisfactory conditions. This is also true for the locations of the sidewalk or sidepath that are frequently crossed by motor vehicles, especially at commercial driveways.

SPEED REDUCTION THROUGH NARROWING THE "FEEL" OF THE ROADWAY

Streets and roads that feel constrained to drivers encourage driving at lower speeds. Short of physically narrowing the roadway (which can be reassessed in the long term, if conditions change), lanes can be narrowed using striping and the visual field can be constrained using street trees.

Street trees are recognized as a traffic calming measure in the NACTO Urban Streets Design Guide. They provide rhythm and constraint to the driver's visual experience, helping them gauge their speed, and making high speeds feel less comfortable.

Rows of street trees creating a visually-constrained corridor (Photo Credit: University of Washington)

SPEED REDUCTION THROUGH SPEED LIMIT, SIGNALIZATION, AND ENFORCEMENT POLICIES

As shown in Chapter 1, and again in Exhibit 19, rates of pedestrian survival drop precipitously if they are struck by a vehicle traveling above approximately 20 miles per hour. While this may not be a realistic speed limit for a roadway that is designated a major highway, comprehensive speed limit reduction should be considered, for the length of the corridor.

The traditional method of setting speed limits at the 85th percentile speed of the roadway 85th percentile speed fails to consider safety impacts of non-auto users. This topic was addressed in a recent National Transportation

Safety Board report titled *Reducing Speeding-Related Crashes Involving Passenger Vehicles.*

The report describes how using the existing speed on a roadway to determine the appropriate speed on a roadway can have unintended consequences. When the speed limit is raised to match the speed over which only 15% of drivers drive, that may increase the operating speed, thus triggering a cycle of increasing speeds, dictated by driver behavior. Instead, speed limits should be set with the safety and travel need of all road users (not just drivers) in mind.

As an adopter of Vision Zero, Montgomery County is moving toward a "safe system" approach to roadway safety. The same NTSB report says the following about setting speed limits as part of a safe system:

Within a safe system paradigm, road designers should use "a proactive urban street design approach (in which the posted speed limit is determined by a target speed based on a desired safety result)." The report also recommends choosing speed limits near the AASHTO minimum for a given roadway type (e.g., the target speed for urban arterial roadways is 35 miles per hour).

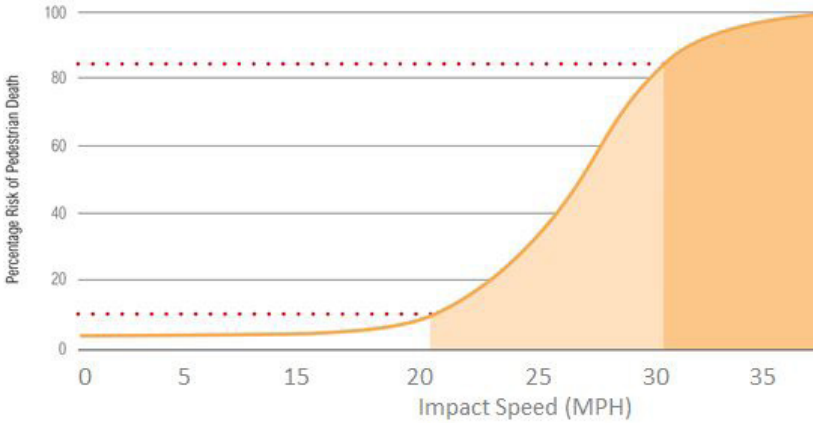
All portions of Veirs Mill Road would see safety benefits from speeds this low, or lower. This is particularly true for the portions with many driveways, vulnerable users, and other conflicts, such as the Newport Mill and Connecticut/Randolph districts. With judgment, highest conflict locations could be reduced to 30 miles per hour.

Once lower speed limits are set, automated enforcement through average speed cameras is one strategy for improving compliance. Another is to use coordinated signal timing so that vehicles traveling at the desired speeds reach repeated green lights and vehicles traveling above this speed must stop frequently at red lights. While actuated beacons are listed as a crossing intervention, full signalization with automatic pedestrian crossing phases offers this further speed control opportunity, as this works best with closely space intersections. Exhibit 19 reiterates the pedestrian fatality rates when hit by vehicles traveling at different speeds, due to the crucial role that speed reduction plays in safety.

SAFETY THROUGH SIGNAL TIMING

Some traffic signal features are known to have safety benefits for pedestrians; specifically, leading pedestrian intervals should be considered at all signalized intersections, and any pedestrian signals that do not yet have countdowns, should be upgraded when possible. In general, programing of signal phasing should be another part of the "safe system" approach in which safety is prioritized, even when Level of Service trade offs may be necessary.

EXHIBIT 19. RATES OF PEDESTRIAN FATALITY AT VARIOUS SPEEDS.



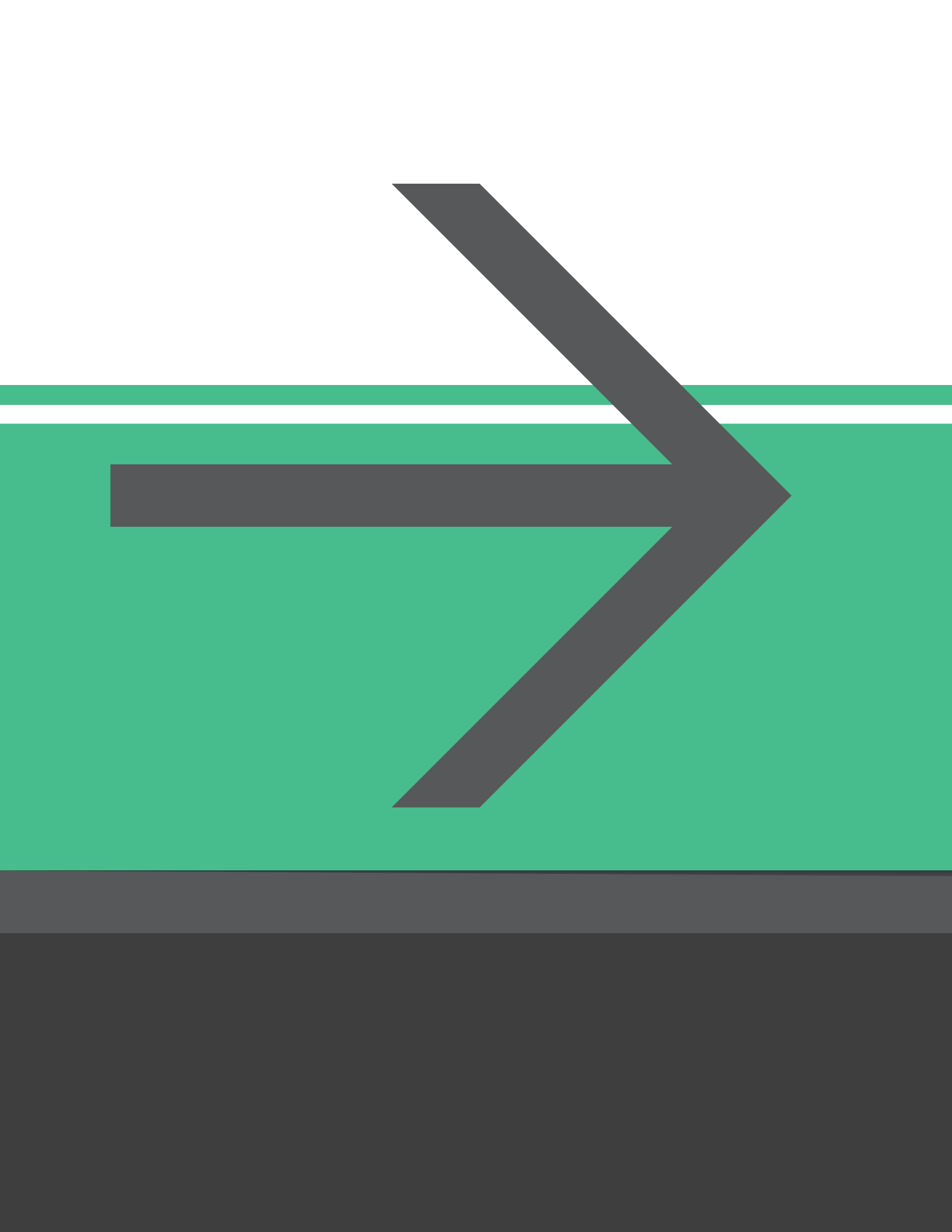
Rates of pedestrian fatality when hit by a car traveling various speeds. (Image Credit: World Resource Institute)

2.4 IMPACTS OF THE INTERVENTIONS

As mentioned previously, each intervention in the toolbox can perform multiple safety Table 1 represents their full range of safety benefits, organized by how they contribute to the ways that safety is created.

TABLE 1. INTERVENTIONS AND THEIR SAFETY BENEFITS

Treatment	Decrease Crash Frequency				Decrease Crash Severity (by slowing motor vehicles)
	Decrease conflicts by providing separate spaces	Decrease conflicts by improving crossing opportunities	Increase safe yielding by slowing motor vehicle speeds	Increase predictability of road users	
Create continuous sidewalks	✓			✓	
Create continuous bikeways	✓			✓	
Add pedestrian refuge islands		✓			
Create a level sidewalk or sidepath across driveways	✓			✓	
Add signalized crossing opportunities		✓	✓	✓	✓
Create raised crossings		✓	✓		✓
Tighten turn radii		✓	✓		✓
Create curb extensions		✓	✓	✓	✓
Reduce posted speed limit (and enforce)				✓	✓
Ensure proper sidewalk, sidepath, and bikeway maintenance	✓			✓	
Signal phasing used to prioritize safety				✓	



CHAPTER 3

SHORT-TERM SAFETY INTERVENTIONS

3.1 ADDRESSING THE PROBLEM LIST

This chapter will show how the toolbox of interventions can be applied to Veirs Mill Road, to improve safety for all users. The following corridor-wide strategies should be applied for the length of the study corridor:

- Speed Reduction through Speed Limit, signalization, and Enforcement Policies
- Maintenance practices that maintain bicyle and pedestrian mobility at all times

The site-specific improvements are mapped on the following pages according the the "districts" identified in the Veirs Mill Corridor Master Plan. Exhibit 20 shows the limits of each of the districts.

The most major, and among the most pressing, recommendations are to add or retrofit signals or beacons, in order to create a pattern of protected pedestrian crossings, at regular intervals. These locations are shown in the tables below, as well as on their respective district maps.

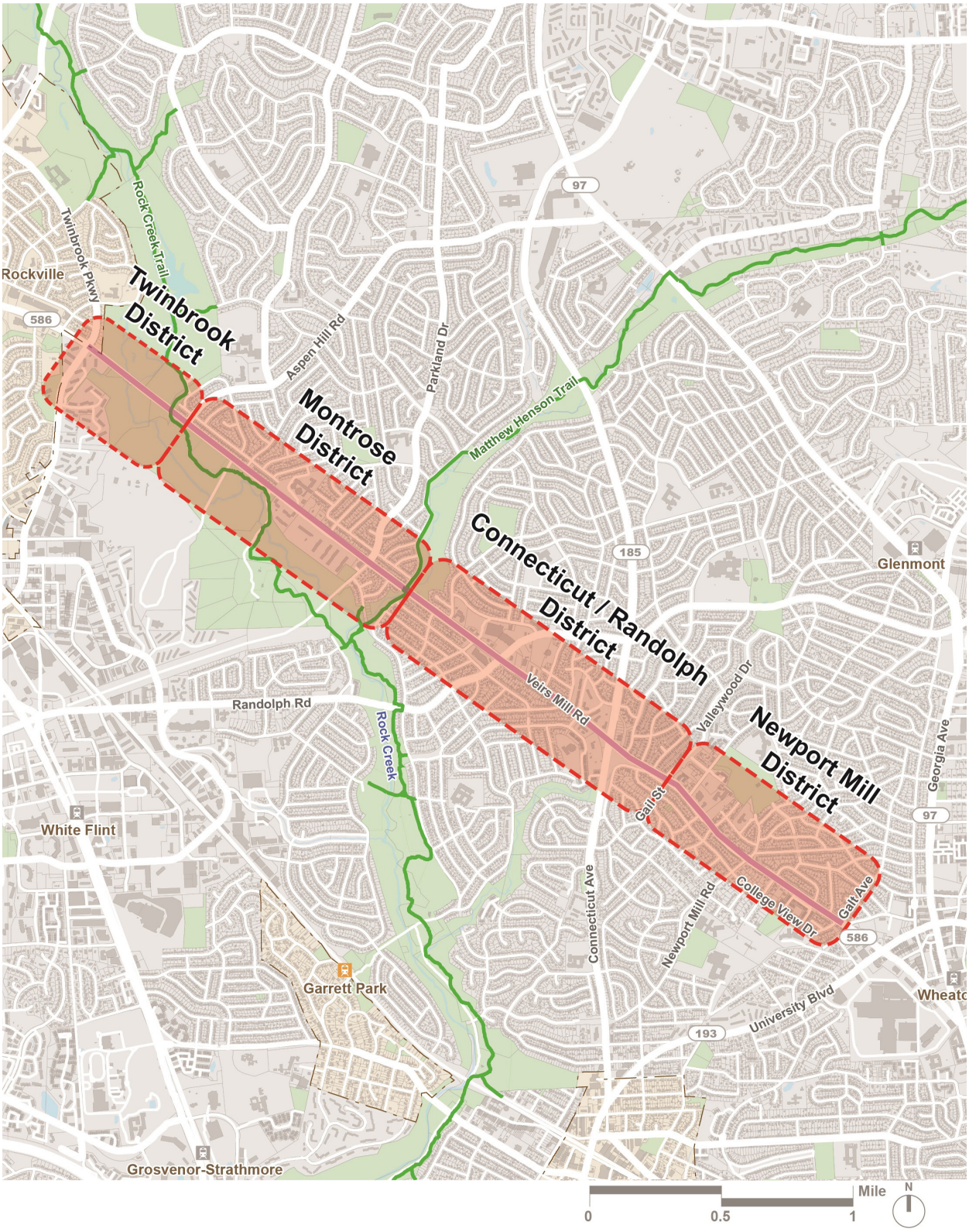
TABLE 2. LOCATIONS OF NEW SIGNAL OR BEACON RECOMMENDATIONS

District	Location
Newport Mill	Galt Avenue & Veirs Mill Road
Newport Mill	Pendleton Drive & Veirs Mill Road
Newport Mill	Valleywood Drive & Veirs Mill Road
Montrose	Arbutus Avenue & Veirs Mill Road

TABLE 3. LOCATIONS OF SIGNAL RETROFIT RECOMMENDATIONS

District	Location
Newport Mill District	Newport Mill Road & Veirs Mill Road
Newport Mill District	Claridge Road & Veirs Mill Road
Connecticut/Randolph	Connecticut Avenue & Veirs Mill Road
Connecticut/Randolph	Ferrara Drive & Veirs Mill Road
Connecticut/Randolph	Randolph Road & Veirs Mill Road
Connecticut/Randolph	Gridley Road & Veirs Mill Road
Connecticut/Randolph	Connecticut Avenue and Veirs Mill Road
Montrose	Matthew Henson Trail Crossing
Montrose	Gaynor Road & Veirs Mill Road
Montrose	Robindale Drive & Veirs Mill Road
Montrose	Aspen Hill Road & Veirs Mill Road
Twinbrook	Twinbrook Parkway & Veirs Mill Road

EXHIBIT 20. LIMITS OF EACH DISTRICT



3.2 NEWPORT MILL DISTRICT

The eastern portion of the study corridor from approximately University Boulevard to Gail Street is described as the Newport Mill District, and its limits are shown in Exhibit 21. This area is characterized by a mix of institutional and residential uses, a relatively constrained right of way, and frequent driveways. Additionally, portions of the south side of the corridor are missing a sidewalk.

3.2.1 RECOMMENDED IMPROVEMENTS

This segment is not wide enough to provide a two-way separated bike lane in the short term, therefore the primary bicycle and pedestrian accommodation recommendation is to provide a sidepath 8 feet in width or wider, wherever there is not a frontage road.

This corridor segment provides occasional signalized opportunities for pedestrians and bicyclists to cross, but the existing signals at Newport Mill Road and Claridge Road should be upgraded to include high-visibility crosswalks on each approach, pedestrian refuges if space allows, and an actuated or pedestrian recall crossing phase. Most changes to the operation of signalized intersections will require further study, but each of the following changes should be considered where retrofitting is recommended:

1. Add additional crosswalks across legs that currently do not have marked crosswalks.
2. Shorten crossing distance by adding curb extensions, reducing lane widths, or reducing number of through or turning lanes.
3. Add pedestrian refuge islands.
4. Evaluate signal phasing to reduce pedestrian wait time as well as ensuring pedestrian green time is sufficient enough for pedestrians to cross.

The existing unsignalized crossings at Pendleton Drive and Gail Street should be upgraded to include an actuated beacon similar to that at the Matthew Henson Trail crossing (or a HAWK signal, if deemed feasible), and a median refuge for pedestrians, to break up the crossing distance. The location for each of these recommended improvements is shown in Exhibit 22.

Where a frontage road is present (such as from Glorus Place continuing past Gail Street and between Dawson Avenue and Galt Avenue) it can be striped with a contraflow bike lane and sharrows (or simply sharrows, if parking is to be maintained) and the frontage road's sidewalks can be used by pedestrians, though they should still be assessed for ADA compliance and upgraded if necessary, using techniques such as the short-ramp described in the previous section. Bicycle-friendly speed humps (or other appropriate vertical deflection techniques) can be used to calm traffic where sharrows are present, as warranted or determined feasible by study.

College View Drive and Upton Drive should also be considered for neighborhood greenway treatments to provide an additional low-stress bicycling option.

EXHIBIT 21. NEWPORT MILL DISTRICT

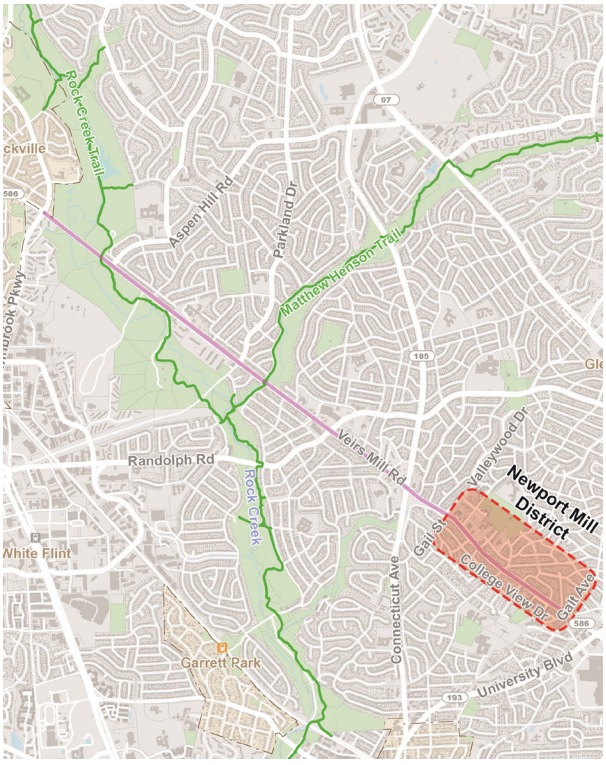


EXHIBIT 22. RECOMMENDATIONS FOR THE NEWPORT MILL DISTRICT

3.3 CONNECTICUT/ RANDOLPH DISTRICT

The section of the study corridor from Gail Street to the eastern edge of Matthew Henson Park is named for its two major intersections, Connecticut Avenue, and Randolph Road; its limits are shown in Exhibit 23.

3.3.1 RECOMMENDED IMPROVEMENTS

This segment is not wide enough to provide a two-way separated bike lane in the short term, thus, the primary bicycle and pedestrian recommendation is to provide a sidepath 8 feet in width or wider on each side of the street, wherever there is not a frontage road. This may be a new sidewalk/ sidepath, or may be a widening retrofit of an existing sidewalk

Where a frontage road is present, it can be striped with a contraflow bike lane and sharrows (or simply sharrows, if parking is to be maintained), and the frontage road's sidewalks can be used by pedestrians, though they should still be assessed for ADA compliance and upgraded if necessary, using techniques such as the short-ramp described in the previous section. Bicycle-friendly speed humps (or other appropriate vertical deflection techniques) can be used to calm traffic where sharrows are present, as warranted or determined feasible by study.

Connecticut Avenue's channelized right-turn lanes warrant detailed traffic study; if their necessity cannot be definitively determined, they should be removed, and the intersection retrofitted with standard right-turn lanes with sufficiently tight turn radii to slow turning vehicles crossing the crosswalks. If it is determined that they cannot be removed, they should be retrofitted with raised crossings and accessible pedestrians signals, as described in the toolbox section, and as determined feasible by warrant and engineering studies. The signalized intersections at Randolph Road, Ferrara Drive and Gridley Road should be retrofitted to ease pedestrian crossings, as described in the Newport Mill District section.

The Intersection of Veirs Mill Road and Havard Street should be improved with a curb extension on the north side of the street. The location for each of these recommended improvements is shown in Exhibit 24.

College View Drive, Ferrara Drive, and Selfridge Road should also be considered for neighborhood greenway treatments to provide an additional low-stress bicycling option.

EXHIBIT 23. CONNECTICUT/RANDOLPH DISTRICT

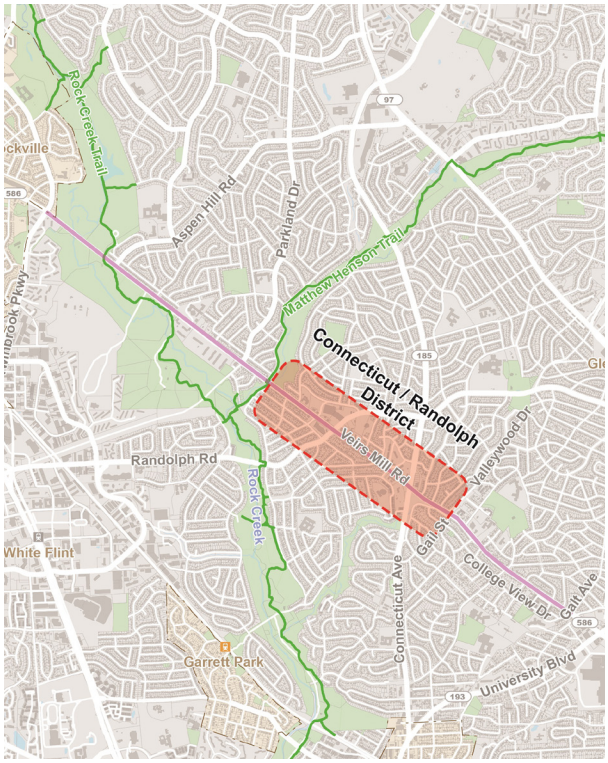


EXHIBIT 24. RECOMMENDATIONS FOR THE CONNECTICUT/RANDOLPH DISTRICT

3.4 MONTROSE DISTRICT

The section of the study corridor bounded by the eastern edge of Matthew Henson Park and the Rock Creek Trail crossing is known as the Montrose District; its limits are shown in Exhibit 26. It is wider than the eastern segments of the corridor, and highly influenced by the parks and open space that border it.

3.4.1 RECOMMENDED IMPROVEMENTS

The segments shown in Exhibit 27 with missing sidewalks should be upgraded with a sidewalk where adjacent to a frontage road or separated bike lane, or a sidepath where indicated.

This segment would also benefit from crossing upgrades as indicated in Exhibits 25 and 27.

This segment is sufficiently wide to provide a two-way separated bike lane in the short term in most places. This separated bike lane is envisioned for the space that currently functions as a shoulder. It should include a vertical separation from traffic such as a curb (which can be crossed in emergency situations but still provide protection), and would require repaving of the shoulder. A neighborhood greenway on Furman Road would provide connection from the bike facilities on Veirs Mill Road to the Matthew Henson Trail.

EXHIBIT 26. MONTROSE DISTRICT

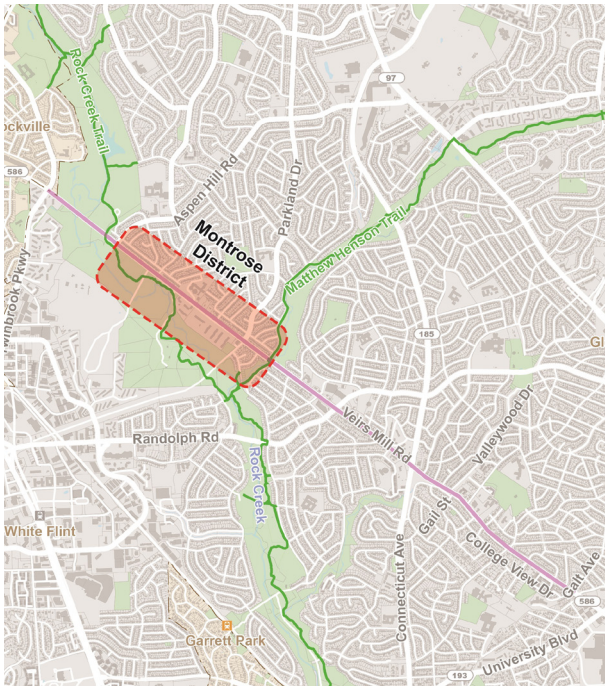


EXHIBIT 25. IMPROVE MATTHEW HENSON TRAIL CROSSING

EXHIBIT 27. RECOMMENDATIONS FOR THE MONTROSE DISTRICT

3.5 TWINBROOK DISTRICT

The westernmost portion of the study corridor is the Twinbrook District, which is bounded by the Rock Creek Trail Crossing. It is missing a sidewalk on the south side of the street, and does not have bicycle accommodations. The limits of the Twinbrook District are show in Exhibit 28.

3.5.1 RECOMMENDED IMPROVEMENTS

The sidewalk should be completed in this district, adjacent to the separated bike lane; this segment would also benefit from curb extensions and crossing upgrades as indicated in Exhibit 29.

This segment is sufficiently wide to provide a two-way separated bike lane in the short term in most places. This separated bike lane is envisioned for the space that currently functions as a shoulder. It should include a vertical separation from traffic such as a curb (which can be crossed in emergency situations but still provide protection), and would require repaving of the shoulder.

EXHIBIT 28. LOCATION OF TWINBROOK DISTRICT

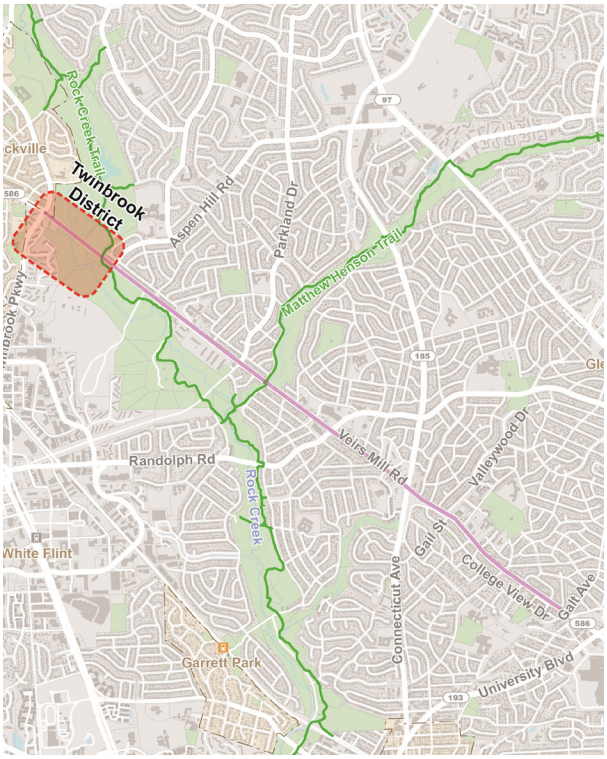
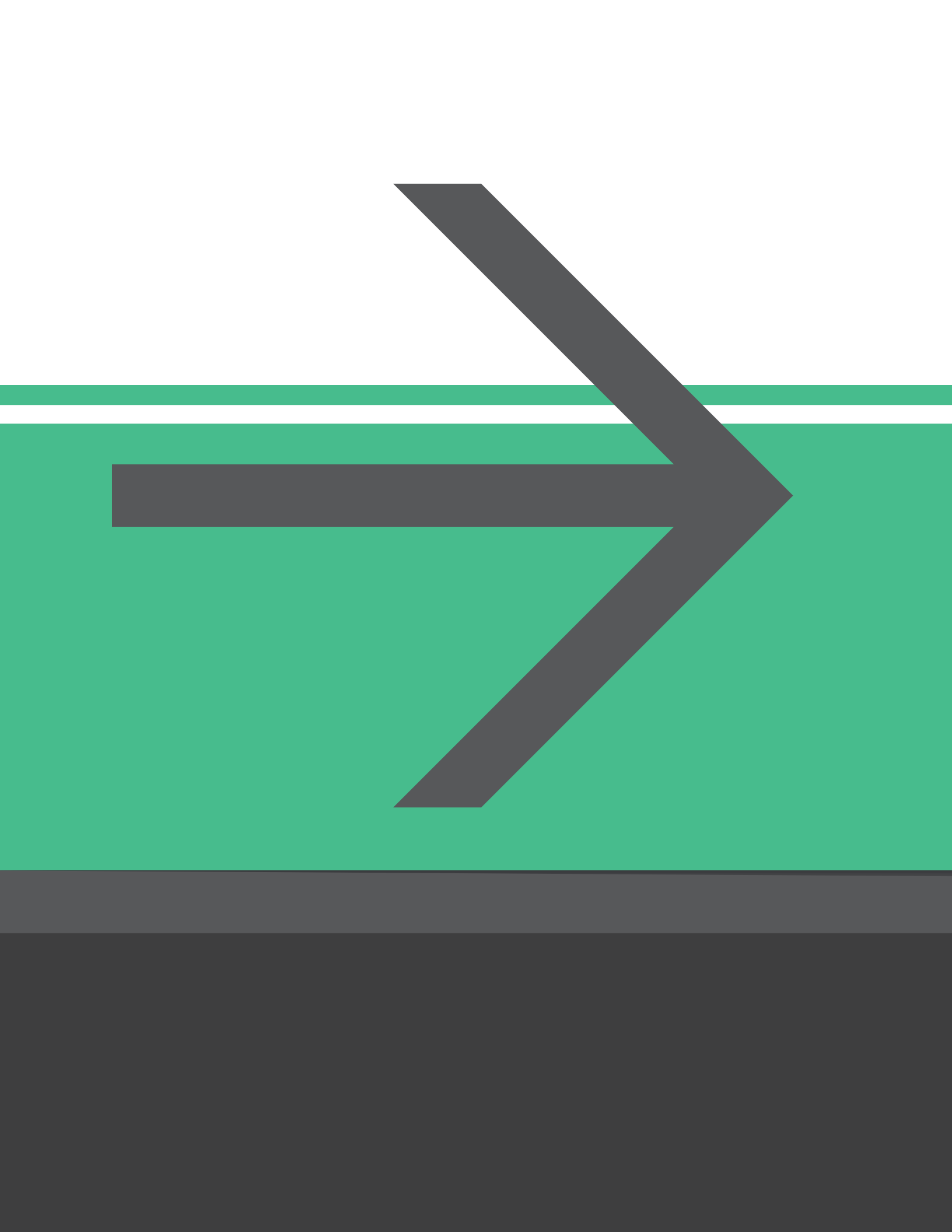


EXHIBIT 29. RECOMMENDATIONS FOR THE TWINBROOK DISTRICT



CHAPTER 4

LONG-TERM COMPLETE STREET CONCEPT

4.1 VISION

The task for the long-term vision for Veirs Mill Road is to provide a high-level conceptual plan to reach Vision Zero in a 30-year time frame. Two options were shared with the community at a meeting on October 24, 2017. The recommended option is a complete street concept, which is described further in this chapter.

4.1.1 CORRIDOR-WIDE DESIGN CONSIDERATIONS FOR CREATING A COMPLETE STREET

A "complete street" design fosters a safe and comfortable environment for all road users by creating separate, clearly demarcated spaces for private automobiles, transit vehicles, pedestrians, and bicyclists.
The ideal complete street is designed to be intuitive and safe for all users. The long-term plan expands on the short-term improvements by providing further separation between all road users, including larger vegetated buffers between vehicles and people walking and biking. The long term plan also incorporates considerations for Bus Rapid Transit.

Long term recommendations for the corridor in general include:

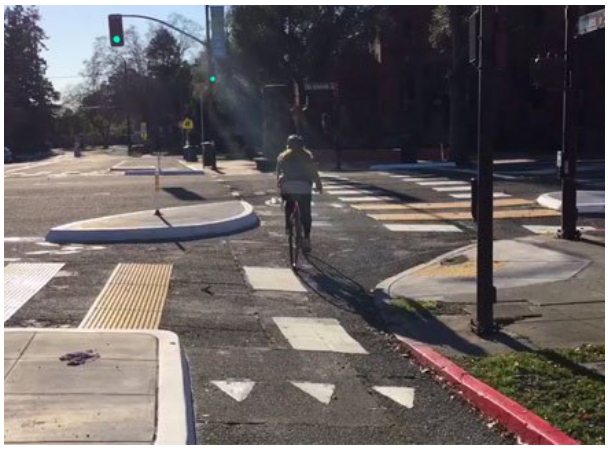
- **Two-way movements for people walking and riding bicycles on both sides of Veirs Mill Road, with vegetated buffers.**
    - » In unconstrained portions of the corridor (those where the available right-of-way width is 120 feet or more), facilities may include, for example, a sidewalk plus a two-way separated bike lane (with a center stripe) on each side of Veirs Mill Road.
    - » In constrained portions of the corridor, where there is less available right-of-way, bicycle and pedestrian sidepaths are envisioned.
    - » Due to varying conditions along the corridor, there are some portions with a sidepath on one side of Veirs Mill Road and a two-way separated bike lane with a sidewalk on the other side of the street.

A complete street design fosters a safe and comfortable environment for all road users by creating separate spaces for private automobiles, transit vehicles, pedestrians, and bicyclists.

Example of a two-way separated bike lane with a sidewalk (Photo credit: Bicycle Coalition of Greater Philadelphia)

Example of a path shared by people walking and riding bicycles (Photo credit: Laura Stark)

- **More frequent safe crossings.**
  - » The long-term plan incorporates and builds on the short-term improvements related to newly signalized intersections & crossings.
  - » All bicycle and pedestrian crossings will be, at a minimum, level and well-marked. Where possible, crossings should be raised to encourage cautious movement by vehicles, particularly for crossings at driveways and small side street intersections.
  - » Where separate (as opposed to shared-use) bicycle and pedestrian facilities are utilized, bicycle crossings should be separate from pedestrian crossings.
  - » All curb ramps should be ADA compliant.
  - » At the time of adoption of this plan, protected intersections are the state of the practice for extending separated bike lanes through the intersection and should be implemented where separated bike lanes cross major highways, arterial roads, business district streets or other high-volume streets. Should best—practices change, the most recent guidance for these designs should be applied.



Protected intersections, such as the one shown here (from Berkeley, California) help to avoid crashes between turning vehicles and people walking or riding bicycles using a raised curb that protects people as they wait to cross the intersection. (Photo credit: Bike East Bay)

- **Rows of trees** planted along the roadway edges and all medians, except near intersections where the center median may be replaced by a turn lane. In addition to the obvious shade benefits, these trees help to visually and physically narrow the roadway, potentially reducing traffic speeds.
- **A lane in each direction for bus rapid transit and local buses,** with easily-accessible stations provided along the curb or in a median between the access road and the main road (where an access road currently exists). This bus lane can also be used for right turns by other vehicles. The recommended width for these lanes is 11 feet.
- **Two general travel lanes in each direction.** These lanes should be as narrow as they can safely be in order to encourage slower driving. The recommended width is 10 feet.
- **Removal of all dual left-turn lanes** for increased safety and appropriate intersection scale. A single left turn lane remains at these locations.
- **Utilities buried underground or re-routed** behind buildings or along alleys when possible, to leave a clearer path for people walking and riding bicycles.
- **Pedestrian-scale lighting** in addition to adequate roadway lighting, particularly at intersections.
- **No new access roads.** Existing access roads will be improved for bicycle and pedestrian safety.

4.1.2 BUS RAPID TRANSIT

Any long-term improvements to Veirs Mill Road must consider Bus Rapid Transit (BRT). Maryland Department of Transportation (MDOT) and Montgomery County Department of Transportation (MCDOT), completed a BRT study in 2016. The study analyzed the costs and benefits of several options for providing enhanced service on the Veirs Mill Road corridor. The County Council voted to move forward with a design called Alternative 2.5, retaining Alternative 3 for the master plan and potential eventual long-term design. Alternative 2.5 was developed at the request of the County Council and is called Alternative 2.5 because it is a hybrid of Alternative 2 and Alternative 3. Any future BRT project or implementation would be led by Montgomery County DOT.

- **Features of Alternative 2.5**:
  - » No dedicated curb lane.
  - » Provision of queue jump lanes at Veirs Mill Road's 12 busiest intersections between Rockville and Wheaton, with transit signal prioritization.
  - » Stations with features such as level-boarding, off-board fare collection, and real-time information, and new BRT service would be provided using new, branded, and larger BRT vehicles.
- **Features of Alternative 3**:
  - » Curb lanes along most of the corridor, shared only with local buses and right-turning vehicles.
  - » Stations with features such as level-boarding, off-board fare collection, and real-time information, and new BRT service would be provided using new, branded, and larger BRT vehicles.

Because Alternative 3 was retained as the master plan option, this Vision Zero long-term concept plan incorporates dedicated curb lanes for buses. Alternative 3 would require extension of the current curb line, within the existing right-of-way, for several parts of the corridor. While Alternative 2.5 would not require extension of the current curb line in most locations, it may be necessary to widen the roadway to provide for queue jump lanes for buses, which are proposed at six locations within the study area:

- Twinbrook Parkway (EB and WB)
- Aspen Hill Road (EB and WB)
- Parkland Drive/ Montrose Parkway (EB and WB)
- Gridley Road (WB)
- Randolph Road (WB)
- Connecticut Avenue (EB and WB)

These queue jumps promote improved travel times for the bus, particularly when paired with signal prioritization, as proposed. Of the six locations where they are proposed, it is likely that only one (Parkland Drive / Montrose Parkway East) may require widening to achieve the queue jumps, should Alternative 2.5 proceed.

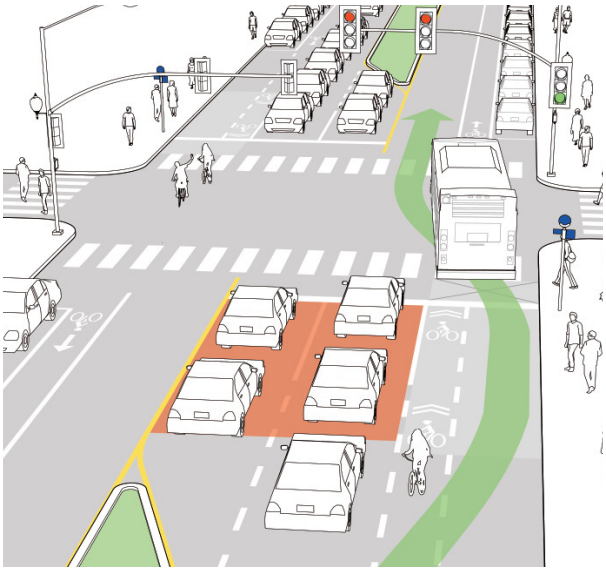


Illustration depicting the use of a bus queue jump lane, which can significantly provide improve transit travel time, even without a dedicated lane (Image Source: NACTO Transit Street Design Guide)

It is very likely that enhancements to the bus system would draw more riders, which means more people traveling to each bus station. Stations must be easily and safely accessible by pedestrians and bicyclists. This includes signalized crossings at all BRT stations.

4.1.3 LAND USE CONSIDERATIONS

Though this plan does not specifically address potential future land use patterns, land use can play an important role in creating a safer and more comfortable experience for people walking and riding bicycles. To further support the vision for Veirs Mill Road, future development and redevelopment plans along the corridor should include:

- Buildings built up to the sidewalks, rather than set back behind parking lots, in order to both visually narrow the roadway and provide enhanced pedestrian accessibility to buildings.
- Access points from side roads or the rear of the property, rather than directly off of Veirs Mill Road.
- A mix of land uses, where feasible, to provide greater interest and visibility for people walking and riding along Veirs Mill Road.

4.1.4 DISTRICT-SPECIFIC RECOMMENDATIONS

The remainder of this chapter provides general design concepts for each of the four Districts (see Exhibit 29), starting at the far southeastern end of the Veirs Mill Road corridor.

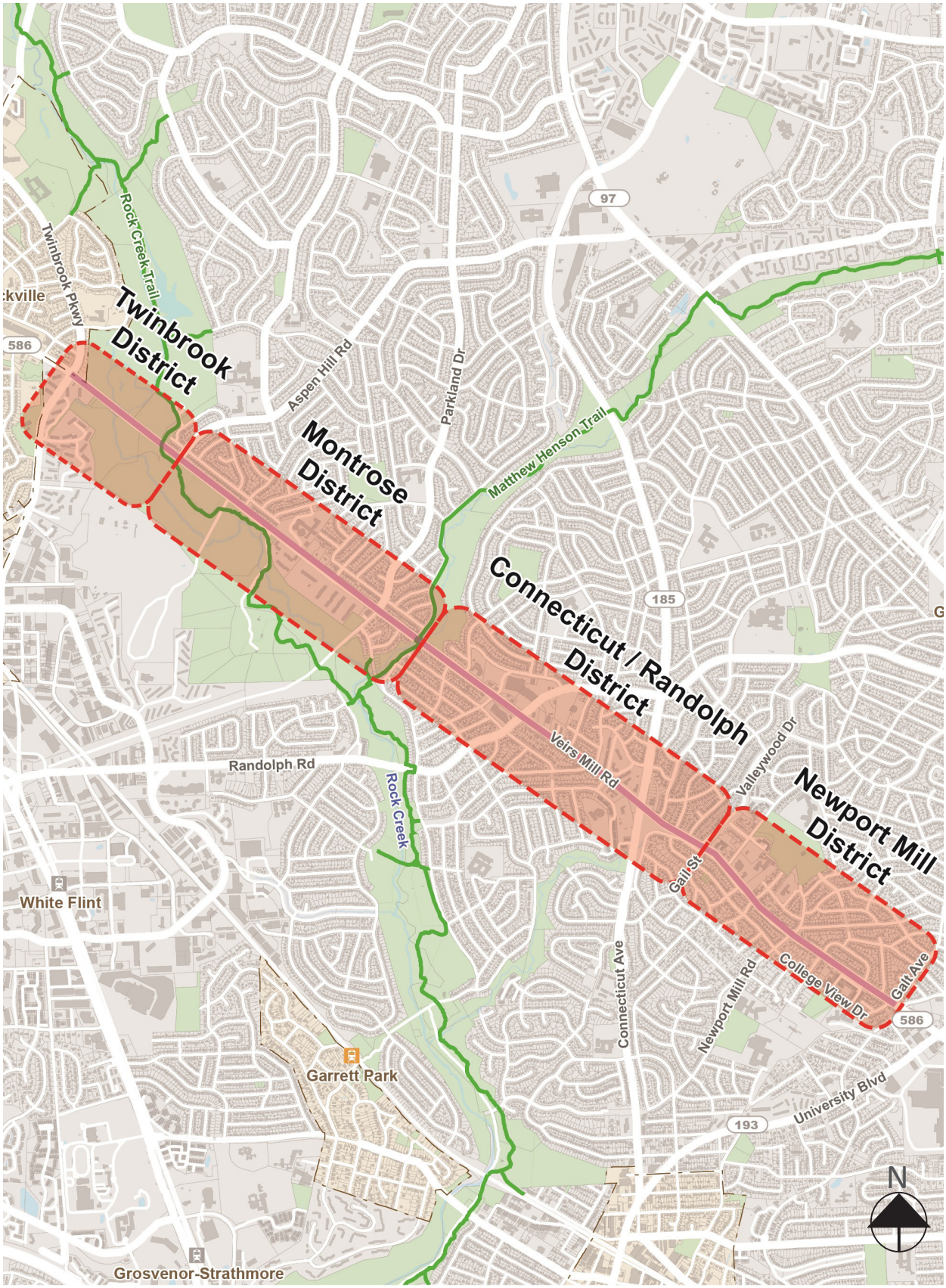
Recommendations include examples of typical cross sections within each District, and solutions to certain problem/issue areas. The full concept plan provided in the Appendix provides a high-level overview of one way these recommendations could create a complete street redesign for Veirs Mill Road.

The long-term District-specific recommendations incorporate many of the short-term recommendations, but also make changes to some facilities and utilize additional features to provide greater safety enhancements and separation between modes.

- In general, the long-term plan incorporates increased separation between different types of modes, where right-of-way allows.
- The long-term plan incorporates protected intersections, which are not included as a short-term solution.

Note that while the cross sections and other solutions indicate recommended dimensions for facilities based on the available right-of-way in each District, detailed design guidance for each type of facility is not provided. Conditions will vary along the corridor based on available width and other considerations. The plan assumes compliance with all County standards found in the Bicycle Facility Design Toolkit (2017). Facilities must also be compliant with ADA standards.

EXHIBIT 30. VEIRS MILL ROAD DISTRICTS



4.2 NEWPORT MILL DISTRICT

4.2.1 RECOMMENDED IMPROVEMENTS

BICYCLE AND PEDESTRIAN FACILITIES

In the Newport Mill District (as shown in Exhibit 31) as in all Districts in the Veirs Mill Corridor, the recommended bicycle and pedestrian facilities seek to provide as much space and separation between the two modes as is allowed by the available right-of-way.

From Galt Avenue to just east of Norris Drive, the recommended facilities are two-way separated bike lanes with a six-foot sidewalk on the south side of the road, and a 12-foot sidepath on the north side; see Exhibit 34, which represents this condition with the access road. A similar cross section is recommended from Galt Avenue to Sherrie Lane, with the exception of the access road.

For the western portion of the District, Norris Drive to Gail Street, the general recommended bicycle and pedestrian facility is a 10-foot sidepath on both sides of Veirs Mill Road as shown in Exhibit 33.

When the facilities change from separated spaces for bicyclists and pedestrians to shared space, as is recommended east of Norris Drive, there should be a transition period where a sidepath coexists with a sidewalk to allow pedestrians time to move to the sidewalk before the addition of the separated bike lanes.

On the south side of Veirs Mill Road between Glorus Place and Pendleton Road, there is a large change in elevation. Because the slope is very steep, it does not allow for continuation of the access road to Pendleton Road, or for an easy connection from the access road to Veirs Mill Road. Though that connection may be possible with further engineering, a simpler solution to continuous bicycle and pedestrian facilities is to provide these facilities in the median between the primary roadway and the access road, rather than on the outside of the access road.

EXHIBIT 31. LOCATION OF NEWPORT MILL DISTRICT

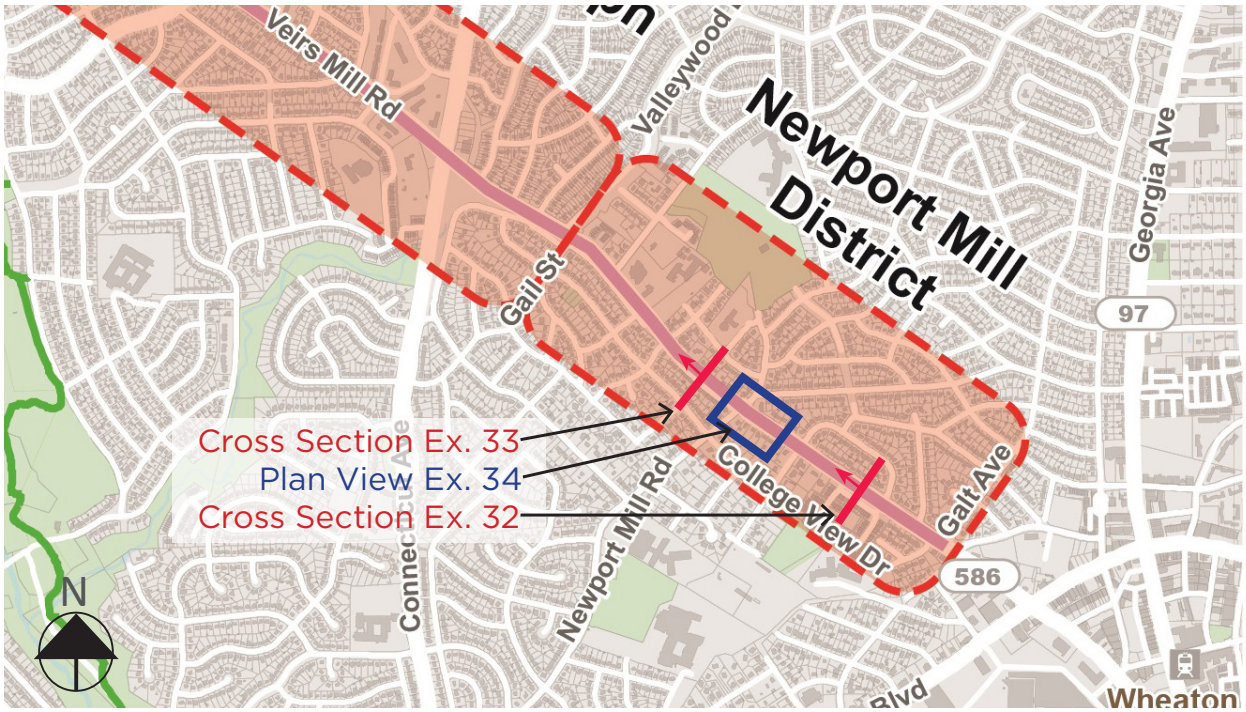


EXHIBIT 32. EXISTING AND RECOMMENDED CROSS SECTIONS, GALT AVE TO EAST OF NORRIS DRIVE

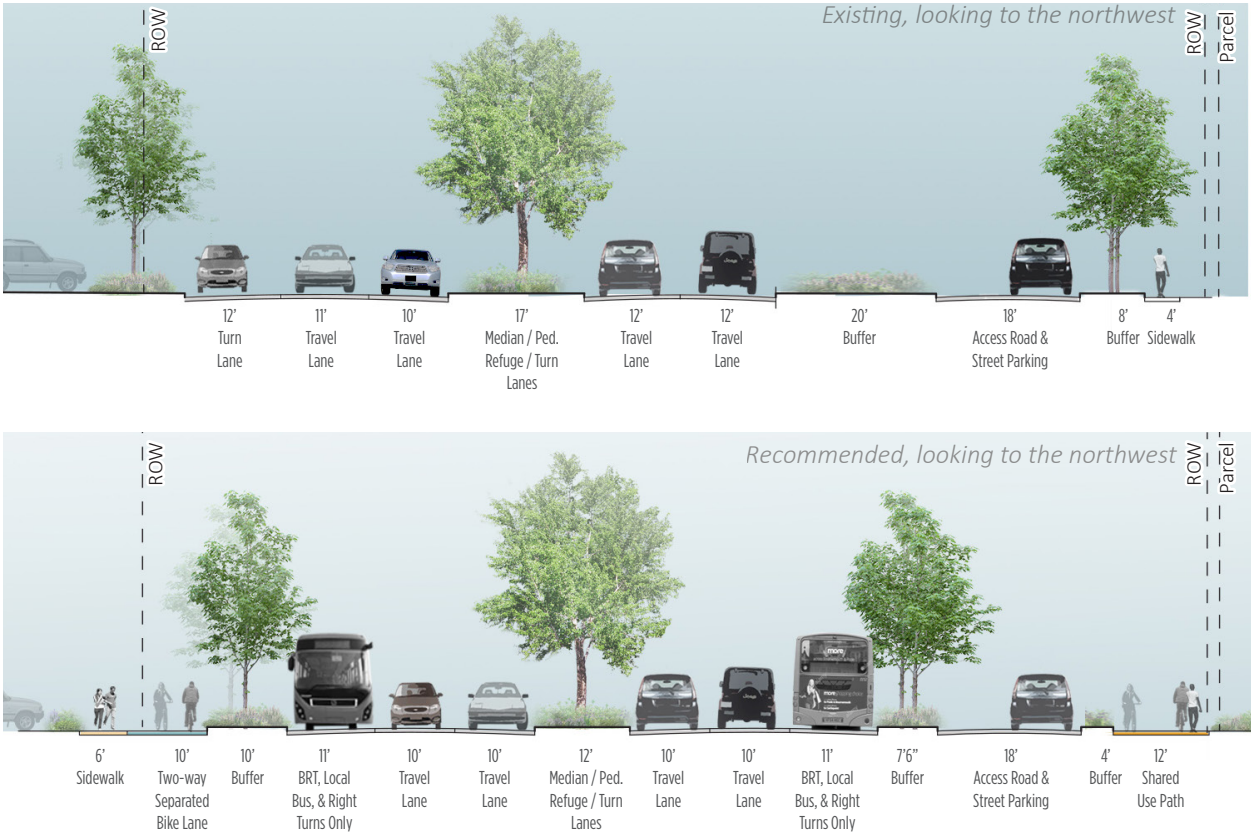
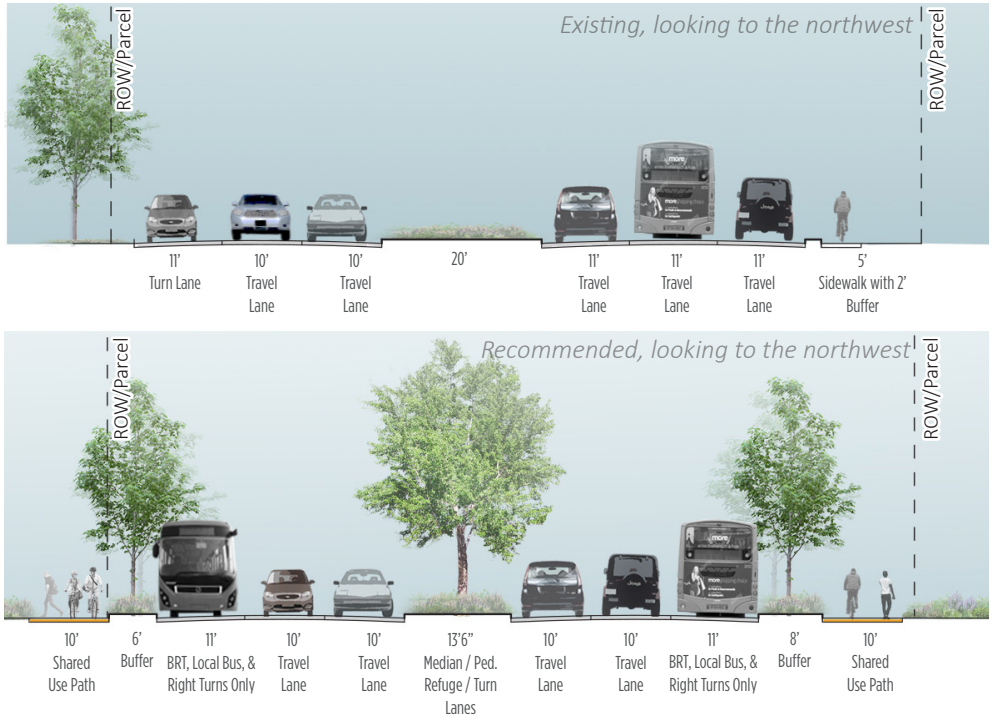


EXHIBIT 33. EXISTING AND RECOMMENDED CROSS SECTIONS, EAST OF NORRIS DRIVE TO GAIL STREET



The cross section recommended in Exhibit 32 would require approximately six additional feet of right of way. If this is not feasible to obtain, some cross section elements could be narrowed.

The cross section recommended in Exhibit 33 would require an additional 10 feet of right of way in some sections (between Norris and Pendleton and between Pendleton and Gail. Cross section elements could be narrowed if necessary.

CROSSINGS & INTERSECTIONS

Galt Avenue, Norris Drive, Pendleton Drive, and Gail Street should be considered for, at minimum, actuated beacons, and perhaps full signalization. In either case, these intersections should include pedestrian refuge medians that are as wide as allowed by the right-of-way. Existing signalized intersections must be upgraded, as needed, to include high-visibility crossings on each side of the intersection.

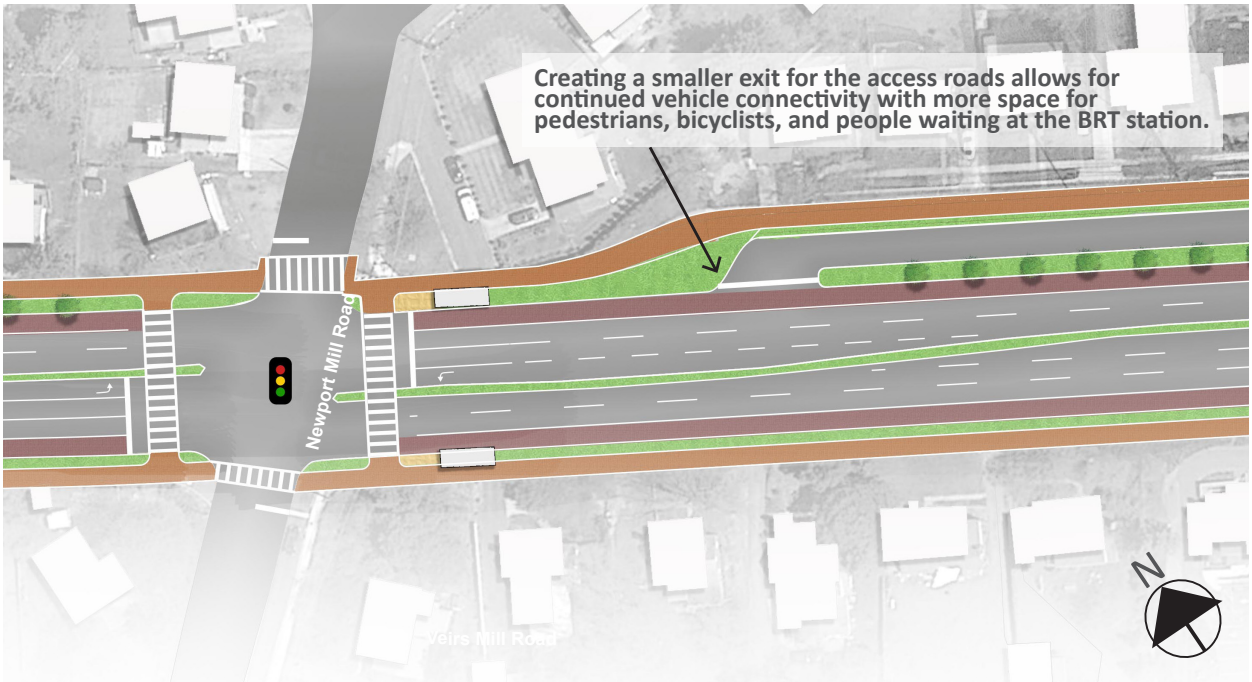
ACCESS ROADS

Tightening the space for the exit of the access road just east of Newport Mill Road will clarify vehicle movements and provide more space for people walking and riding bicycles as seen in Exhibit 34.

BRT CONSIDERATIONS

Though the plans for the future BRT system show a westbound stop on the far side of Veirs Mill Road at Newport Mill Road, it is recommended that the stop be moved to the near side of the intersection, to take advantage of the extra space provided by the tightening of the access road exit, for enhanced station amenities.

EXHIBIT 34. RECOMMENDATIONS FOR THE NEWPORT MILL ROAD AREA



4.3 CONNECTICUT/ RANDOLPH DISTRICT

4.3.1 RECOMMENDED IMPROVEMENTS

BICYCLE AND PEDESTRIAN FACILITIES

There are three recommended cross sections for the Connecticut/Randolph District, the limits of which are shown in Exhibit 35.

From Gail Street to west of Ferrara Avenue, the recommended facilities are a 10-foot sidepath on the north side of Veirs MIll and an 11-foot sidepath on the south side, see Exhibit 36.

From Ferrara Avenue to Gridley Road, the recommended facilities are two-way separated bike lanes and a six-foot sidewalk on both sides of the road as shown in Exhibit 37. From Gridley Road to Edgebrook Road, the recommended facilities are a 10-foot two-way bike lane with a six-foot sidewalk on the north side, and a 10-foot sidepath on the south side as shown in Exhibit 38.

CROSSINGS & INTERSECTIONS

Centerhill Street and Bushey Drive should be considered for at least actuated beacons, and perhaps full signalization. In either case, these intersections should include pedestrian refuge medians that are as wide as allowed by the right-of-way. Existing signalized intersections must be upgraded, as needed, to include high-visibility crossings on each side of the intersection.

CHANGES TO TRAVEL LANES & MEDIANS

The intersection of Connecticut Avenue and Veirs Mill Road today is very wide, with channelized turn lanes that function like on-ramps to Connecticut Avenue. The long-term recommendation echoes that of the short-term: the channelized turn lanes should be removed, requiring all traffic movements to occur at the signalized intersection, with tighter turning radii to encourage slower turns as shown in Exhibit 39. With the addition of BRT stations at this intersection, and an assumed increase in pedestrian and bicycle traffic, safer and more intuitive crossings will become even more vital.

EXHIBIT 35. KEY MAP: LOCATION OF CONNECTICUT/RANDOLPH DISTRICT & EXHIBITS

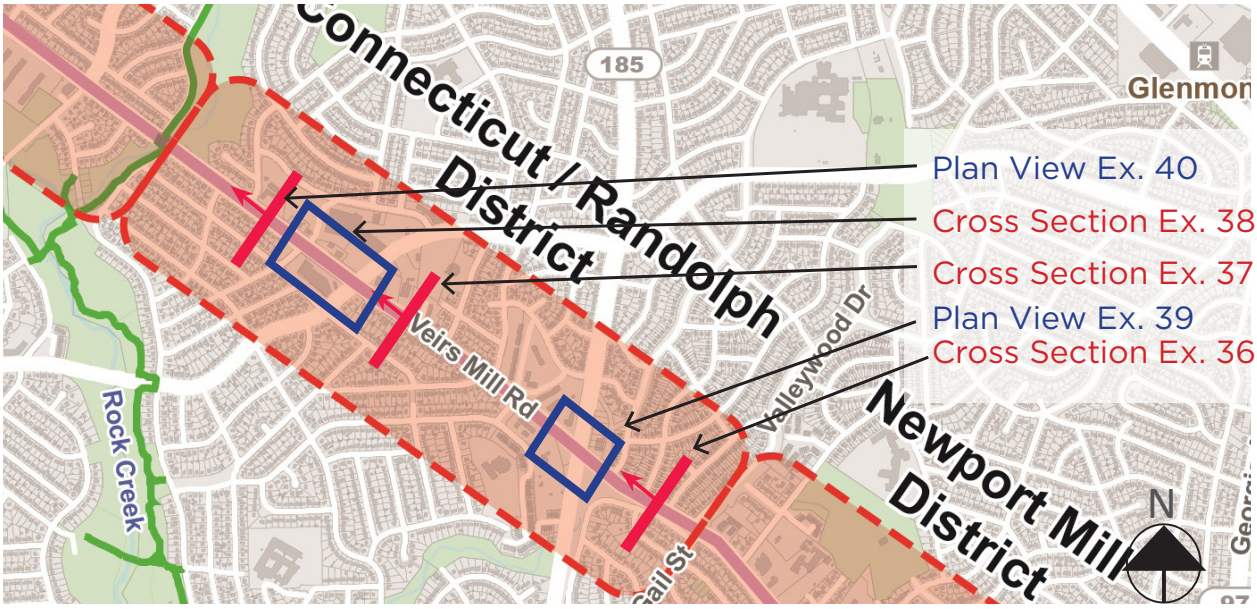
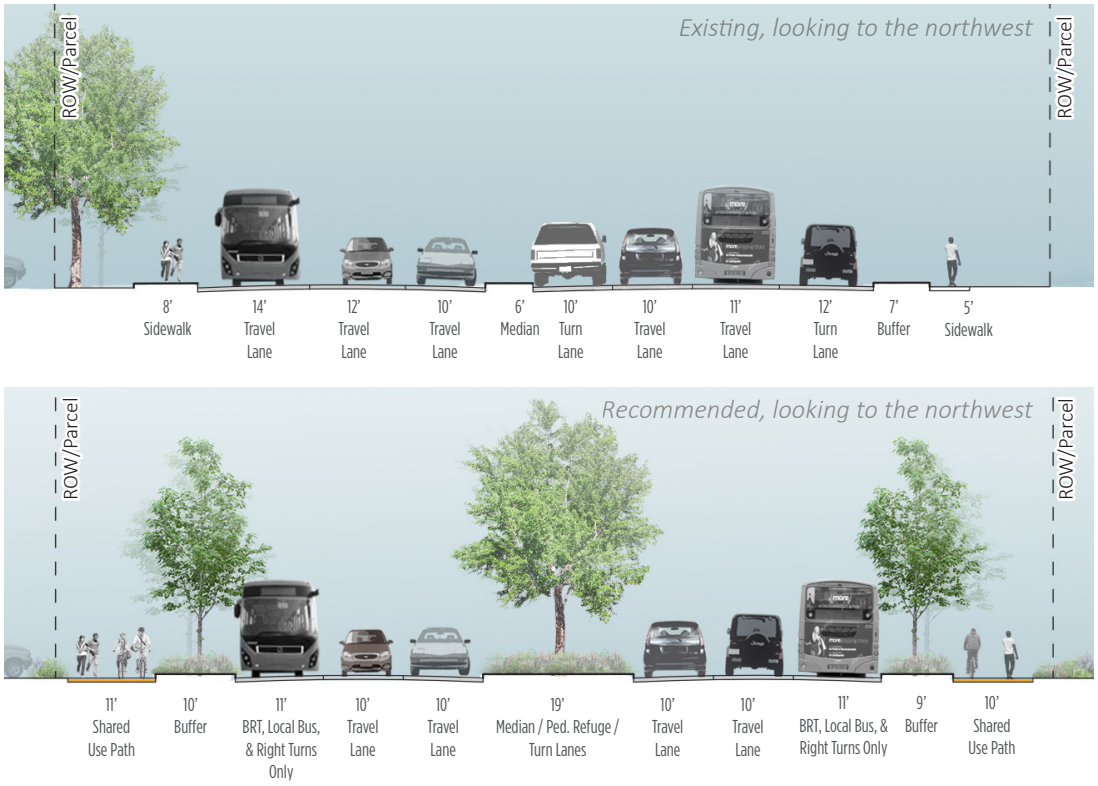


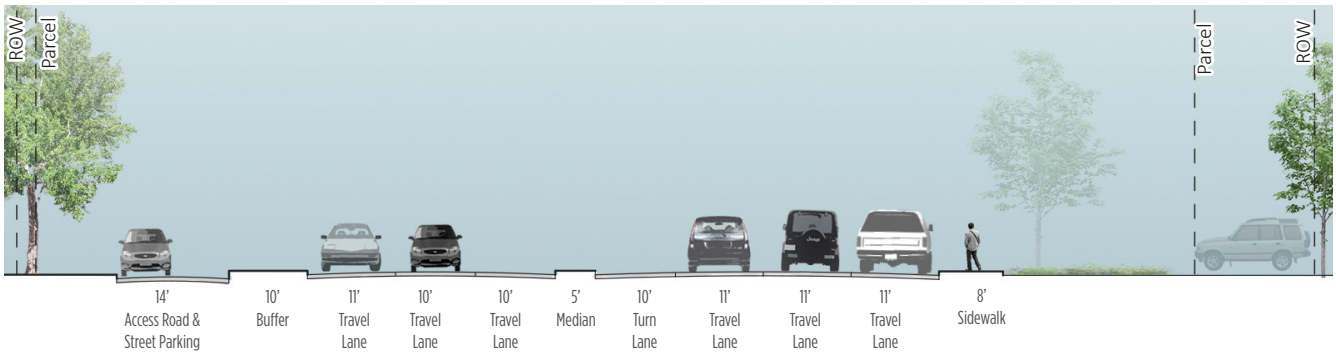
EXHIBIT 36. EXISTING AND RECOMMENDED CROSS SECTIONS, GAIL STREET TO WEST OF FERRARA AVENUE



The cross section recommended in Exhibit 36 falls within the existing right of way.

The cross section recommended in Exhibit 37 would require repurposing the space currently used for the commercial parking lot. This can be reconsidered in the future, and cross section elements can be narrowed, if this is not desired.

EXHIBIT 37. EXISTING AND RECOMMENDED CROSS SECTIONS, WEST OF FERRARA AVENUE TO GRIDLEY ROAD



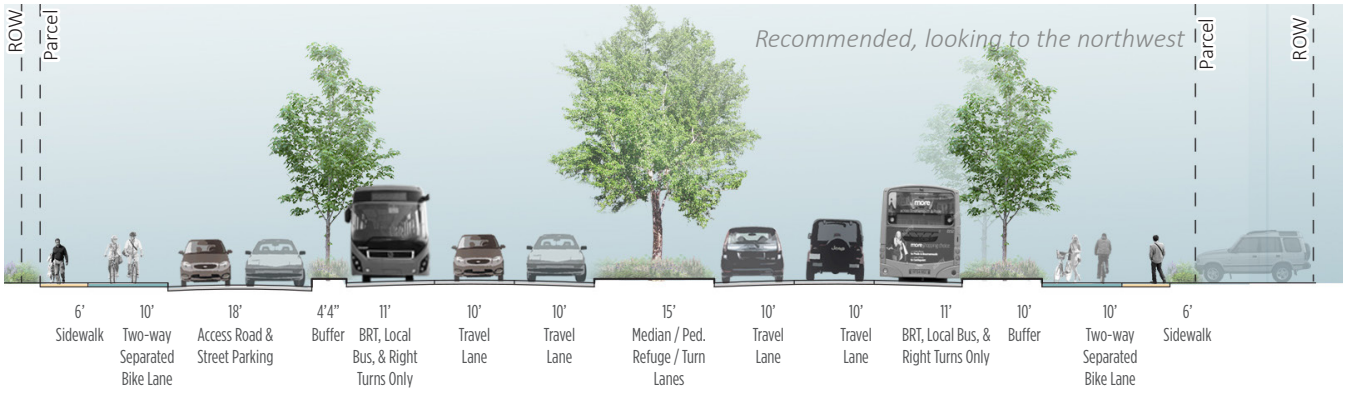
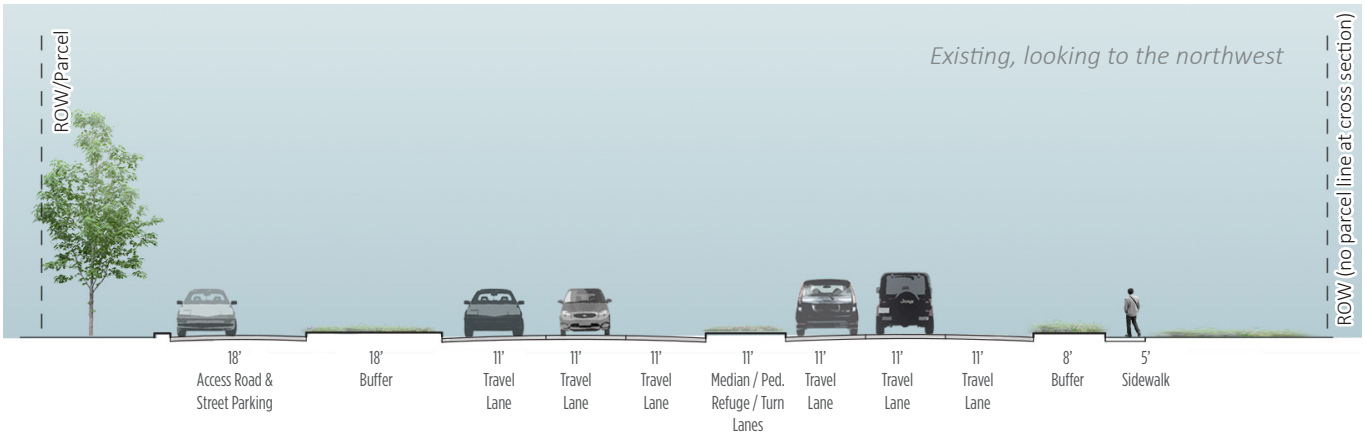
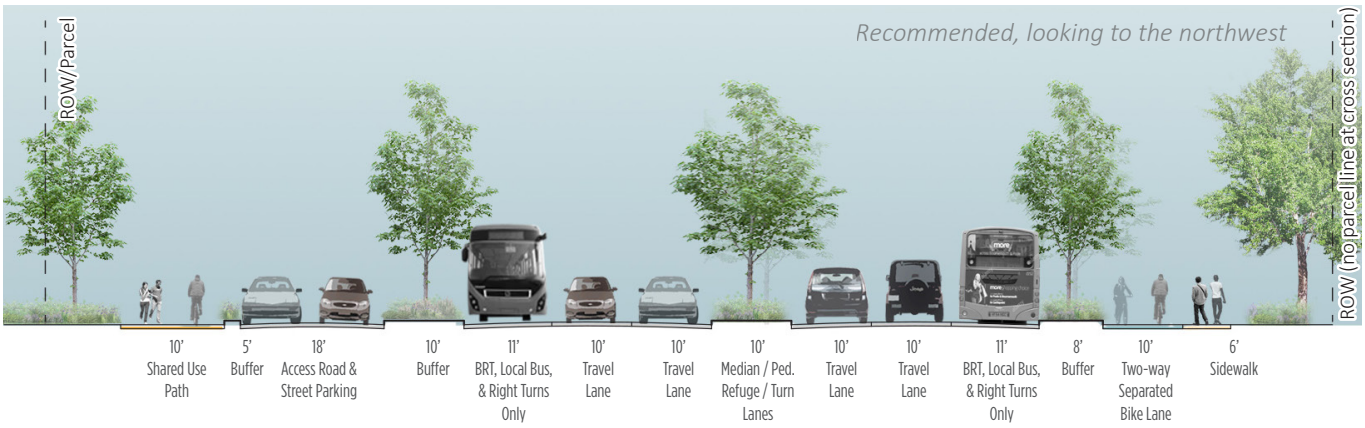


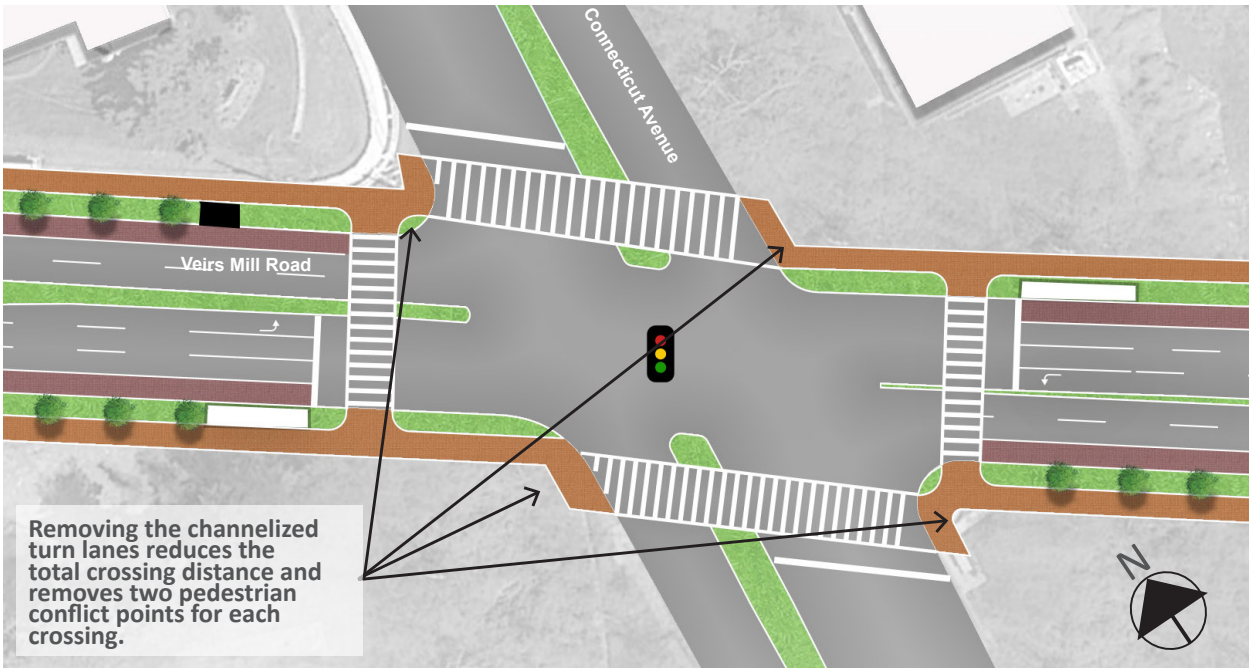
EXHIBIT 38. EXISTING AND RECOMMENDED CROSS SECTION, GRIDLEY ROAD TO EDGEBROOK ROAD





The available right of way data suggests that no additional right of way is needed for the cross section proposed in Exhibit 38.

EXHIBIT 39. RECOMMENDATIONS FOR THE CONNECTICUT AVENUE INTERSECTION



Connecticut Avenue & Veirs Mill Road today, from the air and from the ground (Photo credit: Google Maps)

- Shared-Use Path
- Planting Strip / Median
- Level Pedestrian/Bicycle Crossing of Driveway
- Bus Lane
- Planned Future BRT Station *(Also serves as a local bus stop at some locations)*
- Local Bus Stop

The double left turn lanes at Randolph Road should also be eliminated, leaving a single left-turn lane, to increase safety and reduce the crossing distance.

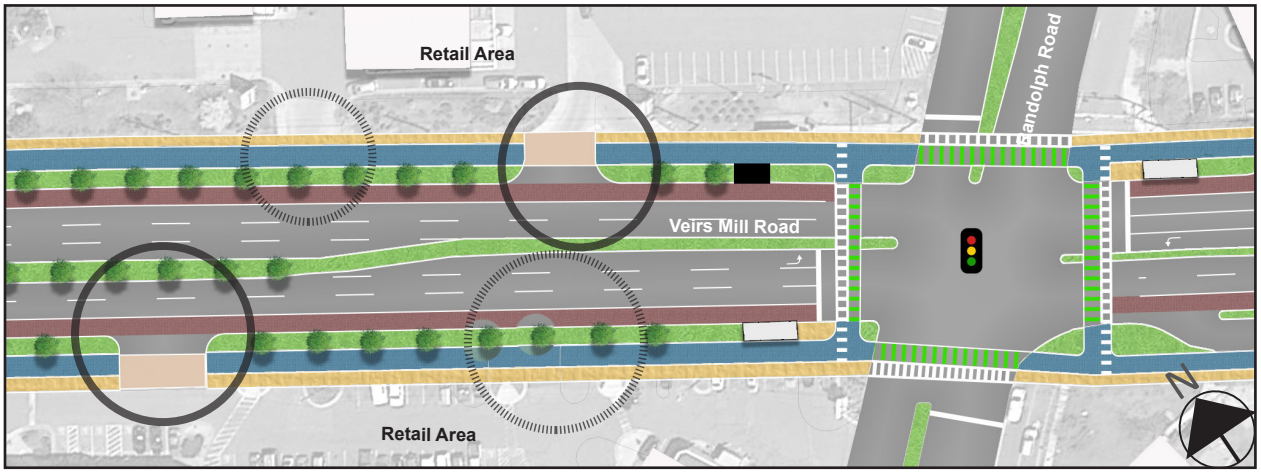
BRT CONSIDERATIONS

The BRT plan calls for a westbound station on the east side (near side) of Veirs Mill Road at Randolph Road, and an eastbound station on the east side (far side). It is recommended that the eastbound station be moved to the near side of the intersection of Veirs Mill Road and Randolph Road, in order to remove one crossing required to access the retail nodes, and to remove complications related to the access road entrance on the far side of the intersection as shown in Exhibit 40.

OTHER RECOMMENDATIONS

One recommended change is a consolidation of the entrances to the retail nodes on both sides of Veirs Mill Road, in order to reduce conflicts with the sidewalk and bicycle lanes as shown in Exhibit 40.

EXHIBIT 40. RECOMMENDATIONS FOR THE RANDOLPH ROAD AREA



- Sidewalk
- Two-Way Separated Bike Lane
- Planting Strip / Median
- Level Pedestrian/Bicycle Crossing of Driveway
- Bus Lane
- Planned Future BRT Station *(Also serves as a local bus stop at some locations)*
- Local Bus Stop
- Recommended narrowing of existing entrance
- Recommended removal of existing entrance

4.4 MONTROSE DISTRICT

4.4.1 RECOMMENDED IMPROVEMENTS

BICYCLE AND PEDESTRIAN FACILITIES

There are two recommended cross sections for the Montrose District, the limits of which are shown in Exhibit 41.

From Edgebrook Road to Parkland Drive, the recommended facilities are two-way 12-foot separated bike lanes and a six-foot sidewalk on the south side of the road and 11-foot separated bike lanes and a six-foot sidewalk on the north side, as seen in Exhibit 42. A similar cross section, without the access road is recommended for Parkland Drive to the area near Shrine of Saint Jude Thaddeus Catholic Church.

From Shrine of Saint Jude Thaddeus Catholic Church to the Rock Creek Trail crossing, the recommended facilities are 10-foot sidepath on both sides of the road, see Exhibit 43.

CHANGES TO TRAVEL LANES & MEDIANS

To clarify and facilitate movement, the median at Arbutus Avenue can be removed to create a signalized T-intersection. This would allow a formal spot to make u-turns, and could allow for closure of the median opening that previously existed to the east. In addition, consolidation of the entrances to Parklawn Local Park would remove one pedestrian/bicycle conflict point.

CROSSINGS & INTERSECTIONS

Arbutus Avenue and the entrance to Park Terrace Apartments, across from the Shrine of St Jude Thaddeus, should be considered for at least actuated beacons, and perhaps full signalization. In either case, they should include crossings and pedestrian refuge medians that are as wide as allowed by the right-of-way.

EXHIBIT 41. KEY MAP: LOCATION OF MONTROSE DISTRICT

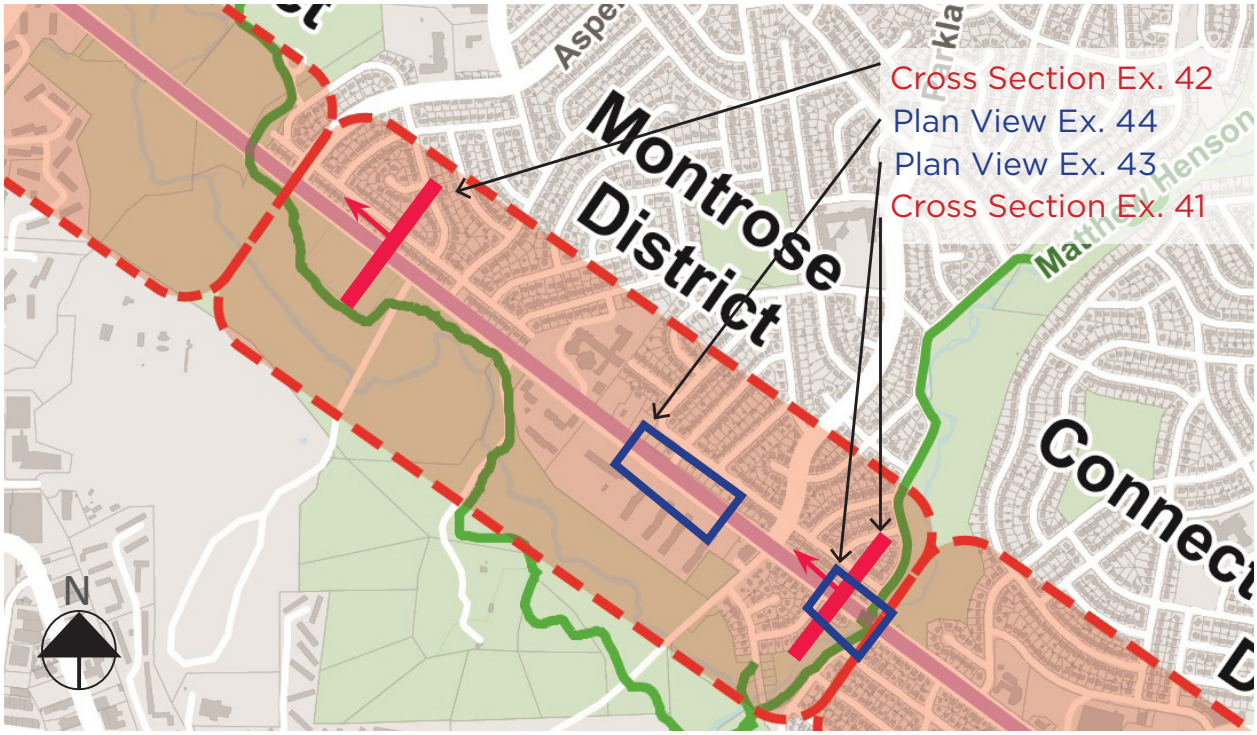


EXHIBIT 42. EXISTING AND RECOMMENDED CROSS SECTIONS, EDGEBROOK ROAD TO PARKLAND DRIVE

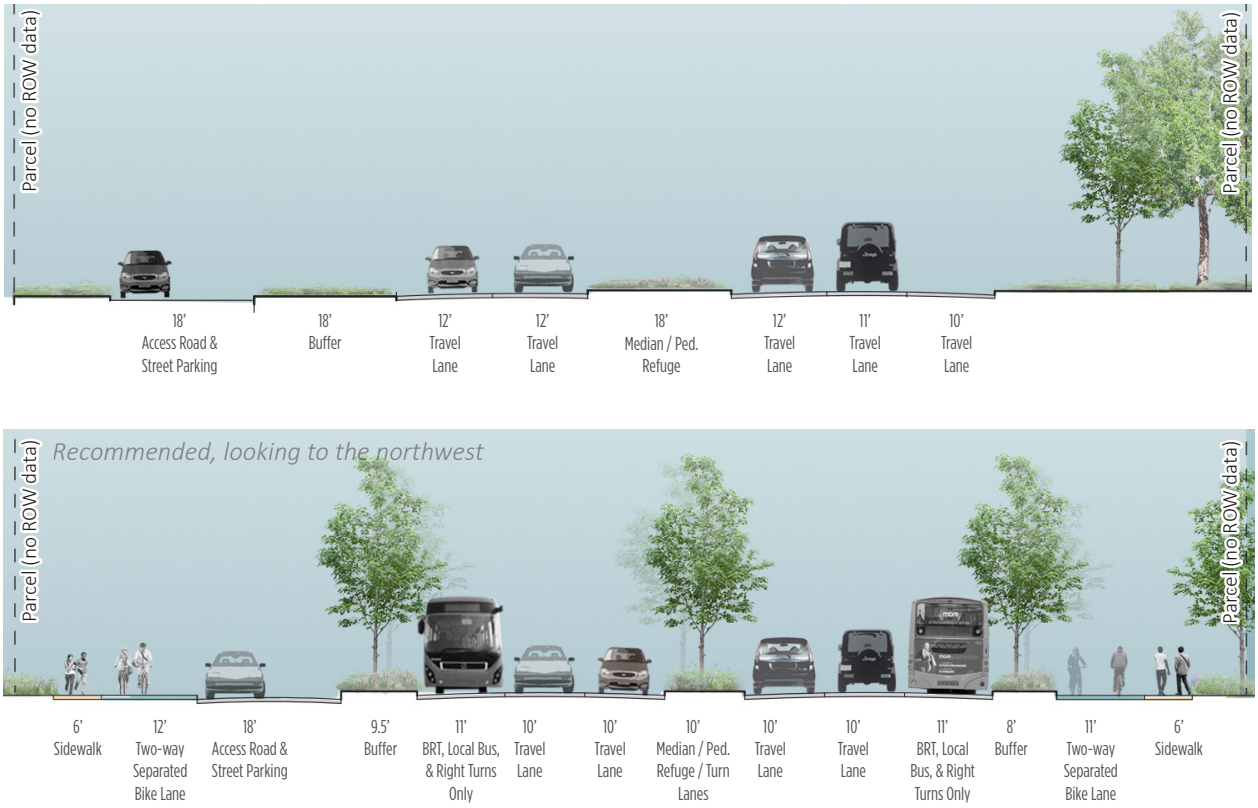
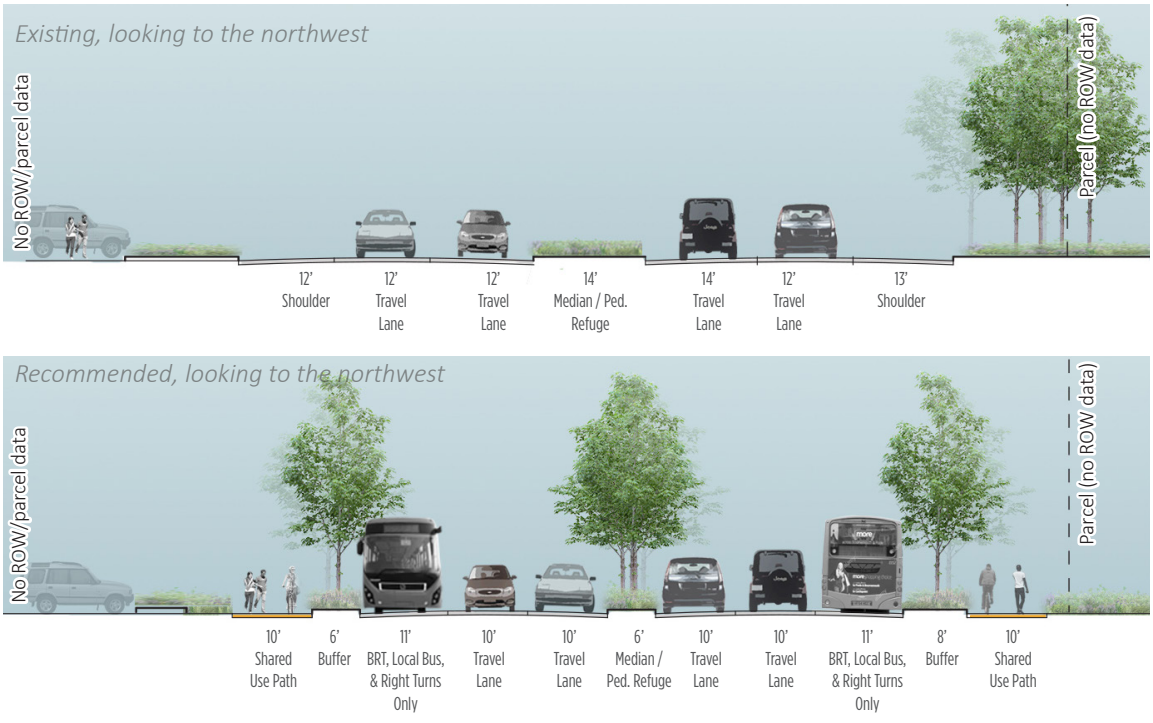
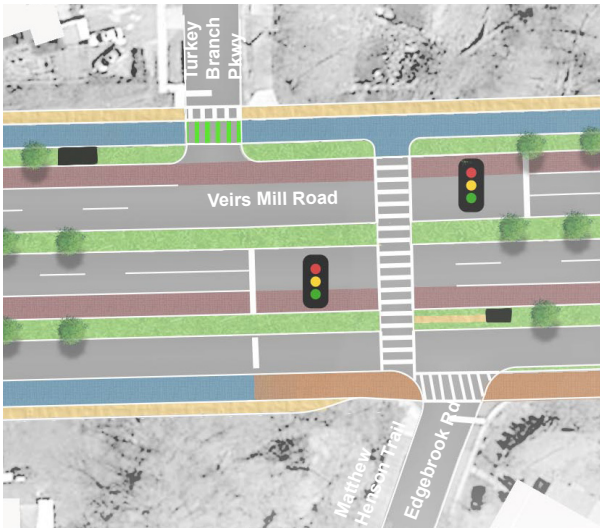


EXHIBIT 43. EXISTING AND RECOMMENDED CROSS SECTIONS, SHRINE OF SAINT JUDE THADDEUS CATHOLIC CHURCH TO ROCK CREEK TRAIL CROSSING

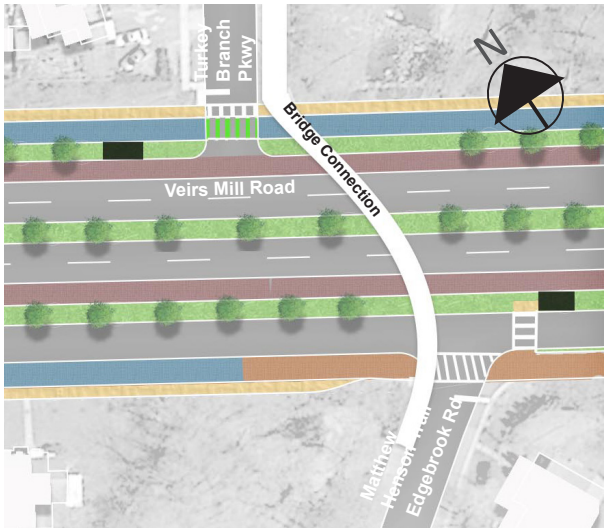


The available right of way data suggests that no additional right of way is needed for the cross section proposed in Exhibits 42 and 43.

EXHIBIT 44. MATTHEW HENSON TRAIL CROSSING OPTIONS



Recommended Crossing



Alternate Bridge Crossing Concept

- Sidewalk
- Two-Way Separated Bike Lane
- Shared-Use Path
- Planting Strip / Median
- Level Pedestrian/Bicycle Crossing of Driveway
- Bus Lane
- Planned Future BRT Station *(Also serves as a local bus stop at some locations)*
- Local Bus Stop

Existing signalized intersections must be upgraded, as needed, to include high-visibility crossings on each side of the intersection.

The existing bicycle and pedestrian crossing at the Matthew Henson Trail provides an important and well-used connection. The recommended short-term improvements would greatly improve that crossing, but another potential long-term solution is a bicycle and pedestrian bridge, as shown in Exhibit 44, similar to the one that exists near Aspen Hill Drive. Though engineering would be needed to determine the final facility design, and it would be more costly than an at-grade crossing, a bridge would provide even more separation and continuous flow for people walking and riding bicycles. A tunnel could also be considered, but the nearby stream valley may pose engineering challenges, and users often have personal security concerns with tunnel designs.

Further to the west, the existing connection to Rock Creek Trail at Aspen Hill Drive means that intersection is also already a hub for people walking and riding bicycles. Future BRT connections will only increase the number of people who need to cross Veirs Mill Road in order to reach various destinations. This long-term plan recommends protected intersections with refuge islands for all signalized intersections in the corridor; they are especially vital for crossings that may be expected to have heavy bicycle and pedestrian traffic, such as Veirs Mill Road and Aspen Hill Drive.

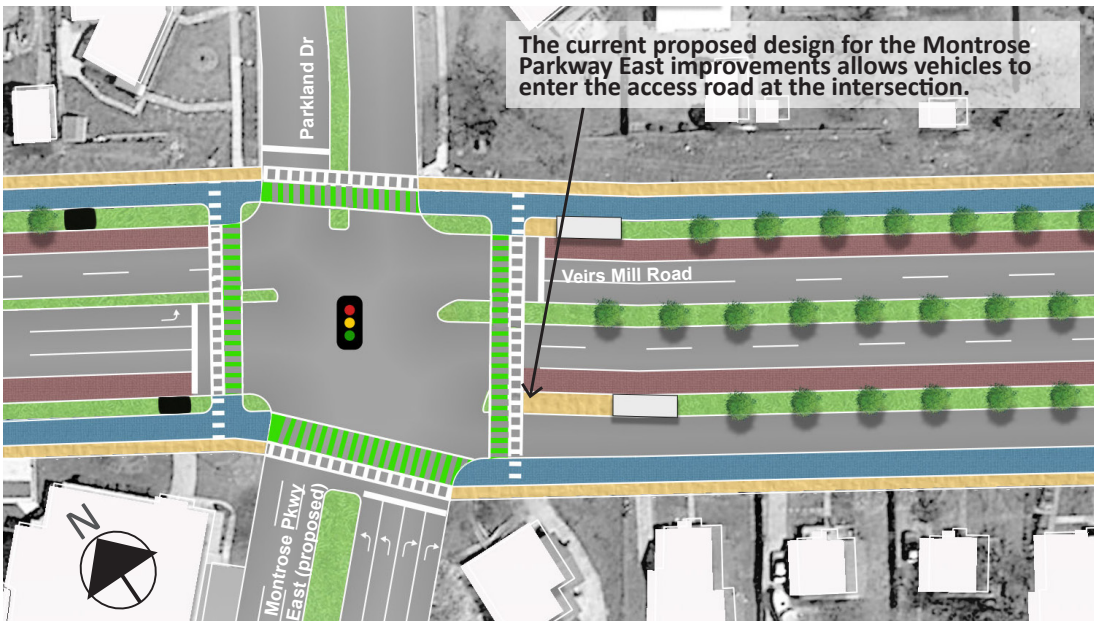
OTHER RECOMMENDATIONS

Future planning must incorporate the design for Montrose Parkway East, a planned roadway that will connect Parklawn Drive to Veirs Mill Road at the point where Gaynor Road now connects. The enhanced automobile accessibility will bring more traffic and more turning movements. Since the Montrose Parkway East and Veirs Mill Road intersection is planned to have BRT stations, it will likely see increased pedestrian and bicycle traffic as well.

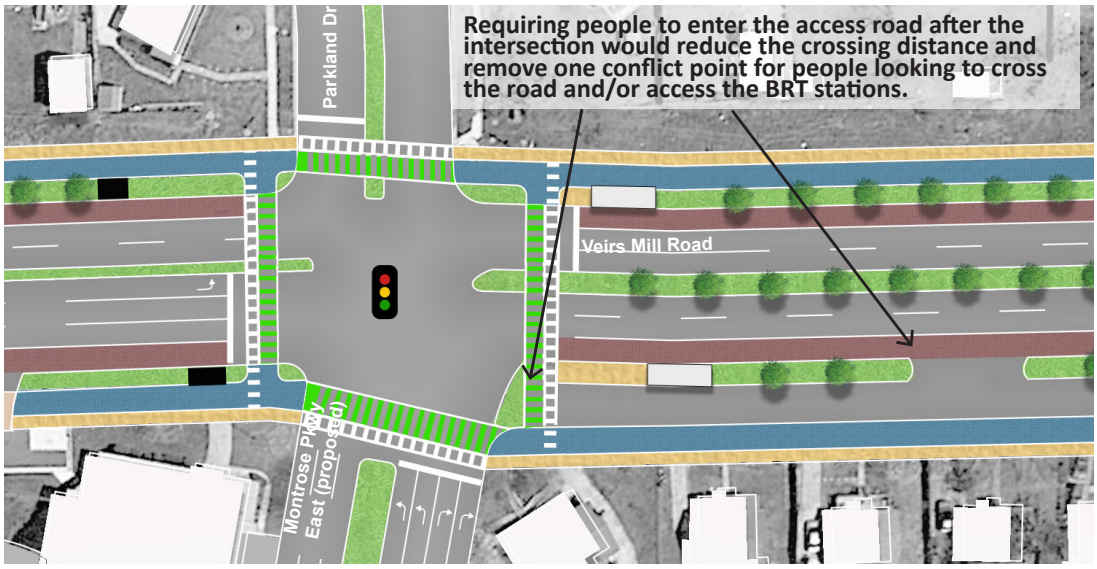
Protected crossings will help to promote safe and intuitive travel for all users. Current plans call for entrance to the access road to occur at the intersection. To further remove conflict points, one option would be to require entrance to the access road after the intersection, removing one of three potential

conflict points for pedestrians and bicyclists crossing on the east side of Parkland Drive, which is the location for both BRT stations, as shown in Exhibit 45.

EXHIBIT 45. MONTROSE PARKWAY EAST ACCESS ROAD OPTIONS



Planned Configuration (access road connection at the intersection)



Alternate Configuration (access road connection after the intersection)

- Sidewalk
- Two-Way Separated Bike Lane
- Shared-Use Path
- Planting Strip / Median
- Level Pedestrian/Bicycle Crossing of Driveway
- Bus Lane
- Planned Future BRT Station *(Also serves as a local bus stop at some locations)*
- Local Bus Stop

4.5 TWINBROOK DISTRICT

4.5.1 RECOMMENDED IMPROVEMENTS

BICYCLE AND PEDESTRIAN FACILITIES

The limits of the relatively small Twinbrook District are shown in Exhibit 46. One cross section is recommended for the Twinbrook District, as shown in Exhibit 47. From the Rock Creek Trail crossing to Twinbrook Parkway, the recommended facilities are 11-foot sidepaths on both sides of the road.

CHANGES TO TRAVEL LANES & MEDIANS

The double left turn lanes at Twinbrook Parkway should be reduced to one turn lane, to increase safety and reduce the crossing distance, as shown in Exhibit 48.

OTHER RECOMMENDATIONS

Many portions of Veirs Mill Road are currently very wide, but this section of the corridor feels particularly wide, due to both a wide shoulder and the surrounding park land use. Rows of trees on either side of the road will help to create a narrower roadway, encouraging people to drive more slowly, as shown in Exhibit 48.

EXHIBIT 46. LOCATION OF TWINBROOK DISTRICT

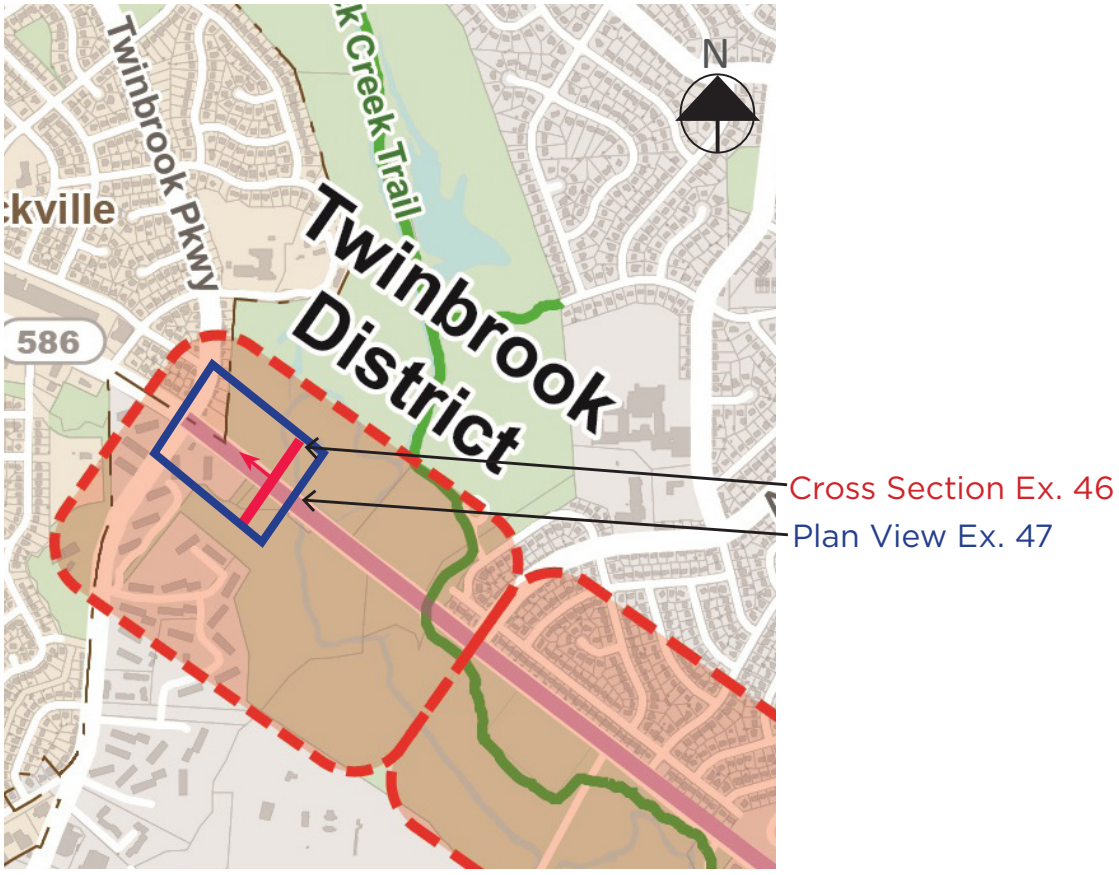


EXHIBIT 47. EXISTING AND RECOMMENDED CROSS SECTIONS, ROCK CREEK TRAIL CROSSING TO TWINBROOK PARKWAY

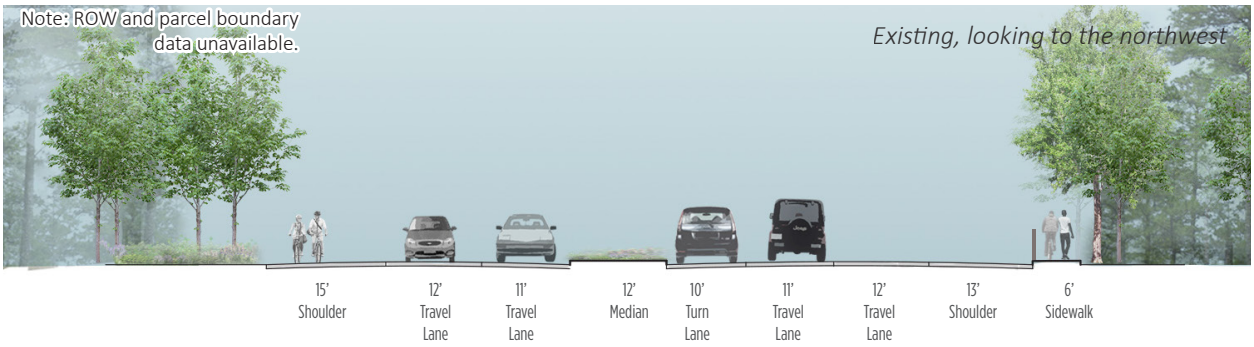


EXHIBIT 48. RECOMMENDATIONS FOR EAST OF TWINBROOK PARKWAY

- Shared-Use Path
- Planting Strip / Median
- Level Pedestrian/Bicycle Crossing of Driveway
- Bus Lane
- Planned Future BRT Station *(Also serves as a local bus stop at some locations)*