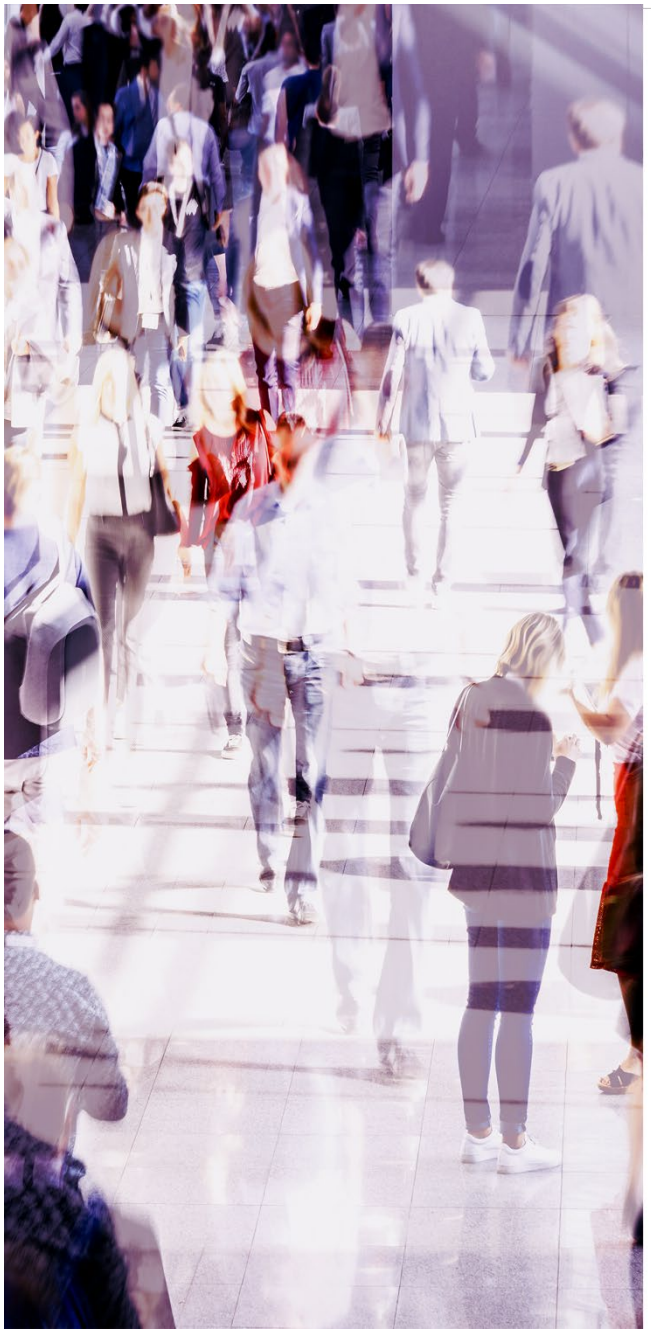

Purple Line Pedestrian Connectivity Report

MONTGOMERY COUNTY'S PEDESTRIAN PLAN

Prepared by the Montgomery County Planning Department

PLCC
PURPLE LINE CORRIDOR COALITION

Montgomery Planning

Montgomery County Planning Department

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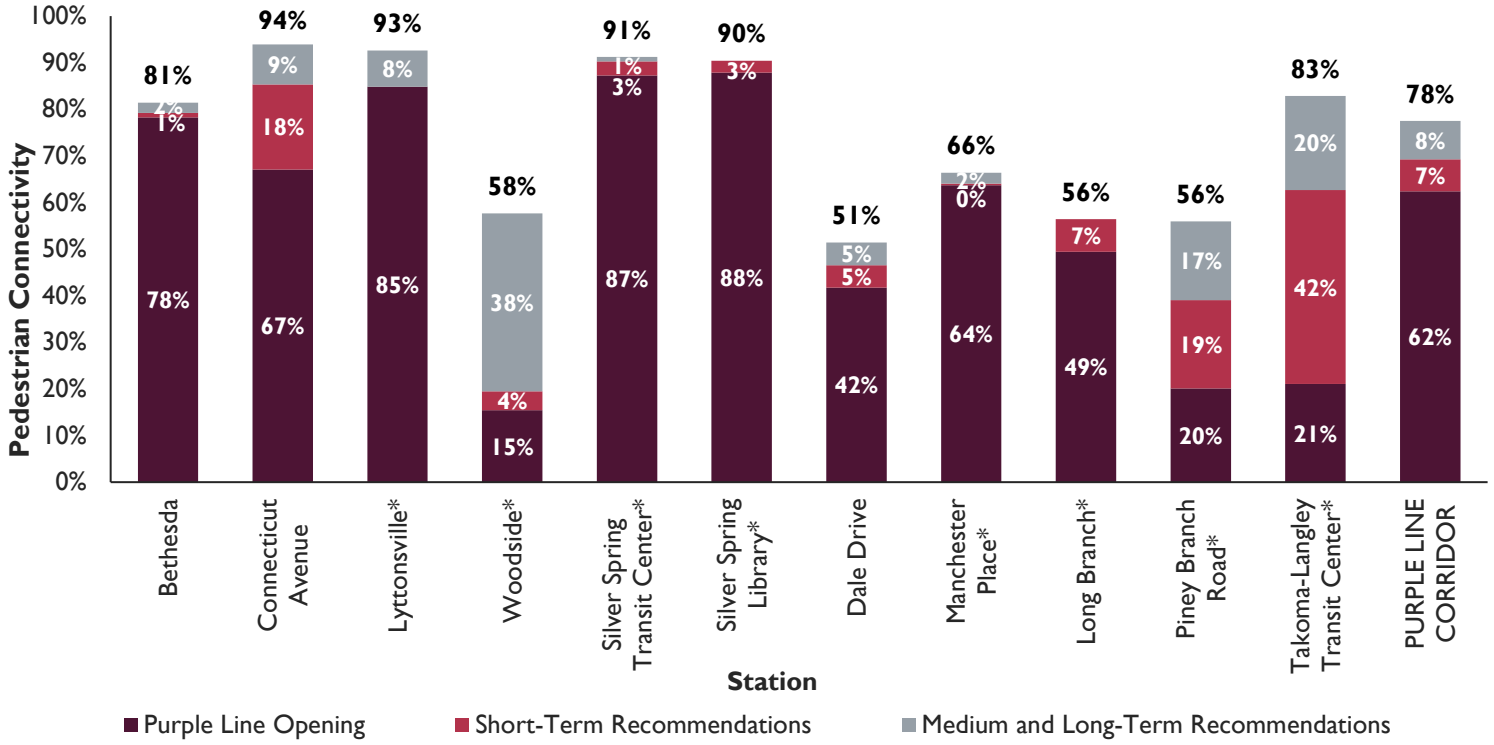
I. Executive Summary

The Purple Line light rail, scheduled for completion in 2023, will rely on a predominantly pedestrian ridership base. However, comfortable pedestrian access to many of the stations is notably lacking, particularly as the line passes through neighborhoods designed for cars. To quantify comfortable pedestrian access and make recommendations to increase pedestrian comfort, the Montgomery County Planning Department (Montgomery Planning) assessed pedestrian access to all Purple Line light rail stations serving Montgomery County, accounting for all current and upcoming projects that will affect pedestrian infrastructure before the opening of the light rail in mid-2023. These projects included the infrastructure improvements of the Purple Line Project itself, plus additional capital improvement program (CIP) projects expected to be completed by mid-2023 and private development projects currently under construction. Comfort level was assigned to each segment of the pedestrian network using Montgomery Planning's Pedestrian Level of Comfort (PLOC) evaluation, which considers the characteristics of each pedestrian pathway and crossing segment (using such factors as pathway width, speed limit, or crosswalk type) and assigns it a score on a four-point scale, ranging from "very comfortable" to "undesirable." A subsequent connectivity analysis used the PLOC-evaluated network to determine routes for each residence-to-station trip. Percent connectivity (which reflects **comfortable** connectivity, specifically) for each station area was then calculated by dividing the total comfortable distance of all residential trips by total distance of all residential trips.

Once the total miles of comfortable access were calculated for each station area, Montgomery Planning made a series of targeted recommendations to make walking to Purple Line stations more comfortable. Recommendations include short term (less costly and quicker-to-implement, such as reducing speed limits and installing high visibility crosswalks) and medium-to-long term (more costly and slower-to-implement, such as the installation of wider sidewalks and sidewalk buffers) strategies. All strategies focused on the public right-of-way and did not include recommendations for private redevelopment.

The analysis shows that for many stations, the short-term, lower-cost recommendations would yield notable pedestrian connectivity increases. On the other hand, stations like Lyttonsville and Woodside Stations demonstrated substantial increases in pedestrian connectivity only with medium-to-long term recommendations. Piney Branch Road and Takoma-Langley Stations would require both short- and medium-to-long term recommendations to achieve an increase in pedestrian connectivity.

The results also reveal that, in general, stations located in Central Business Districts, such as Bethesda, Silver Spring, and Silver Spring Library, all have high pedestrian connectivity even before considering additional recommendations. All stations located on major highways with higher posted speed limits – Woodside, Long Branch, Piney Branch Road, and Takoma-Langley – demonstrate low connectivity prior to additional recommendations. Wherever possible, substantial increases in pedestrian connectivity were achieved with additional recommendations, but some station areas saw limited increases in connectivity (Dale Drive, Long Branch, and Piney Branch Road) because pedestrian improvements would require either taking away front yard space from private owners or redevelopment of privately-owned properties. The following figure highlights the connectivity improvements results for each station if all recommendations from this report are implemented.



Pedestrian Connectivity Comparison by Station at Purple Line Opening and with Additional Recommendations

For most station areas, 25 mph speed limits are recommended within a half-mile of the station. Major road crossings should be signal-controlled and have high-visibility crosswalks. These lower-cost and quicker-to-implement improvements can yield substantial increases in comfortable pedestrian connectivity. However, higher-cost and slower-to-implement projects that include the installation of separated bikeways (which provide an extra buffer between pedestrians and cars) and the widening of sidewalks and sidewalk buffers are essential to transforming major highways into comfortable places for pedestrians (and bicyclists). A number of these medium-to-long-term projects were designated as priorities: two-way separated bikeways on Lyttonsville Place; a two-way separated bikeway on 16th Street (between Georgia Avenue and Colesville Road); a two-way separated bikeway on Piney Branch Road (between University Boulevard and New Hampshire Avenue); and assorted sidewalk and buffer improvements along Piney Branch Road and University Boulevard.

II. Introduction

The Purple Line light rail, connecting New Carrollton Station (Prince George's County, MD) to Bethesda Station (Montgomery County, MD), is currently under construction and scheduled to open in phases, with full completion expected in mid-2023. The stations were designed without park-and-ride areas (except for already-existing stations, such as Silver Spring Transit Center) and will primarily serve passengers arriving on foot, bus, bicycle, or train. Comfortable pedestrian access to all Purple Line stations is therefore a top priority.

In partnership with the Purple Line Corridor Coalition (PLCC), Montgomery Planning was tasked with evaluating the station areas within the context of the approved station designs and identifying ways to improve the user experience as users move from the stations to surrounding civic spaces. To accomplish this, Montgomery Planning assessed pedestrian access to all Purple Line stations in Montgomery County as it is projected to exist upon light rail opening, accounting for the impact of current and future development projects on pedestrian infrastructure. Current and future development projects used in the analysis include: capital improvements associated with the Purple Line Project, additional programmed capital projects expected to be completed in time for the Purple Line opening, and development projects under construction in each station area. The pedestrian comfort of each station area was determined by conducting a connectivity evaluation using Montgomery Planning's Pedestrian Level of Comfort methodology, which assessed how comfortable walking will be to each station from residences within a half-mile of that station. Despite the pedestrian infrastructure upgrades provided by capital improvements and private development, comfortable pedestrian connectivity to most stations was lacking. In some station areas, connectivity was less than 50 percent. Therefore, a set of additional recommended projects for both the short- and medium-to-long-term were proposed for each station area, including posted speed limit reductions, safer crossings, and designated space for walking and bicycling. Comfortable pedestrian connectivity was assessed again and Montgomery Planning found the recommendations greatly improved connectivity at all stations.

The main objective of this report is to present Montgomery Planning's analysis of anticipated pedestrian access to Montgomery County Purple Line stations at time of system opening and provide recommendations for increasing comfortable pedestrian access to stations. This report begins with a summary of the methodology used, including the Pedestrian Level of Comfort and the pedestrian connectivity metric. Next, a demographic overview of the corridor is presented, along with profiles for each station, including existing and forecasted ridership, maps of each station area (at Purple Line opening and with additional planning-level recommendations), and a list of recommended projects to enhance comfortable pedestrian connectivity. Following the station profiles is an analysis of the pedestrian connectivity results, and finally, a discussion of the results and proposed recommendations.

III. Methodology

As mentioned, the main objective of this report is to analyze the pedestrian access conditions around Purple Line stations at the time of opening and provide recommendations for improving access. For this purpose, Montgomery Planning has developed a process based on a series of metrics and tools, which together provide a robust analysis of pedestrian connectivity along the Purple Line Corridor. Below is a summary of the study's methodology. Additionally, Appendix 1 provides a detailed overview of the pedestrian access analysis.

Scope Definition

Geographic Scope

The geographic boundary within which the pedestrian access analysis was performed was defined as a half-mile walking distance around every Purple Line station in Montgomery County.

Scenario Definition

Three scenarios were defined to perform the pedestrian access analysis, as described below.

Scenario 1: Conditions at Purple Line Opening

This scenario reflects the pedestrian network as it is predicted to exist when the Purple Line opens. As such, it includes the pedestrian network conditions as of April 2020, plus all current and future development projects that will impact pedestrian infrastructure. Current and future development projects used in the analysis include capital improvements associated with the Purple Line Project (such as sidewalk widening and additional crossings), additional programmed capital projects expected to be completed in time for the Purple Line opening, and development projects under construction in each station area.

Additional projects included in this scenario are the Capital Crescent Trail improvements, capital projects that are expected to be completed by the time the Purple Line is complete (such as the Montgomery Avenue and Montgomery Lane separated bike lanes), as well as development projects that are under construction (such as the Chevy Chase Lake and Elizabeth Square projects) as of April 2020. The complete list of projects included in Scenario 1 is provided in Appendix 2.

Scenario 2: Conditions with Short-Term Recommendations Only

This scenario includes the pedestrian network from Scenario 1, as well as short-term (quicker to implement and low-cost) pedestrian improvement recommendations identified around each station's vicinity, as detailed below. The pedestrian improvements proposed for each station under Scenario 2 can be classified depending on their type of implementation, as follows:

- Speed Reductions

  The main speed reduction recommendation is to reduce the posted speed limit to 25 mph along every road within a half-mile area around the Purple Line stations, with a few exceptions on state highways where 30 mph posted speed limits are recommended. Decreasing motor vehicle speed is the fastest and least costly way to improve pedestrian comfort and improve the quality of pedestrian access along the corridor.

- Safe Crossings

  This type of recommendation includes a variety of treatments to make pedestrian crossings safer. Implementing high-visibility crossings is the least costly and fastest to implement. Additional treatments that could take place in the short-term include converting uncontrolled crossings into stop-controlled crossings and building pedestrian refuges and curb extensions on local roads.

- Designated Space for Walking and Bicycling

  This type of recommendation is characterized by improving or installing sidewalks, trails, or sidewalk buffers, which typically requires a medium-to-long-term time frame. However, one example of a short-term project is installing vertical sidewalk buffers, such as bollards, where space does not allow for a 5-foot-wide vegetative buffer.

Scenario 3: Conditions with All Recommendations (including Short- and Medium-to-Long-Term)

This scenario includes the pedestrian network from Scenarios 1 and 2, as well as a series of medium-to-long-term (slower to implement and more costly) pedestrian improvement recommendations identified around each station's vicinity, as detailed below. The pedestrian improvements proposed for each station under Scenario 3 can be classified depending on their type and term of implementation, as follows:

- Safe Crossings

  While many safe crossings treatments may qualify as short-term, there are some treatments that require more time and cost more. These include removing channelized turn lanes, as well as building pedestrian refuges and curb extensions on arterial roads. Additional treatments include converting uncontrolled crossings into signalized crossings.

- Designated Space for Walking and Bicycling

  This type of recommendation includes either improving existing pedestrian infrastructure or building new infrastructure. As such, these improvements are among the slowest to implement and most costly. Examples of improving existing infrastructure include widening narrow sidewalks to at least 5 feet wide, converting existing sidewalks to 10-foot-wide sidepaths where appropriate, and ensuring buffers between sidewalks and the street are at least 5 feet wide. Examples of building new infrastructure include installing new sidewalks, sidepaths, and sidewalk buffers, or installing separated bike lanes (which function as sidewalk buffers, in addition to improving bicycling).

All recommendations in Scenarios 2 and 3 are preliminary and will require evaluation by the Maryland State Highway Administration and Montgomery County Department of Transportation prior to implementation.

Table 1 includes a summary of the types of recommendations and their classification based on their implementation term.

Table 1. Summary of Recommendations: Types and Subtypes by Implementation Term

RECOMMENDATION TYPE	RECOMMENDATION SUBTYPE	IMPLEMENTATION TERM	
		Short Term	Medium-to-Long Term
Posted Speed Limits	Reduce posted speed limits	X	
	Provide automated speed enforcement	X	
Safe Crossings	Install high visibility crosswalks	X	
	Convert uncontrolled crossings to stop-controlled crossings	X	
	Convert uncontrolled crossings to signalized crossings		X
	Install pedestrian refuges on local streets	X	
	Install pedestrian refuges on arterial streets		X
	Install curb extensions on local streets	X	
	Install curb extensions on arterial streets		X
	Remove channelized turns		X
Designated Space for Walking and Bicycling	Install bollards or other vertical sidewalk buffer where space is constrained	X	
	Upgrade sidewalk buffers to least 5' wide		X
	Upgrade sidewalks to 10' wide sidepath		X
	Build separated bike lanes		X

Pedestrian Level of Comfort

The Pedestrian Level of Comfort (PLOC) is a tool developed by Montgomery Planning and Toole Design Group for systematically evaluating how comfortable different areas of the county are for walking. This methodology enables staff to conduct pedestrian connectivity analyses and to prioritize pedestrian improvements.

The Pedestrian Level of Comfort evaluates pathways (sidewalks, sidepaths, trails, and places without sidewalks where one must walk in the street) and crossings considering a variety of factors and assigns numeric scores that translate to four possible levels of comfort. The PLOC methodology description can be reviewed in detail in Appendix 3, but a summary is provided below.

Some of the factors considered in determining each pathway or crossing segment's PLOC score are included below.

- *Factors affecting both pathway and crossing scores:*
    - Posted speed limit: For pathways, this is the speed limit of the roadway parallel to the pathway, and for crossings, this is the highest speed limit of the intersection being crossed.
- *Factors affecting pathway scores only:*
    - Urban or suburban context: Urban areas (based on zoning) are expected to have higher pedestrian volumes, and thus require wider sidewalks.
    - Pathway width: Wider pathways mean more space for pedestrians.
    - Pathway buffer: Buffers provide a physical separation between pedestrians and the roadway and can include landscaped buffers and/or separated bike lanes. The presence and width of the buffer affects scoring.
    - On-street separation: Separated bike lanes or dedicated parking (marked lane/spaces or meters) provide an additional barrier between pedestrians and the roadway.
- *Factors affecting crossing scores only:*
    - Type of crossing: Controlled (signalized or stop-controlled) or uncontrolled.
    - Number of travel lanes the pedestrian must cross.
    - Type of median in the crossing: No median, a raised median (not necessarily intended for pedestrians but may provide a place for pedestrians to wait), or a pedestrian refuge (at least 6 feet wide with truncated domes).
    - Crosswalk type: Unmarked, standard parallel line markings, or high visibility markings.
    - Whether the crossing is a crossing of a channelized right turn or interstate ramp.
    - Whether a right turn on red is permitted.

Based on the combination of the factors included above, a comfort score is assigned to each pathway or crossing segment. The four possible PLOC scores are:

- *Very Comfortable - Score 1*

  Using the pathway or crossing is an enjoyable experience for people of all ages and walking abilities. It meets current design standards and is in good condition.

- *Somewhat Comfortable - Score 2*

  Using the pathway or crossing is generally an enjoyable experience for people of all ages and walking abilities. At some point, it may make sense to upgrade the pathway to meet current design standards.

- *Uncomfortable - Score 3*

  Using the pathway or crossing is not a pleasant experience for most people due to vehicle speed, narrow buffers from traffic and/or narrow sidewalks. These issues should be addressed to improve comfort.

- *Undesirable - Score 4*

  Using the pathway or crossing is challenging for everyone. Basic elements like sidewalks may be missing completely or too narrow to be useful and pedestrians may be traveling very close to fast moving traffic. At crossings, streets may be several lanes wide, and crosswalk markings may be missing. These issues should be urgently addressed to improve comfort.

The PLOC evaluation was performed for all scenarios: Scenario 1 – Conditions at the Purple Line Opening, Scenario 2 – Conditions with Short-Term Recommendations Only, and Scenario 3 – Conditions with All Recommendations.

Pedestrian Connectivity

The main tool that drives this report's results and conclusions is what Montgomery Planning has defined as "pedestrian connectivity". While in other contexts, the term "connectivity" may refer to whether a person can get from A to B, here "connectivity" reflects **the ability to walk comfortably**.

For this analysis, pedestrian connectivity is defined as *the percentage of the total distance of all residential trips to a station that meet a certain comfort threshold*. In this case, the comfort threshold is set as "somewhat comfortable," meaning the total comfortable distance only includes pedestrian segments with PLOC scores of "Very Comfortable" or "Somewhat Comfortable." The Pedestrian Connectivity metric for each station is given as a percentage value, provided by the following formula:

$$pedestrian\ connectivity\ = \frac{total\ comfortable\ distance\ of\ all\ residential\ trips}{total\ distance\ of\ all\ residential\ trips}$$

Pedestrian connectivity was obtained by using the Network Analyst tool from the ArcGIS software, and computed for a half-mile network distance around each Purple Line Station for both scenarios. The half-mile distance was based on how far one can actually walk based on the

existing and proposed pathways (an actual walkshed) rather than an "as the crow flies" distance.[1] Furthermore, as some Purple Line stations are spaced closely, some walksheds were modified to avoid overlapping. Without any modification, residences located in overlapping walksheds would be routed to two different stations. Eliminating the overlap allows each residence to be routed to the nearest Purple Line station. The non-overlapping station-area walksheds are shown on Map 1.

In addition, it is important to emphasize that the pedestrian connectivity metric includes *every* residential trip to the station within the half-mile walkshed. This means that, for example, a multifamily structure with 200 units that is a quarter mile from the station counts as 50 miles of residence to station trips (200 trips x ¼ mile) rather than a quarter-mile residential trip.

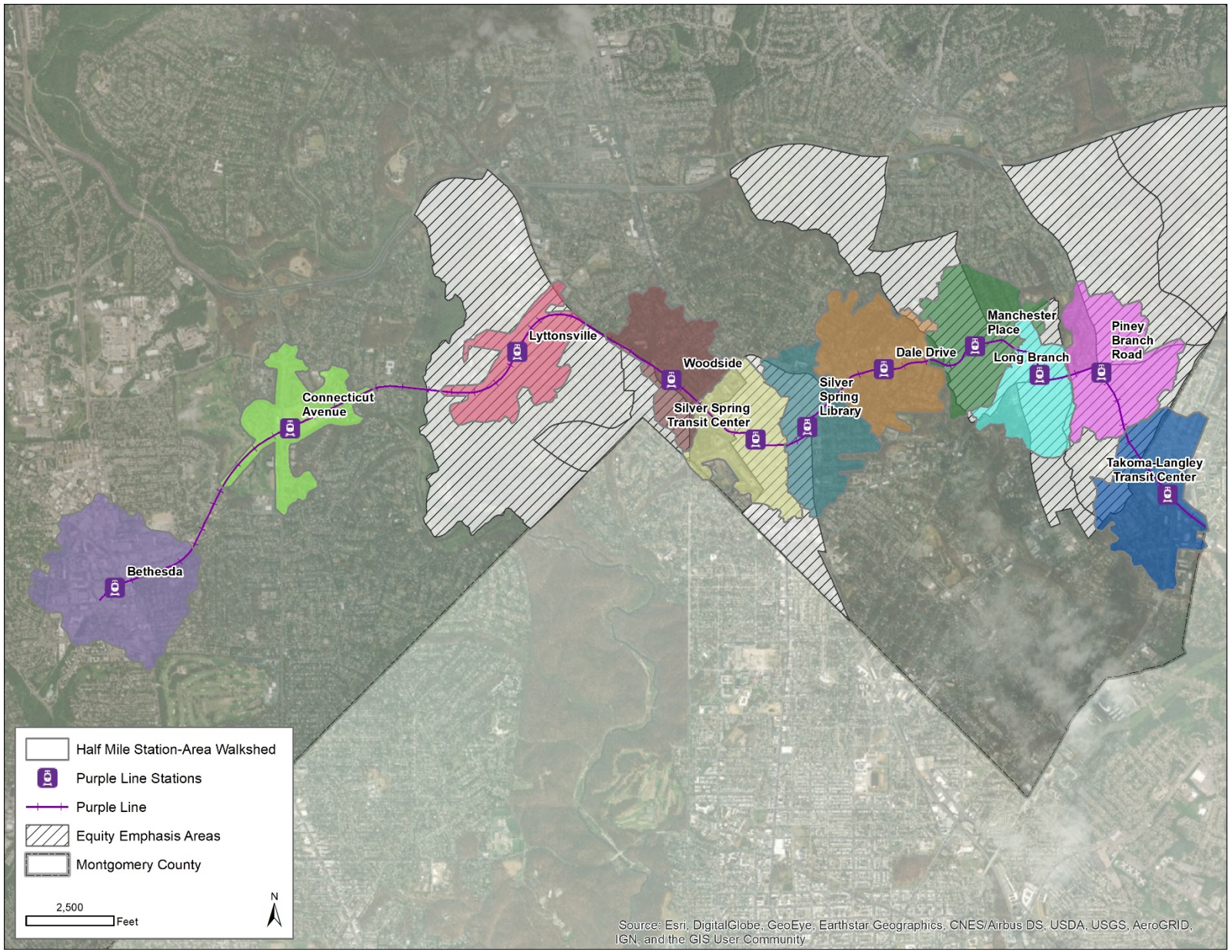
Finally, only *residential* trips are included in the metric computation, as the main purpose of the report is to assess connectivity between residences and the Purple Line stations.

Equity Emphasis Areas

Equity Emphasis Areas (EEAs), determined by the Metropolitan Washington Council of Governments, are census tracts with higher than average concentration of low-income households, minority populations, or both. The EEAs of Montgomery County's portion of the Purple Line Corridor are represented on Map 1. The station-area walksheds that overlap with EEAs were the focus of the pedestrian connectivity recommendations made in this report, particularly station areas with low connectivity at the time of Purple Line opening. All priority projects (listed in the Conclusions section) are located within station-area walksheds that overlap with EEAs.

[1] If one walks in a straight line – "as the crow flies" – the limits of a half-mile walk would form a perfect circle with the station at the center. But in the real world, the straight-line distance one can walk is constrained by natural features, discontinuous streets and pathways, and large blocks, resulting in a walkshed that is smaller than the straight-line distance.

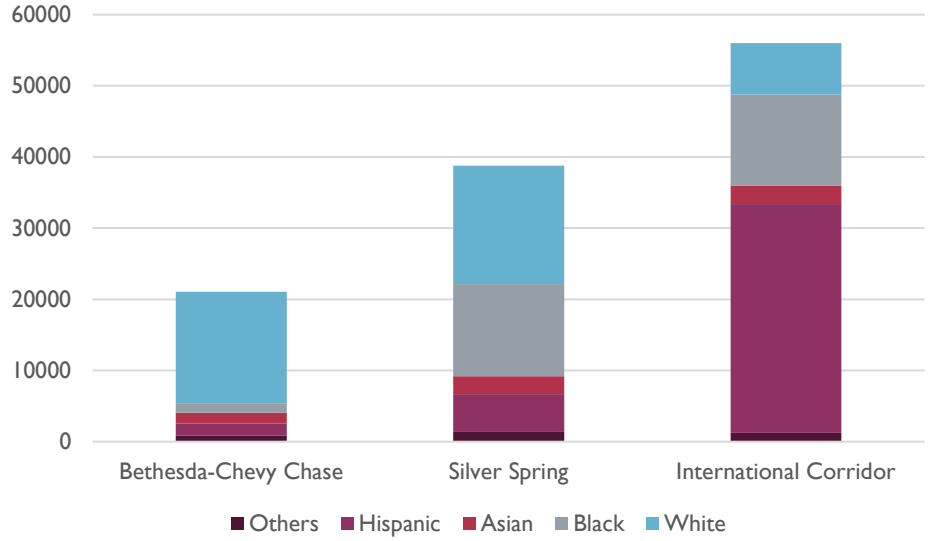
Map 1. Purple Line Corridor Half Mile Station-Area Walksheds



IV. Existing Conditions and Recommendations

Demographic Overview

Racial/ethnic and socioeconomic characteristics vary greatly across the Purple Line Corridor. The Purple Line Corridor Coalition (PLCC) has grouped Purple Line stations into neighborhoods and has arranged demographic data according to these neighborhoods: Bethesda-Chevy Chase, Silver Spring, the International Corridor, University of Maryland, and Riverdale-New Carrollton. The stations analyzed in this report fall into the first three neighborhood groups. In summary, Bethesda-Chevy Chase has a majority-white population and a 2017 median housing price of $828,656, while Silver Spring has a more diverse population and a 2017 median housing price of $538,394, and the International Corridor has a majority-Hispanic population and a 2017 median housing price of $332,427 (Purple Line Corridor Coalition, 2018).



Stations by Neighborhood Cluster

Bethesda-Chevy Chase

Bethesda, Connecticut Ave

Silver Spring

Lyttonsville, 16th Street-Woodside, Silver Spring Transit Center, Silver Spring Library, Dale Drive

International Corridor

Manchester Place, Long Branch, Piney Branch Road, Takoma-Langley

Figure 1. 2018 Population by race/ethnicity within Purple Line neighborhood clusters, Source: Purple Line Corridor Coalition

The following pages feature a profile for each station, including information about the residential and economic activity in the station vicinity, forecast boardings, and mode of access to the station. Following each profile are two maps: the pedestrian comfort evaluation at the Purple Line opening and the pedestrian comfort evaluation including all recommendations (short- and medium-to-long term). Finally, a list of the recommended improvements[2] included in the second map is presented.

[2] Appendix 4 shows the list of recommendations that have a corresponding Master or Sector Plan source

Bethesda Station

Station Profile

Station Context within Half-Mile Walkshed

- Central business district
- 4,336 residential units[3]
- Non-residential building use: primarily office[4]

Forecasted Daily Station Boardings[5]

- 2030: 14,780
- 2040: 14,990

Forecasted Mode of Access to Station in 2040[6]

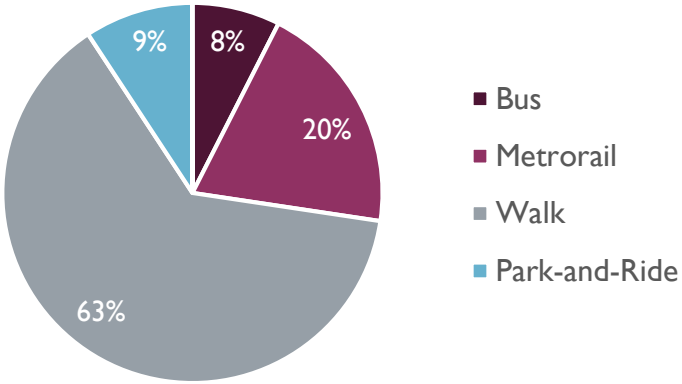


Figure 2. At the intersection of Bradley Boulevard and Strathmore Street, cars making uncontrolled left turns encounter a pedestrian-heavy residential neighborhood.

Figure 3. The narrow, buffer-less sidewalk on Bradley Boulevard.

[3] 2019 total; see Appendix 3 for list of residential projects that will be completed in upcoming years.

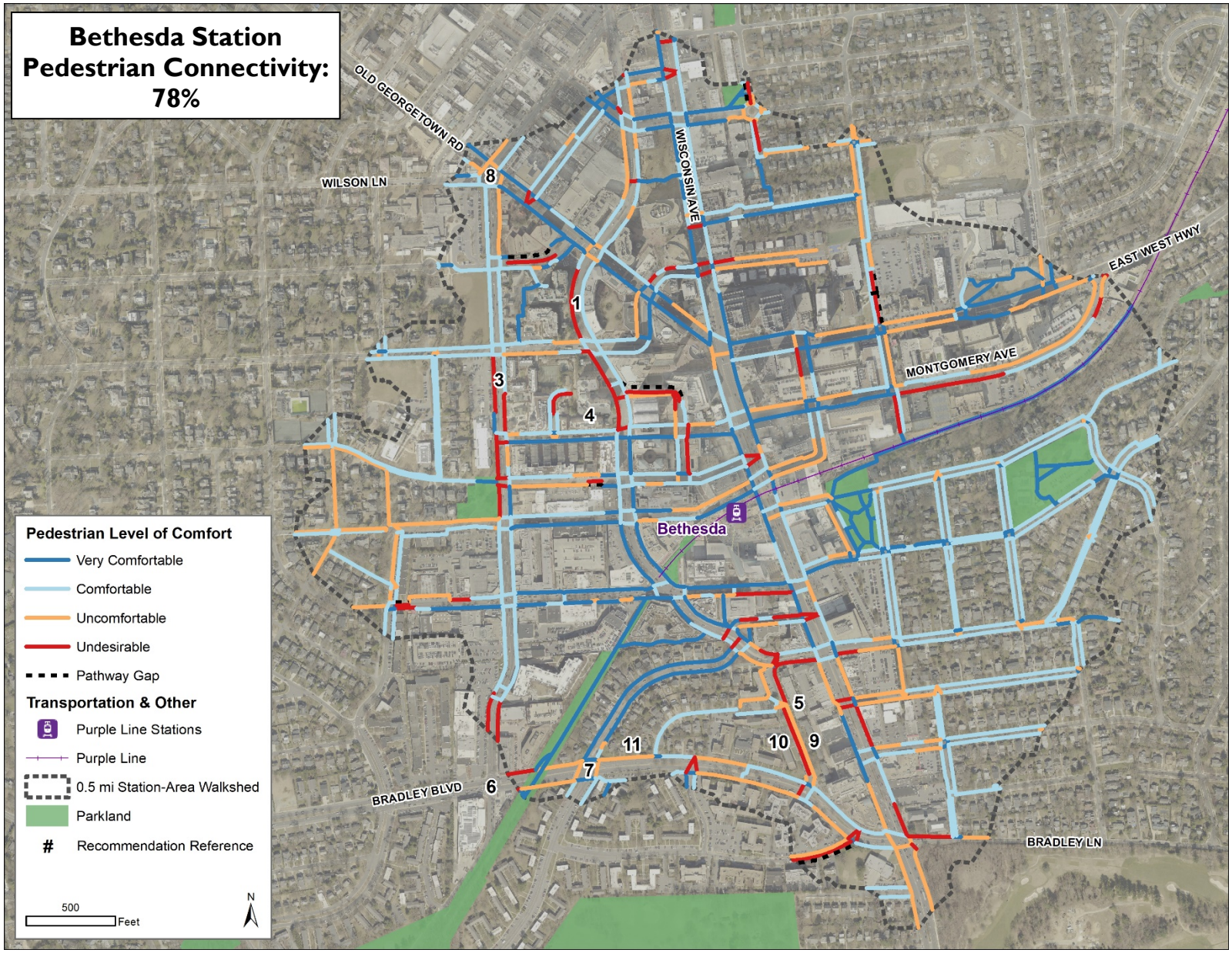
[4] See Appendix 5.

[5] Source: Purple Line Final Environmental Impact, Volume I. Maryland Transit Administration (MTA). August 2013.

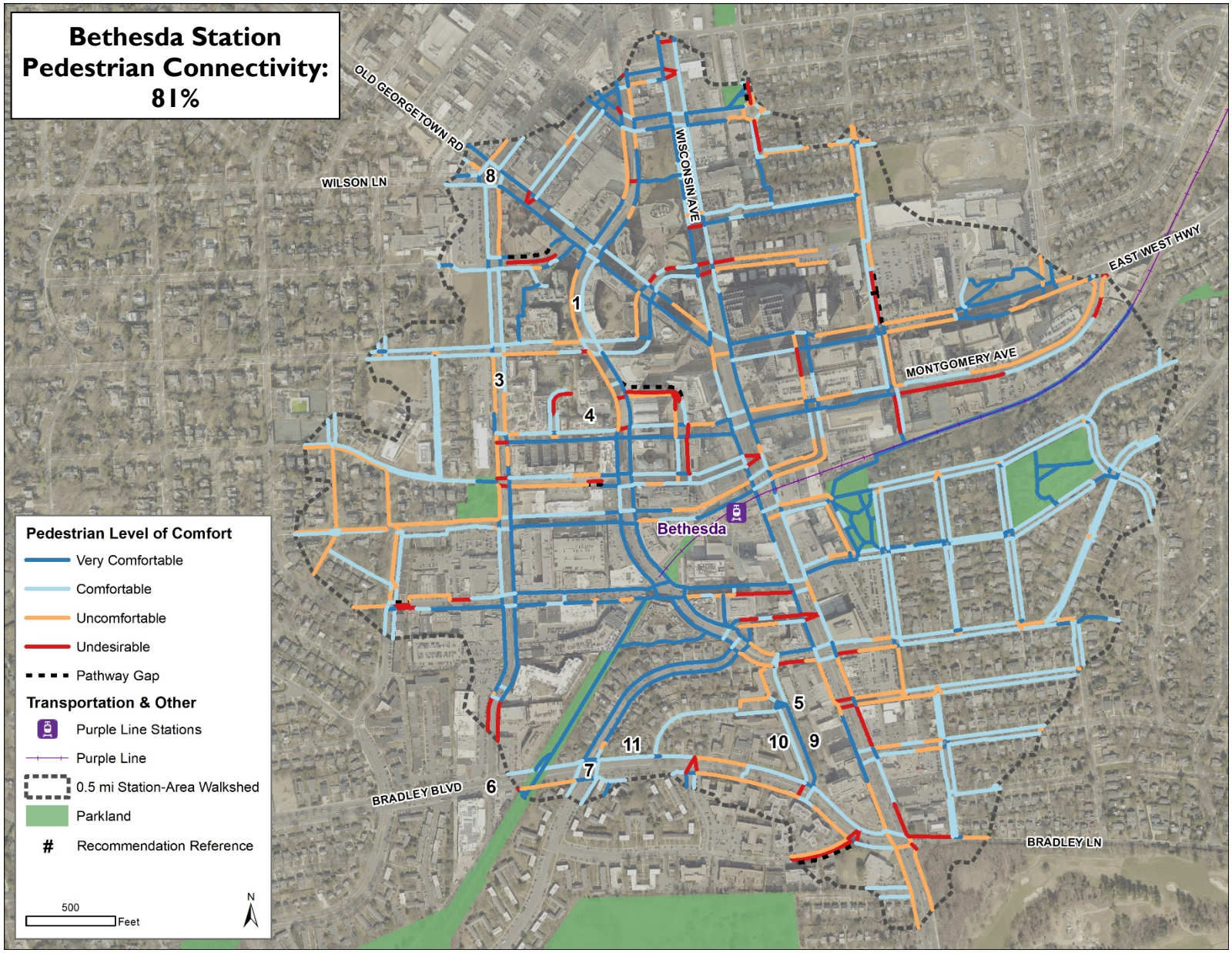
[6] Source: Purple Line Travel Forecasts Results Technical Report. Maryland Transit Administration (MTA). August 2013.

Pedestrian Comfort Evaluation

Map 2. Pedestrian Comfort Evaluation for Bethesda Station: Conditions at Purple Line Opening



Map 3. Pedestrian Comfort Evaluation for Bethesda Station: Conditions with All Recommended Improvements



Station Area Recommendations

BETHESDA STATION			
TERM	**TYPE**	**#**	**RECOMMENDATION**
SHORT TERM	**Slower Speeds**	1	Reduce posted speed limit on Woodmont Ave between Wisconsin Ave (North) and Wisconsin Ave (South) from 30 to 25 mph
		2	Reduce posted speed limit on Battery Ln between Old Georgetown Rd and Wisconsin Ave from 30 to 25 mph
		3	Reduce posted speed limit on Arlington Rd between Old Georgetown Rd and Bradley Blvd from 30 to 25 mph
		4	Reduce posted speed limit on Montgomery Ln between Woodmont Ave and Wisconsin Ave from 30 to 25 mph
	Safe Crossings	5	Implement all-way stop-controlled intersection with high visibility crosswalks at Strathmore St and Wellington Dr
		6	Install high visibility crosswalks at Bradley Blvd and Arlington Rd
		7	Install high visibility crosswalks at Bradley Blvd and Leland St
		8	Install high visibility crosswalks at Old Georgetown Rd and St. Elmo Ave
MEDIUM-LONG TERM	**Designated Space for Walking and Bicycling**	9	Improve the sidewalk on the east side of Strathmore St from Bradley Blvd to Woodmont Ave to be at least 5' wide with a 5' wide buffer
		10	Build a 5' wide sidewalk and 5' wide buffer on the west side of Strathmore St from Bradley Blvd to Wellington Dr
		11	Improve the sidewalk on the north side of Bradley Blvd from Arlington Rd to Wellington Dr to be at least 5' wide with a 5' wide buffer

Connecticut Avenue Station

Station Profile

Station Context within Half-Mile Walkshed

- 934 residential units[7]
- Non-residential building use: mix of office and other, with some retail[8]

Forecasted Daily Station Boardings[9]

- 2030: 2,240
- 2040: 2,250

Forecasted Mode of Access to Station in 2040[10]

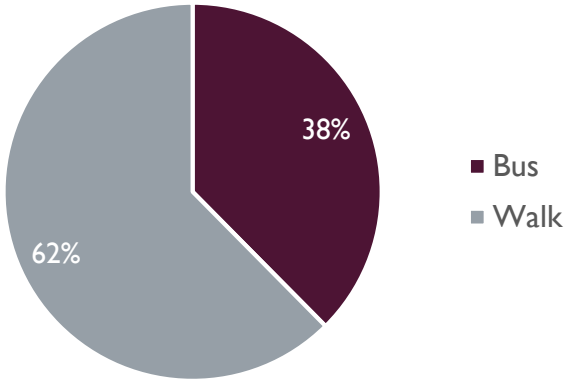


Figure 4. The Connecticut Avenue sidewalk at Chevy Chase Lake Drive, by the future station entrance, has no buffer between pedestrians and a major highway with a 35-mph posted speed limit.

Figure 5.The intersection of Laird Place and Connecticut Avenue is a key connection for residents accessing the station from the west, but pedestrians are discouraged from crossing by the presence of a traffic median and lack of marked crosswalks.

[7] 2019 total; see Appendix 3 for list of residential projects that will be completed in upcoming years.

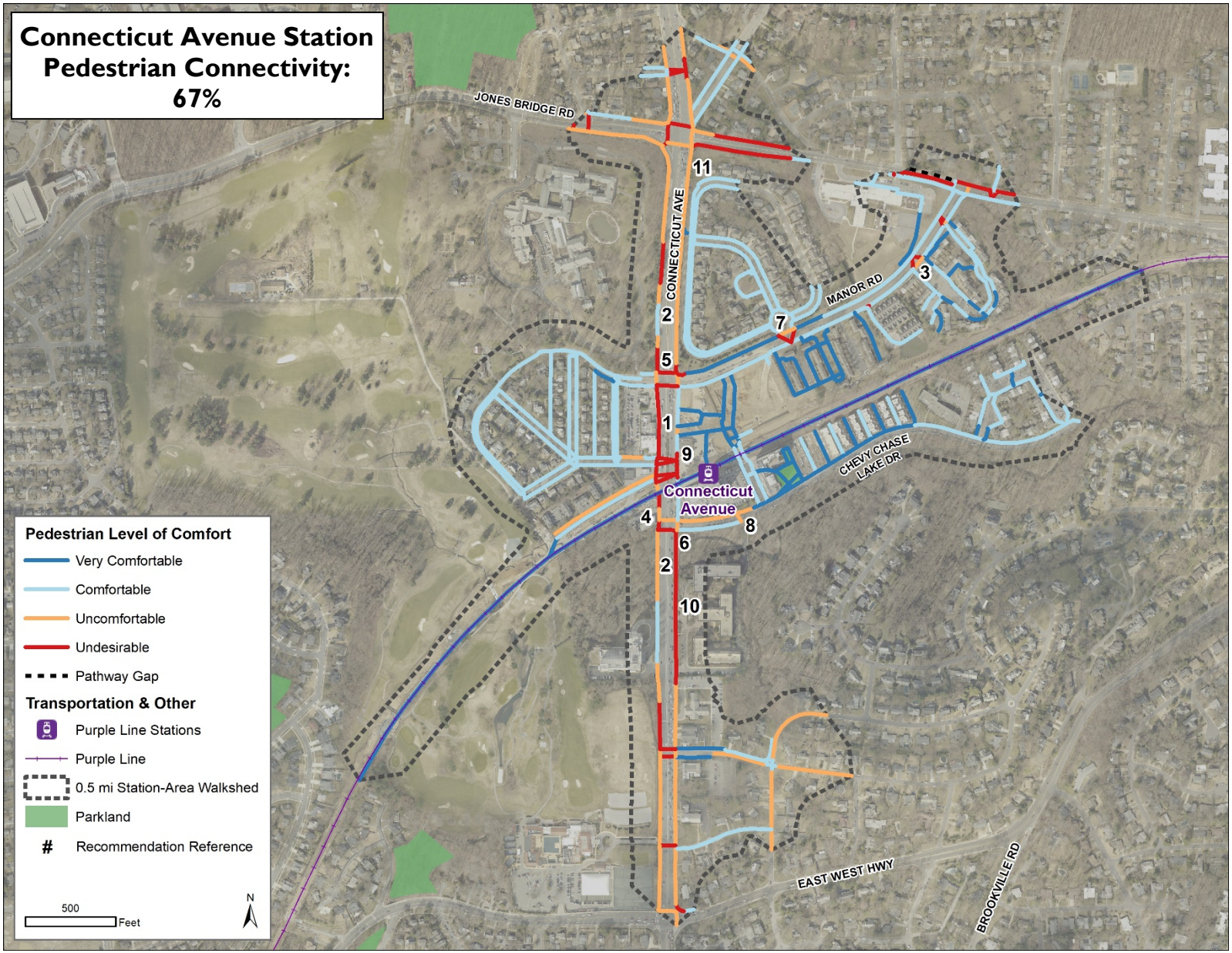
[8] See Appendix 5.

[9] Source: Purple Line Final Environmental Impact, Volume I. Maryland Transit Administration (MTA). August 2013.

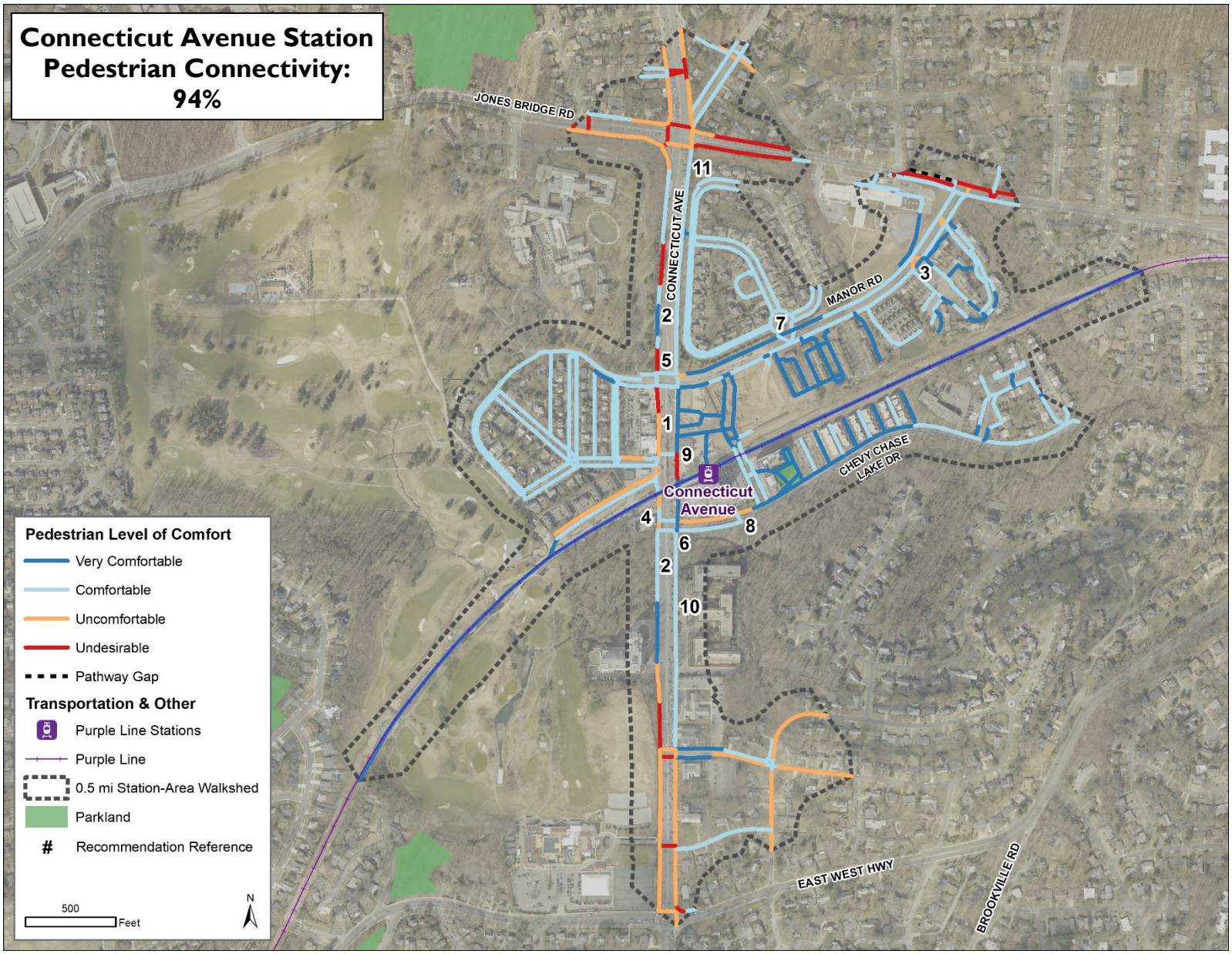
[10] Source: Purple Line Travel Forecasts Results Technical Report. Maryland Transit Administration (MTA). August 2013.

Pedestrian Comfort Evaluation

Map 4. Pedestrian Comfort Evaluation for Connecticut Avenue Station: Conditions at Purple Line Opening



Map 5. Pedestrian Comfort Evaluation for Connecticut Avenue Station: Conditions with All Recommended Improvements



Station Area Recommendations

CONNECTICUT AVENUE			
TERM	**TYPE**	**#**	**RECOMMENDATION**
SHORT TERM	**Slower Speeds**	1	Reduce posted speed limit on Connecticut Ave between Manor Rd and Chevy Chase Lake Dr from 35 to 25 mph
		2	Reduce posted speed limit on Connecticut Ave between Jones Bridge Rd and Manor Rd and between Chevy Chase Lake Dr and Dunlop St from 35 to 30 mph
		3	Reduce posted speed limit on Manor Rd between Connecticut Ave and Jones Bridge Rd from 30 to 25 mph
		4	Provide automated speed enforcement on Connecticut Ave in the vicinity of the Purple Line station
	Safe Crossings	5	Install high visibility crosswalks at Connecticut Ave and Manor Rd
		6	Install high visibility crosswalks at Connecticut Ave and Chevy Chase Dr
		7	Install high visibility crosswalks at Manor Rd and Village Park Dr
		8	Install high visibility crosswalks at Chevy Chase Lake Dr and 8101 Connecticut Ave driveway
MEDIUM-LONG TERM	**Safe Crossings**	9	Investigate a signalized crossing with high visibility crosswalks at Connecticut Ave and Laird Pl or Newdale Rd
	Designated Space for Walking and Bicycling	10	Improve east sidewalk of Connecticut Ave between Chevy Chase Lake Dr and Dunlop St to be 5' wide with a 5' wide buffer
		11	Improve east sidewalk of Connecticut Ave between Jones Bridge Rd and Manor Rd to be a sidepath with a 6' wide buffer

Lyttonsville Station

Station Profile

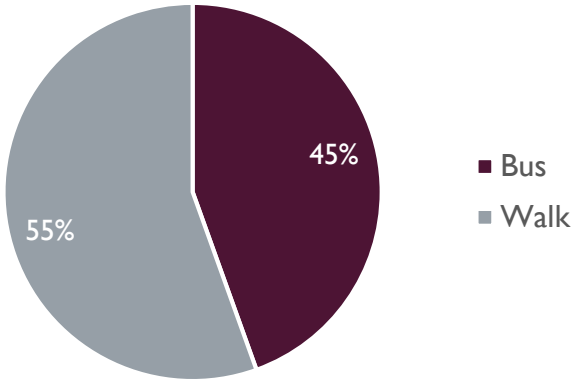
Station Context within Half-Mile Walkshed

- 652 residential units
- Non-residential building use: primarily industrial[11]
- Station's walkshed is part of an Equity Emphasis Area (EEA)

Forecasted Daily Station Boardings[12]

- 2030: 1,330
- 2040: 1,340

Forecasted Mode of Access to Station in 2040[13]



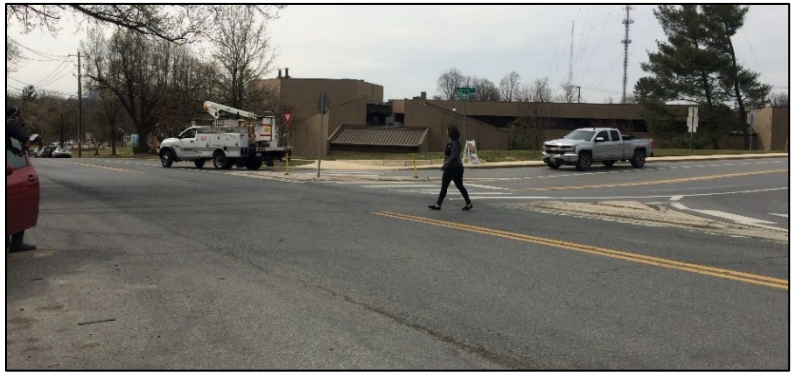


Figure 6. The intersection of Lyttonsville Road and Lyttonsville Place will connect the majority of residences within the station area to the station, yet there are two channelized right turn lanes and no crosswalks across Lyttonsville Road.

Figure 7. The sidewalk on the east side of Lyttonsville Place is being widened, but only on the northern segment as part of the bridge replacement. The southern half, pictured, remains narrow and without a buffer, despite connecting the station to the residential neighborhood south of the station.

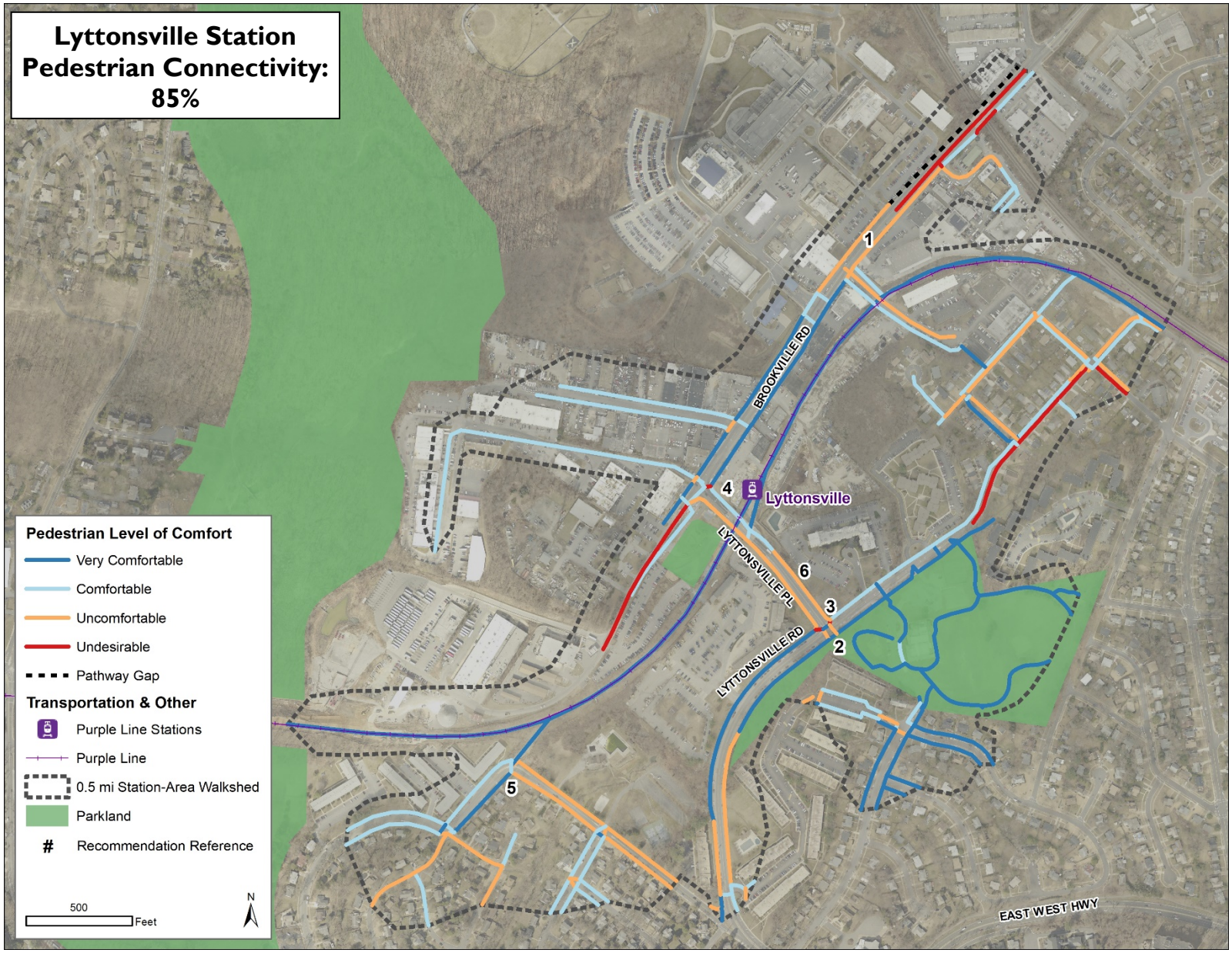
[11] See Appendix 5.

[12] Purple Line Final Environmental Impact, Volume I. Maryland Transit Administration (MTA). August 2013.

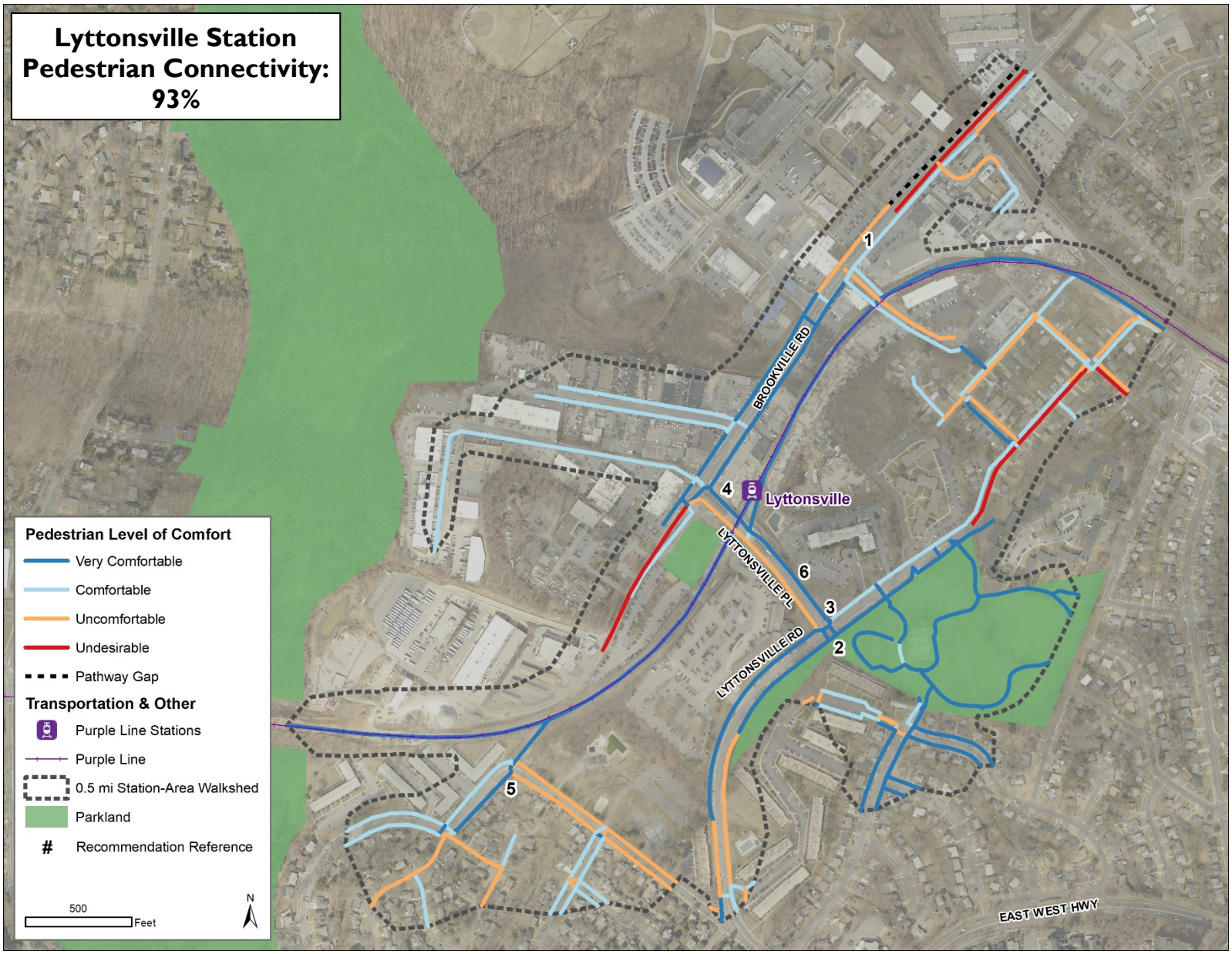
[13] Source: Purple Line Travel Forecasts Results Technical Report. Maryland Transit Administration (MTA). August 2013.

Pedestrian Comfort Evaluation

Map 6. Pedestrian Comfort Evaluation for Lyttonsville Station: Conditions at Purple Line Opening



Map 7. Pedestrian Comfort Evaluation for Lyttonsville Station: Conditions with All Recommended Improvements



Station Area Recommendations

LYTTONSVILLE STATION			
TERM	**TYPE**	**#**	**RECOMMENDATION**
SHORT TERM	**Slower Speeds**	1	Reduce posted speed limit on Brookville Rd between the bus depot and the CSX tracks from 30 to 25 mph
	Safe Crossings	2	Install high visibility crosswalks on east and west legs of Lyttonsville Pl and Lyttonsville Rd
MEDIUM-LONG TERM	**Safe Crossings**	3	Remove channelized right turns and provide traffic control at Lyttonsville Pl and Lyttonsville Rd
		4	Remove channelized right turn and install controlled crossings on the east leg of Lyttonsville Pl and Brookville Rd
		5	Investigate crossing improvements at Grubb Rd and Capital Crescent Trail access point
	Designated Space for Walking and Bicycling	6	Provide two-way separated bike lanes on the east side of Lyttonsville Pl between Brookville Rd and Lyttonsville Rd

Woodside Station

Station Profile

Station Context within Half-Mile Walkshed

- 2113 residential units
- Non-residential building use: mix of office and other[14]
- Station's walkshed is part of an Equity Emphasis Area (EEA)

Forecasted Daily Station Boardings[15]

- 2030: 1,570
- 2040: 1,620

Forecasted Mode of Access to Station in 2040[16]

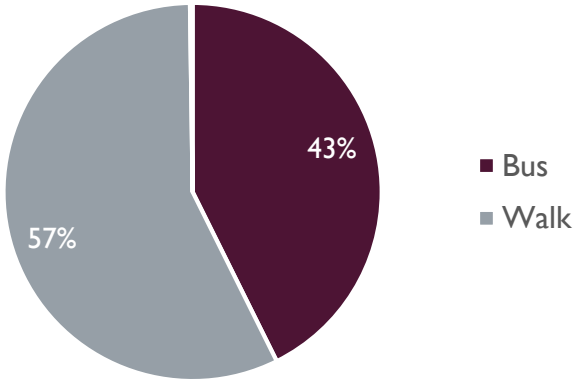


Figure 8. A two-stage, unsignalized crossing on 16th Street by 8600 Apartments (35 mph posted speed limit).

Figure 9. Walking along 16th Street outside the future station entrance.

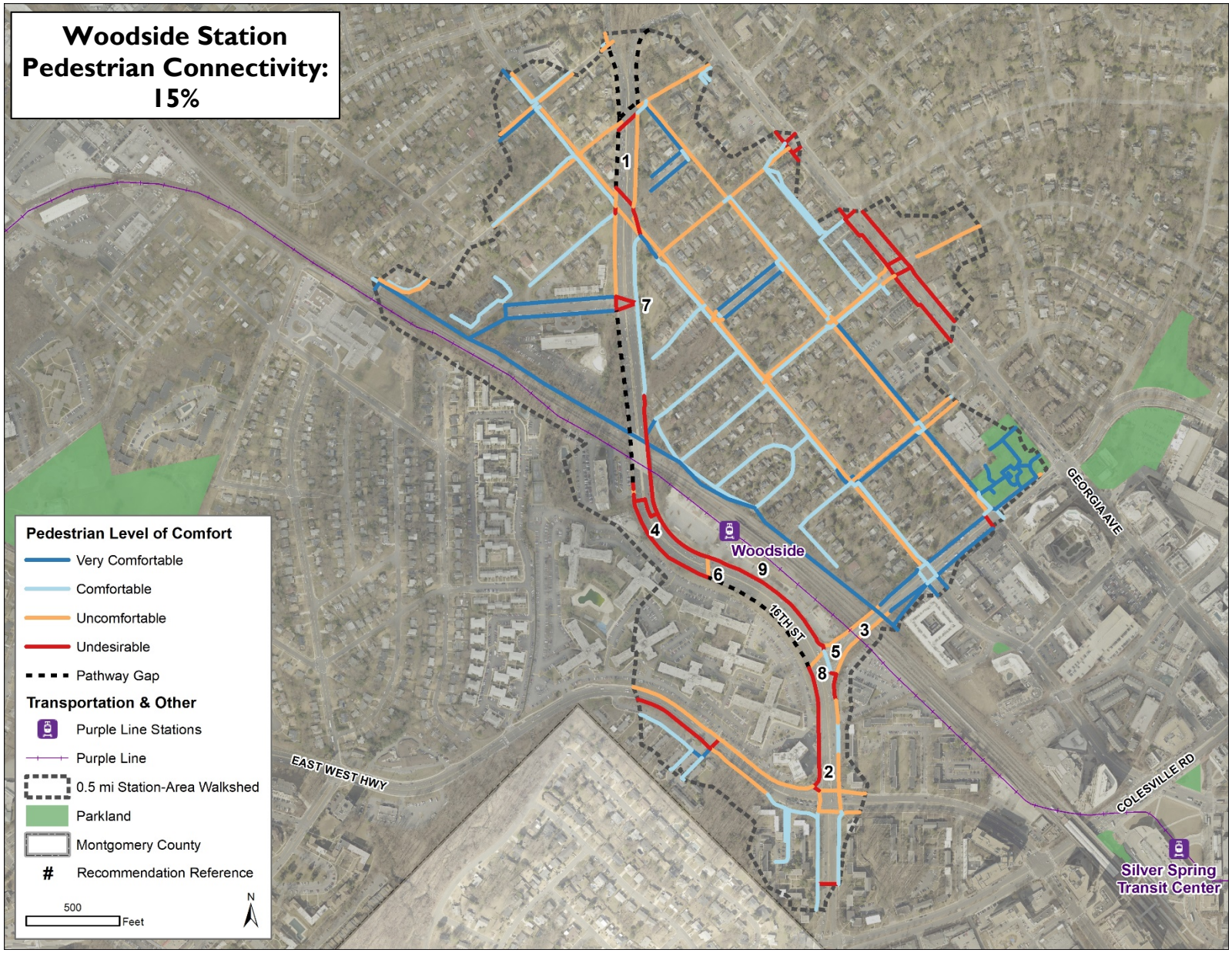
[14] See Appendix 5.

[15] Purple Line Final Environmental Impact, Volume I. Maryland Transit Administration (MTA). August 2013.

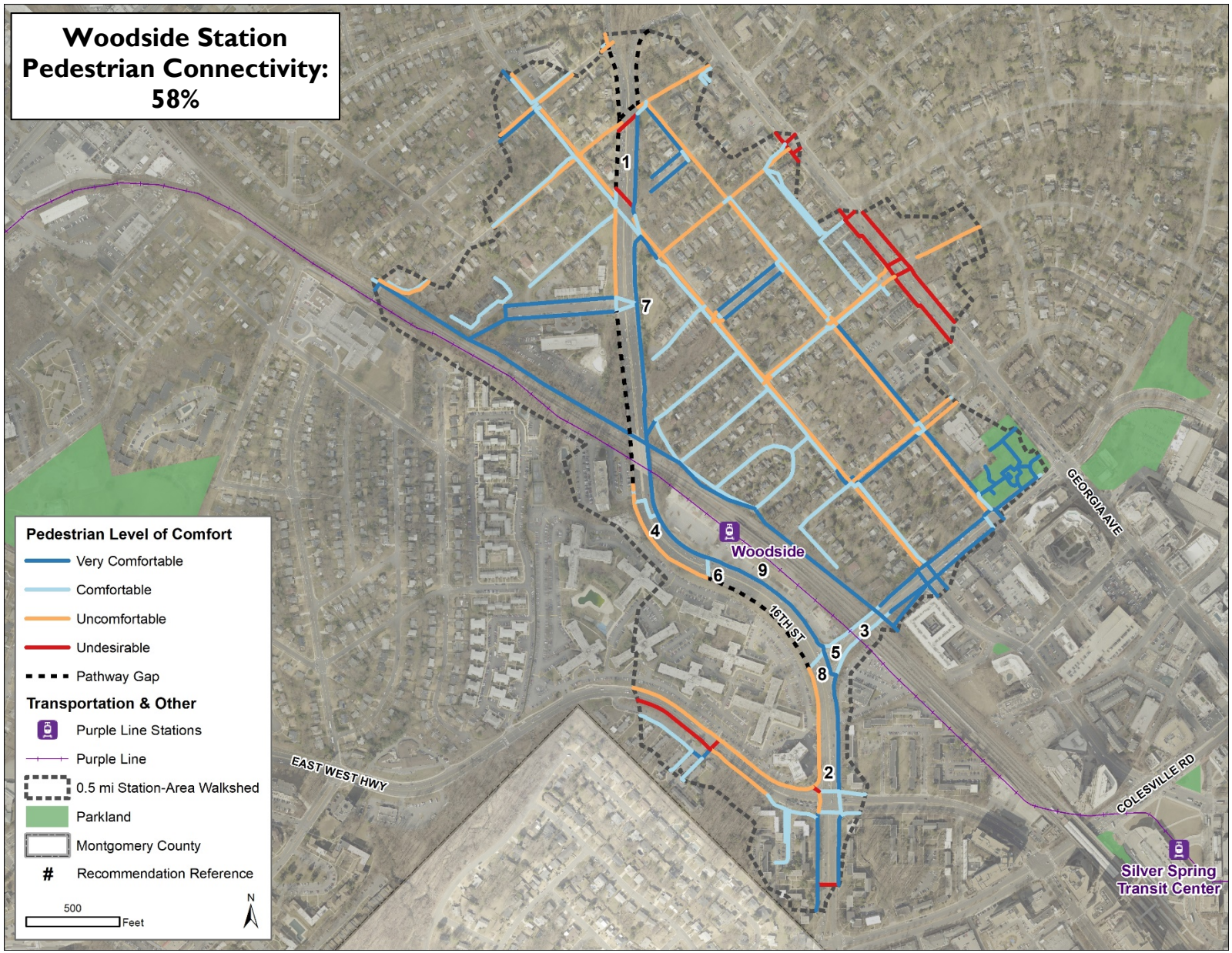
[16] Source: Purple Line Travel Forecasts Results Technical Report. Maryland Transit Administration (MTA). August 2013.

Pedestrian Comfort Evaluation

Map 8. Pedestrian Comfort Evaluation for Woodside Station: Conditions at Purple Line Opening



Map 9. Pedestrian Comfort Evaluation for Woodside Station: Conditions with All Recommended Improvements



Station Area Recommendations

WOODSIDE STATION			
TERM	**TYPE**	**#**	**RECOMMENDATION**
SHORT TERM	**Slower Speeds**	1	Reduce posted speed limit on 16th St between Georgia Ave and the CSX tracks from 35 to 30 mph
		2	Reduce posted speed limit on 16th St between the CSX tracks and the District of Columbia from 35 to 25 mph
		3	Reduce posted speed limit on Spring St between 16th St and Georgia Ave from 30 to 25 mph
		4	Provide automated speed enforcement on 16th St
	Safe Crossings	5	Install high visibility crosswalks at 16th St and Spring St
MEDIUM-LONG TERM	**Safe Crossings**	6	Provide a HAWK signal on 16th St between the Woodside Station and Summit Hills apartments
		7	Provide a traffic signal at the intersection of 16th St and Lyttonsville Rd
		8	Remove channelized right turn and add pedestrian refuge in the median of 16th St at the intersection of 16th St and Spring St
	Designated Space for Walking and Bicycling	9	Convert the northbound lane on 16th St between Colesville Rd and Georgia Ave to a two-way separated bike lane

Silver Spring Transit Center Station

Station Profile

Station Context within Half-Mile Walkshed

- Central business district
- 6,658 residential units[17]
- Non-residential building use: primarily office, retail, and other[18]
- Station's walkshed is part of an Equity Emphasis Area (EEA)

Forecasted Daily Station Boardings[19]

- 2030: 12,490
- 2040: 12,940

Forecasted Mode of Access to Station in 2040[20]

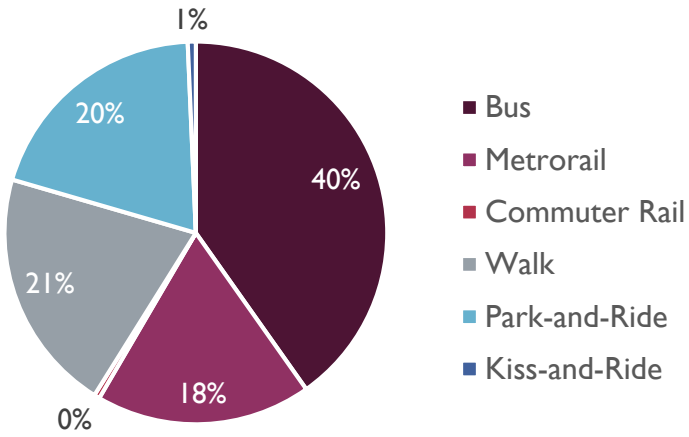


Figure 10. This crossing at Draper Lane and Colesville Road is missing a curb cut on the eastern side (as well as a crosswalk) and is the only crossing of Colesville Road between East-West Highway and 16th Street.

Figure 11. Gas station-adjacent sidewalks, such as this one at Colesville Road and East-West Highway, are a challenge for improving pedestrian comfort in the station area.

[17] 2019 total; see Appendix 3 for list of residential projects that will be completed in upcoming years.

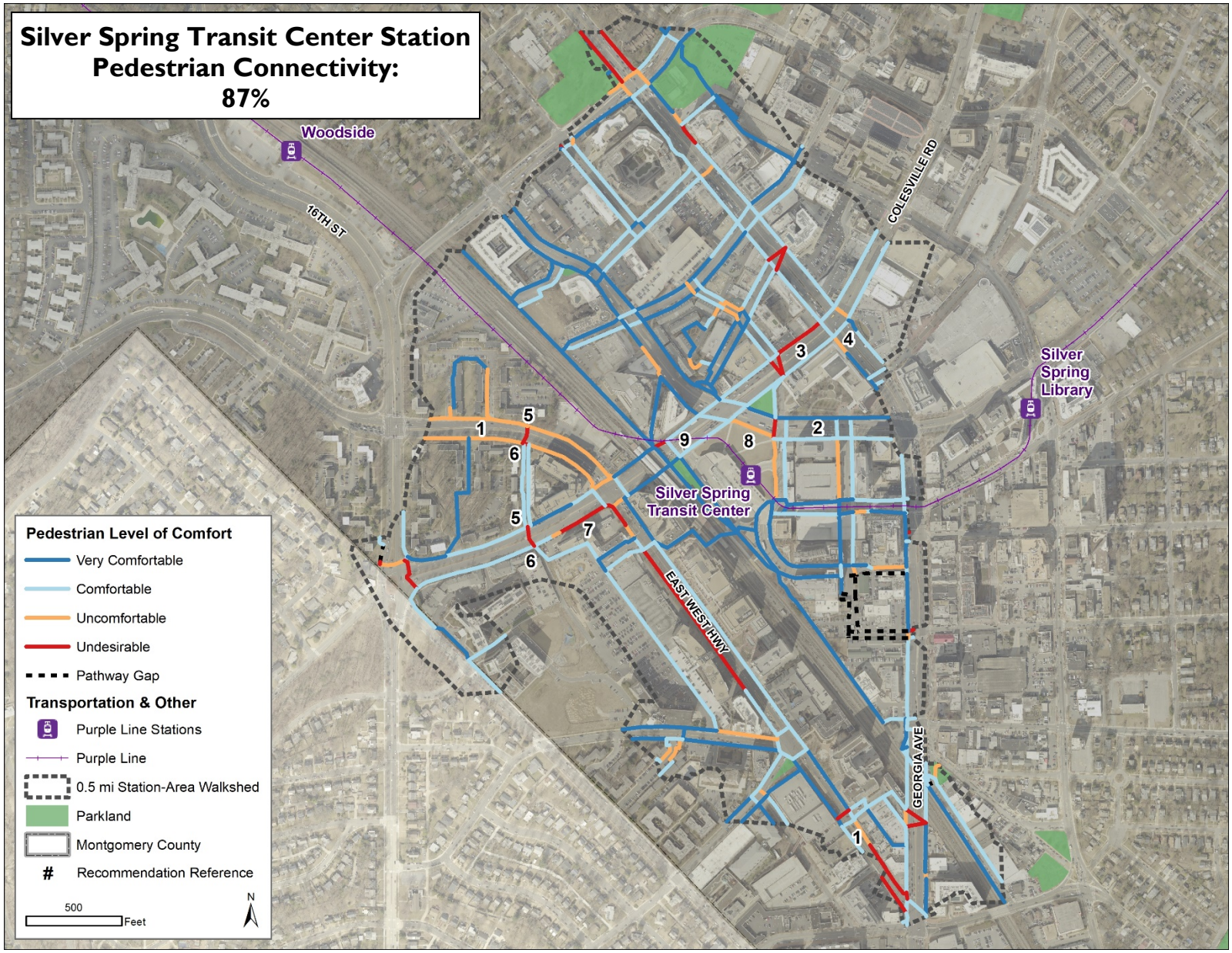
[18] See Appendix 5.

[19] Purple Line Final Environmental Impact, Volume I. Maryland Transit Administration (MTA). August 2013.

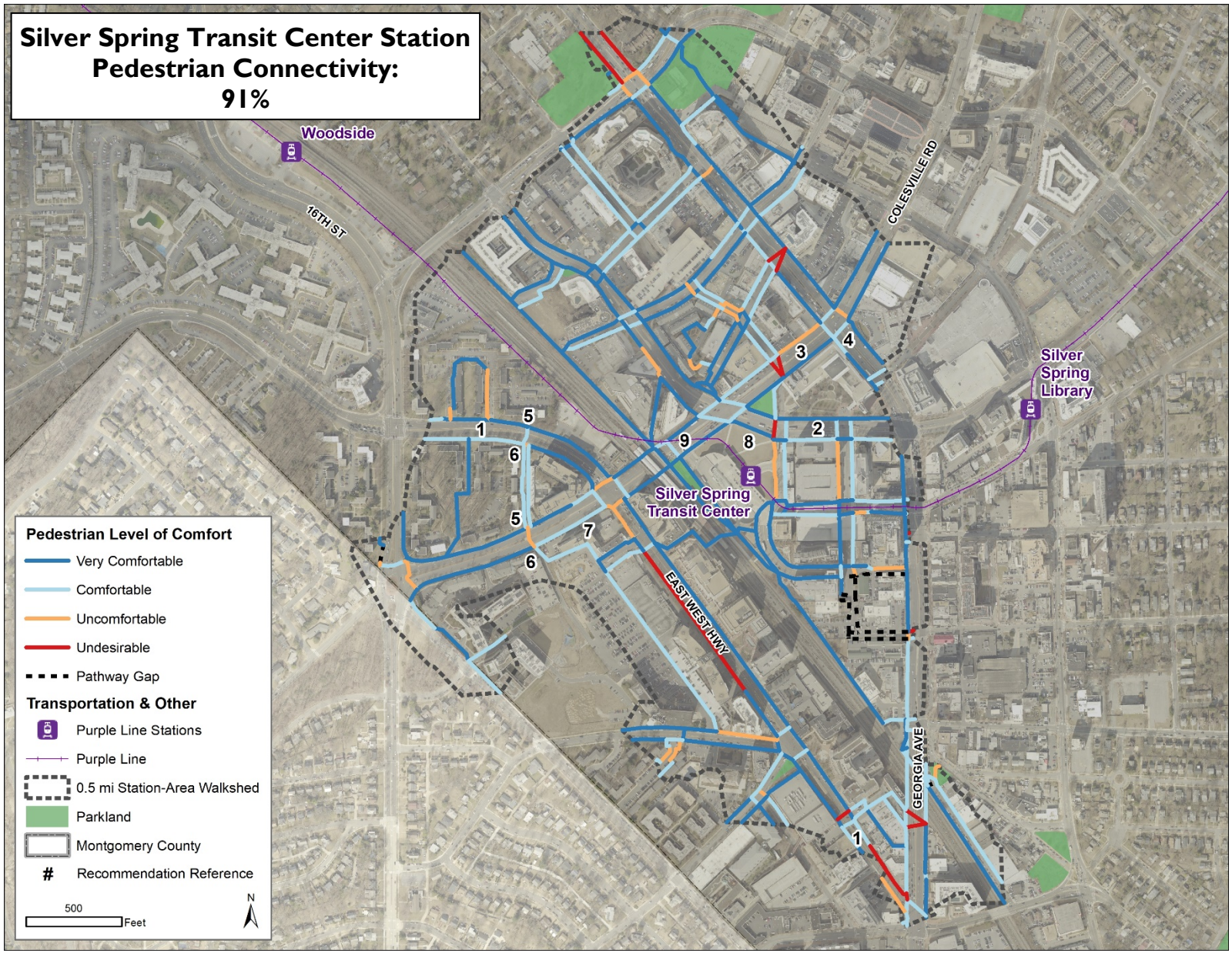
[20] Source: Purple Line Travel Forecasts Results Technical Report. Maryland Transit Administration (MTA). August 2013.

Pedestrian Comfort Evaluation

Map 10. Pedestrian Comfort Evaluation for Silver Spring Transit Center Station: Conditions at Purple Line Opening



Map 11. Pedestrian Comfort Evaluation at Silver Spring Transit Center Station: Conditions with All Recommended Improvements



Station Area Recommendations

SILVER SPRING TRANSIT CENTER STATION			
TERM	**TYPE**	**#**	**RECOMMENDATION**
SHORT TERM	**Slower Speeds**	1	Reduce posted speed limit on East West Hwy between 16th St and Colesville Rd from 35 to 25 mph, and between Colesville Rd and Georgia Ave from 30 to 25 mph
		2	Reduce posted speed limit on Wayne Ave between Colesville Rd and Georgia Ave from 35 to 25 mph
		3	Reduce posted speed limit on Colesville Rd between 16th St and Georgia Ave from 30 to 25 mph
		4	Reduce posted speed limit on Georgia Ave between Spring St and Wayne Ave from 30 to 25 mph
	Safe Crossings	5	Install high visibility crosswalks at Colesville Rd and Draper Ln, and at East West Hwy and Draper Ln
MEDIUM-LONG TERM	**Safe Crossings**	6	Install pedestrian refuge islands across Colesville Rd at Draper Ln, and across East West Hwy at Draper Ln
	Designated Space for Walking and Bicycling	7	Improve the sidewalk on the south side of Colesville Rd between Draper Ln and East West Hwy to be at least 5' wide with a 5' wide buffer
		8	Add a landscaped tree buffer on Wayne Ave adjacent to the Silver Spring Transit Center
		9	Relocate the streetlight post obstructing the sidewalk on Colesville Rd at crosswalk to Silver Spring Transit Center

Silver Spring Library Station

Station Profile

Station Context with a Half-Mile Walkshed

- 2,538 residential units[21]
- Non-residential building use: primarily a mix of office, retail and other[22]
- Station's walkshed is part of an Equity Emphasis Area (EEA)

Forecasted Daily Station Boardings[23]

- 2030: 2,810
- 2040: 3,010

Forecasted Mode of Access to Station in 2040[24]

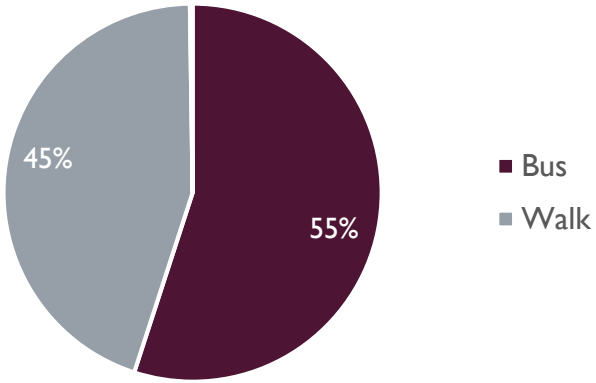


Figure 12. Pedestrians must share the road with cars on Grove Street.

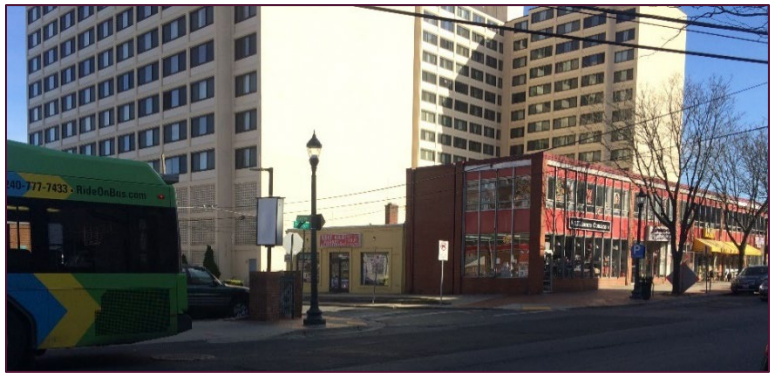


Figure 13. While most intersections in the Silver Spring Library Station area are controlled and/or marked, the intersection of Fenton Street and Easley Street is unmarked and uncontrolled, yet popular for pedestrians accessing retail.

[21] 2019 total; see Appendix 3 for list of residential projects that will be completed in upcoming years.

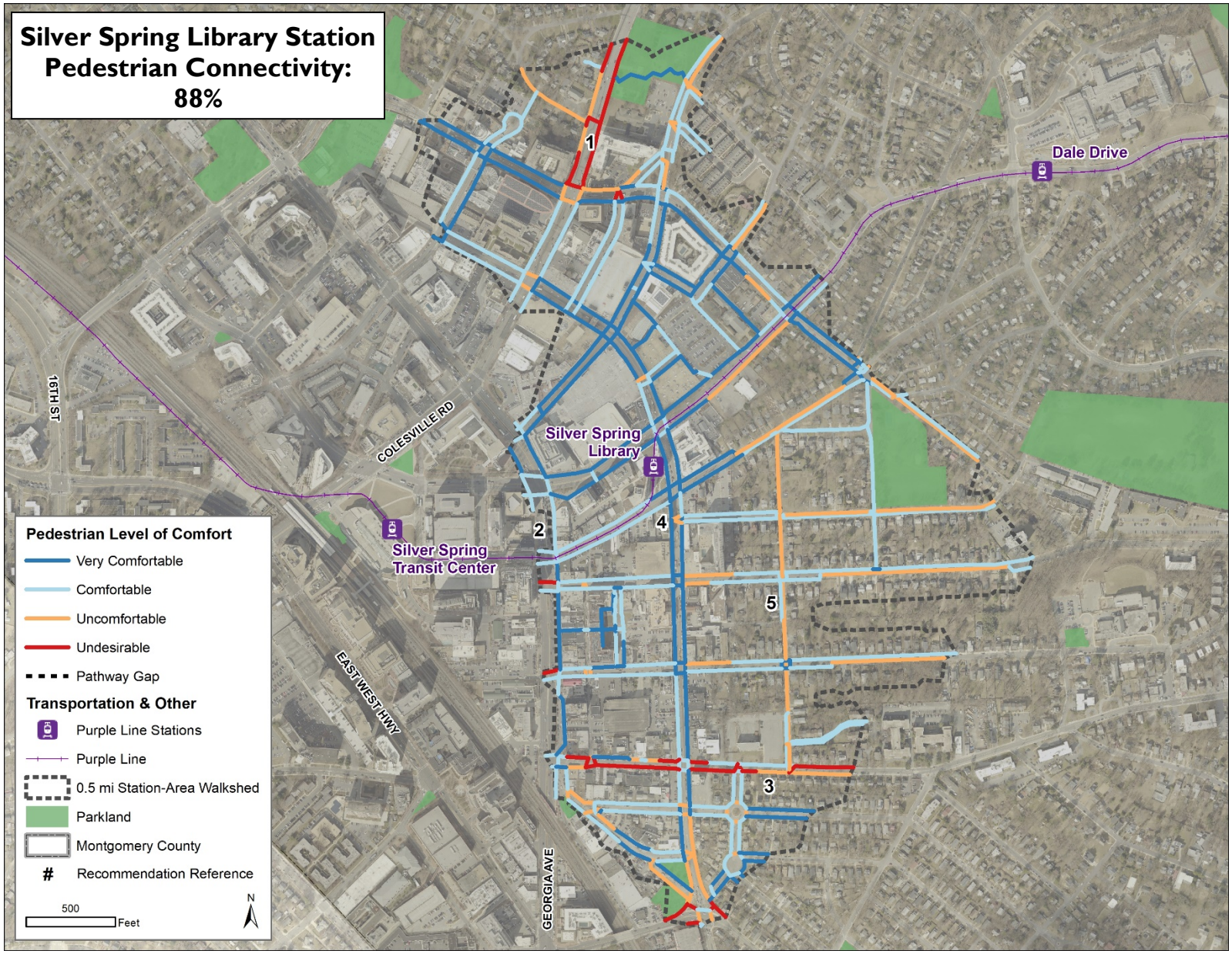
[22] See Appendix 5.

[23] Purple Line Final Environmental Impact, Volume I. Maryland Transit Administration (MTA). August 2013

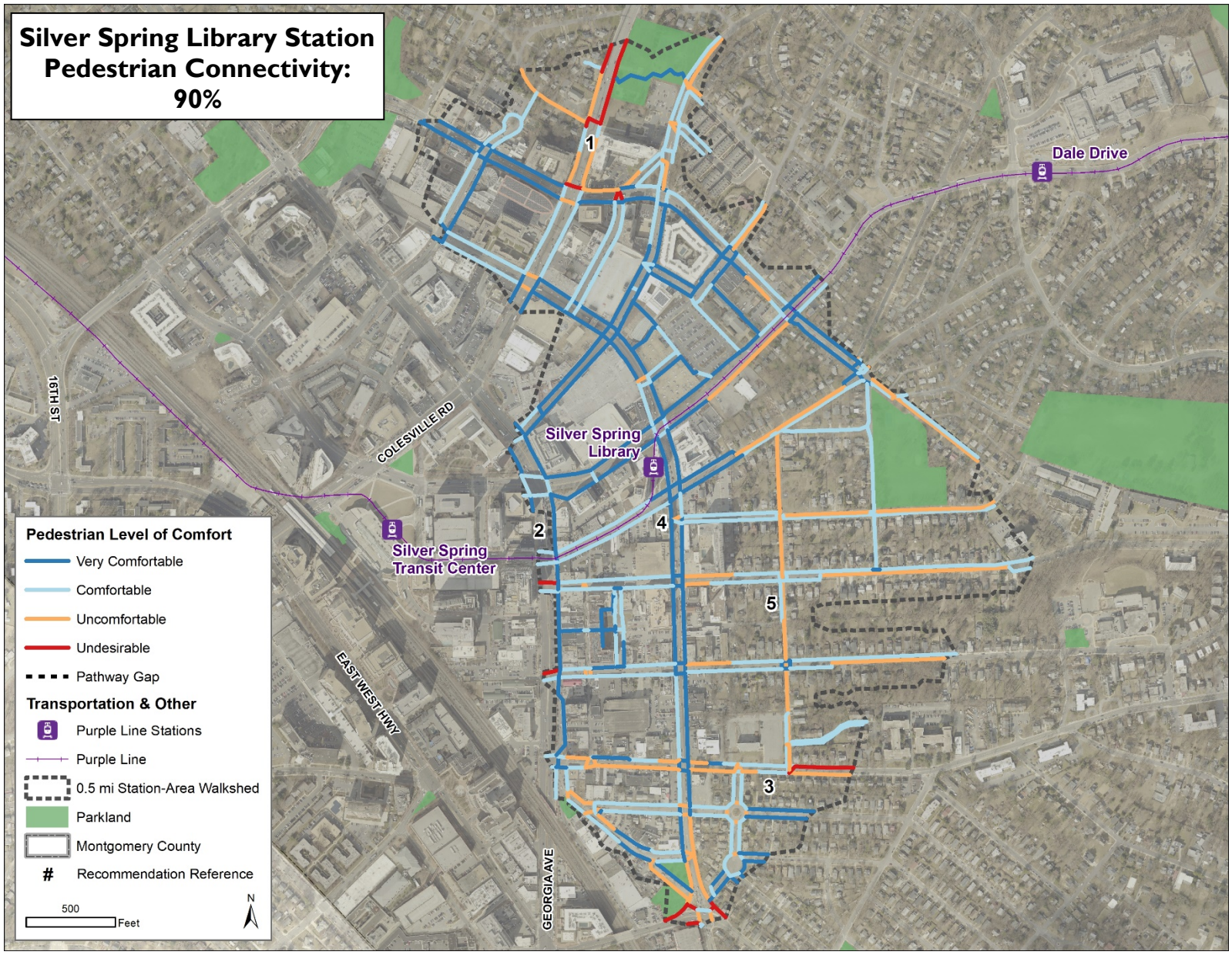
[24] Source: Purple Line Travel Forecasts Results Technical Report. Maryland Transit Administration (MTA). August 2013

Pedestrian Comfort Evaluation

Map 12. Pedestrian Comfort Evaluation for Silver Spring Library Station: Conditions at Purple Line Opening



Map 13. Pedestrian Comfort Evaluation at Silver Spring Library Station: Conditions with All Recommended Improvements



Station Area Recommendations

SILVER SPRING LIBRARY STATION			
TERM	**TYPE**	**#**	**RECOMMENDATION**
SHORT TERM	**Slower Speeds**	1	Reduce posted speed limit on Colesville Rd between Georgia Ave and Spring St from 30 to 25 mph and between Spring St and Noyes Dr from 35 to 25 mph
		2	Reduce posted speed limit on Georgia Ave between Wayne Ave and 16th St/Burlington Ave from 30 to 25 mph
		3	Reduce posted speed limit on Sligo Ave between Georgia Ave and Grove St from 30 to 25 mph
	Safe Crossings	4	Install high visibility crosswalks at Fenton St and Easley St
	Designated Space for Walking and Bicycling	5	Support the Grove St Neighborhood Greenway

Dale Drive Station

Station Profile

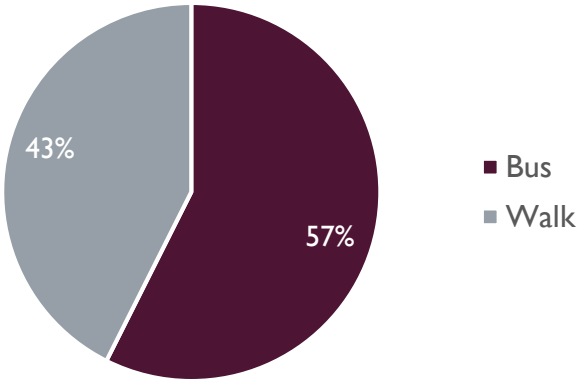
Station Context within Half-Mile Walkshed

- 965 residential units
- Non-residential building use: primarily other[25]

Forecasted Daily Station Boardings[26]

- 2030: 870
- 2040: 960

Forecasted Mode of Access to Station in 2040[27]



Figures 14 and 15. The crossing at Bonifant Street and Dale Drive, top, would benefit from the traffic-calming treatment at Mansfield Road and Dale Drive, bottom, applied to most four-way intersections of Dale Drive south of Wayne Avenue.

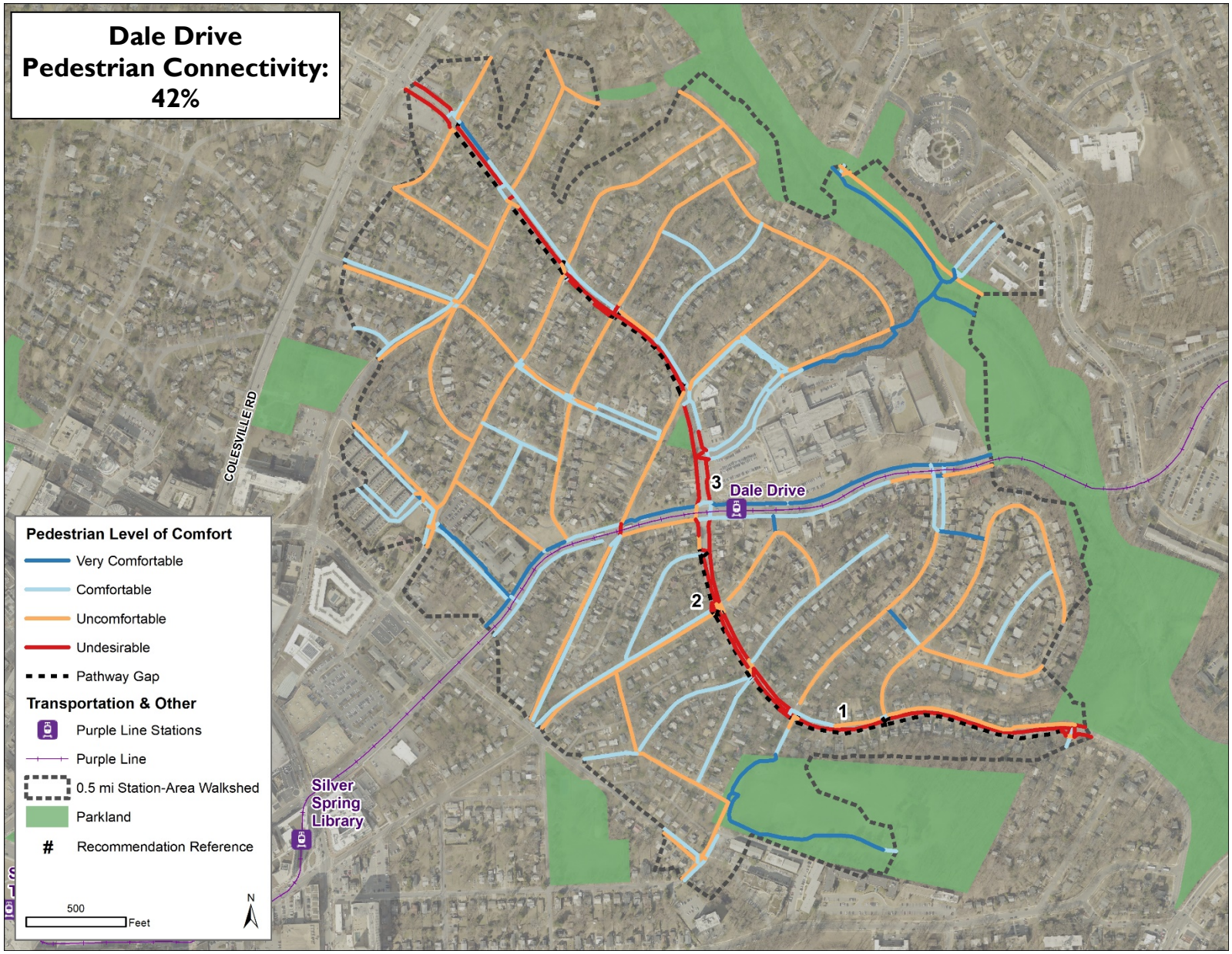
[25] See Appendix 5.

[26] Purple Line Final Environmental Impact, Volume I. Maryland Transit Administration (MTA). August 2013.

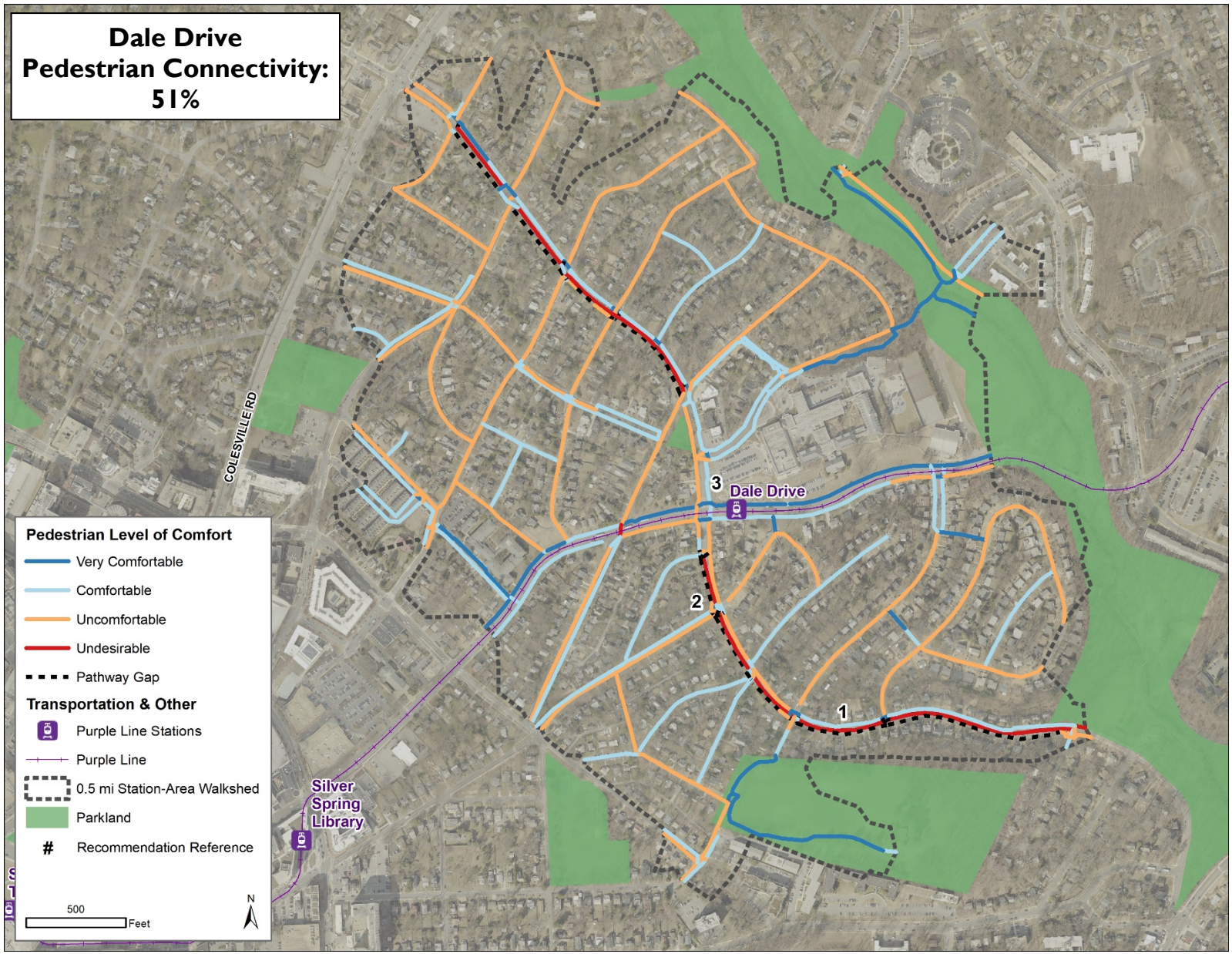
[27] Source: Purple Line Travel Forecasts Results Technical Report. Maryland Transit Administration (MTA). August 2013.

Pedestrian Comfort Evaluation

Map 14. Pedestrian Comfort Evaluation for Dale Drive Station: Conditions at Purple Line Opening



Map 15. Pedestrian Comfort Evaluation for Dale Drive Station: Conditions with All Recommended Improvements



Station Area Recommendations

DALE DRIVE STATION			
TERM	**TYPE**	**#**	**RECOMMENDATION**
SHORT TERM	**Slower Speeds**	1	Reduce speed limit on Dale Dr between Colesville Rd and Piney Branch Rd from 30 to 25 mph
	Safe Crossings	2	Add curb extensions, high visibility crosswalk and pedestrian refuge to northern leg of the Dale Dr and Bonifant St intersection
MEDIUM-LONG TERM	**Designated Space for Walking and Bicycling**	3	Improve the sidewalk on the east side of Dale Dr immediately north of the intersection with Wayne Ave to be at least 5' wide with a 5' wide buffer

Manchester Place Station

Station Profile

Station Context within Half-Mile Walkshed

- 1,867 residential units
- Non-residential building use: primarily other[28]
- Station's walkshed is part of an Equity Emphasis Area (EEA)

Forecasted Daily Station Boardings[29]

- 2030: 1,860
- 2040: 1,910

Forecasted Mode of Access to Station in 2040[30]

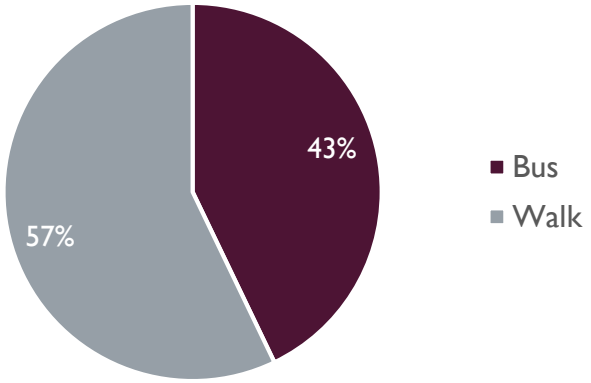


Figure 16. A paved pathway from a residential neighborhood ends near Wayne Avenue and Manchester Place, just short of the future station entrance.

Figure 17. The intersection of Plymouth Street and Bradford Road currently lacks sidewalks, crosswalks, and four-way stop control, but soon will serve pedestrians accessing the station from the south and east directions.

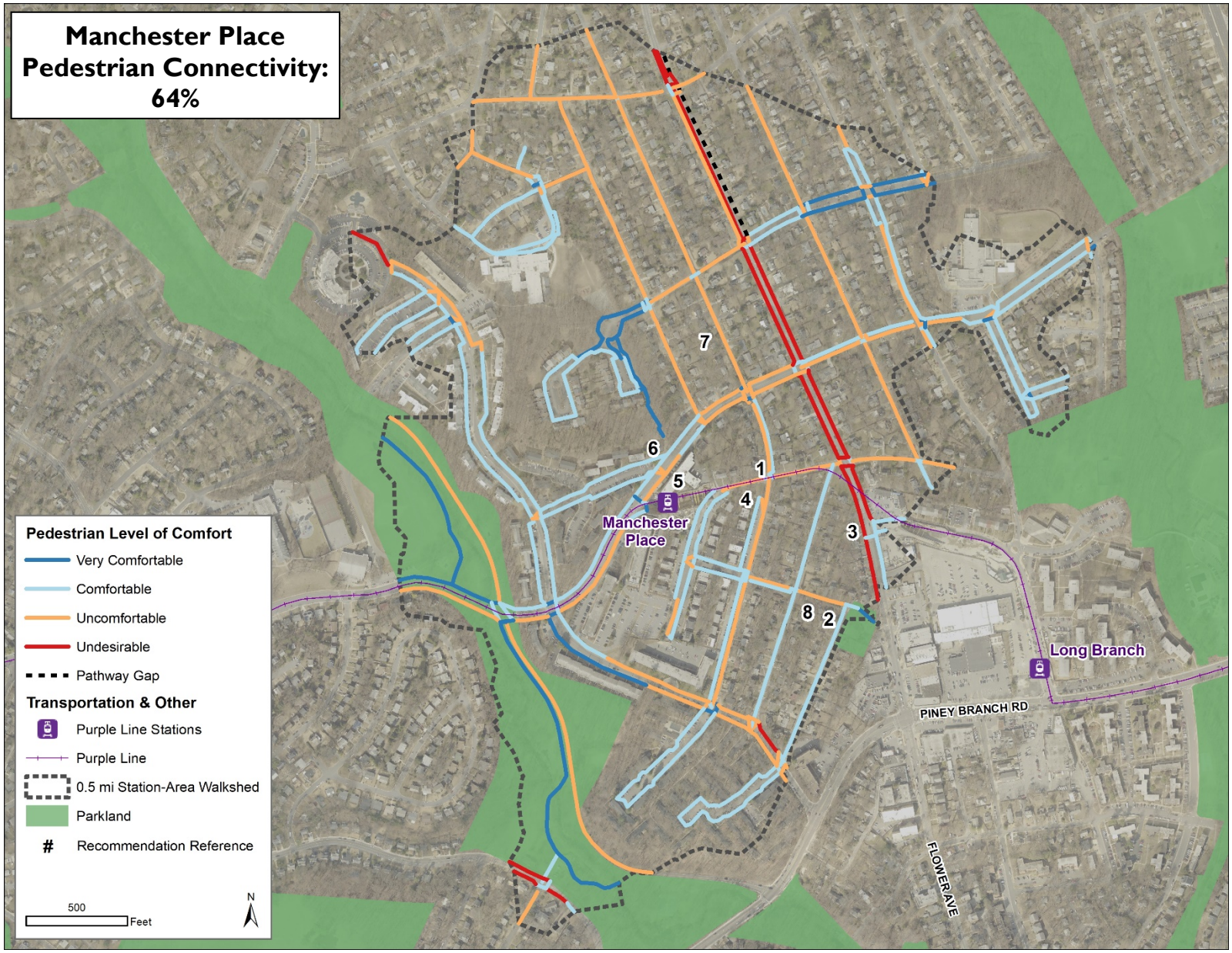
[28] See Appendix 5.

[29] Purple Line Final Environmental Impact, Volume I. Maryland Transit Administration (MTA). August 2013.

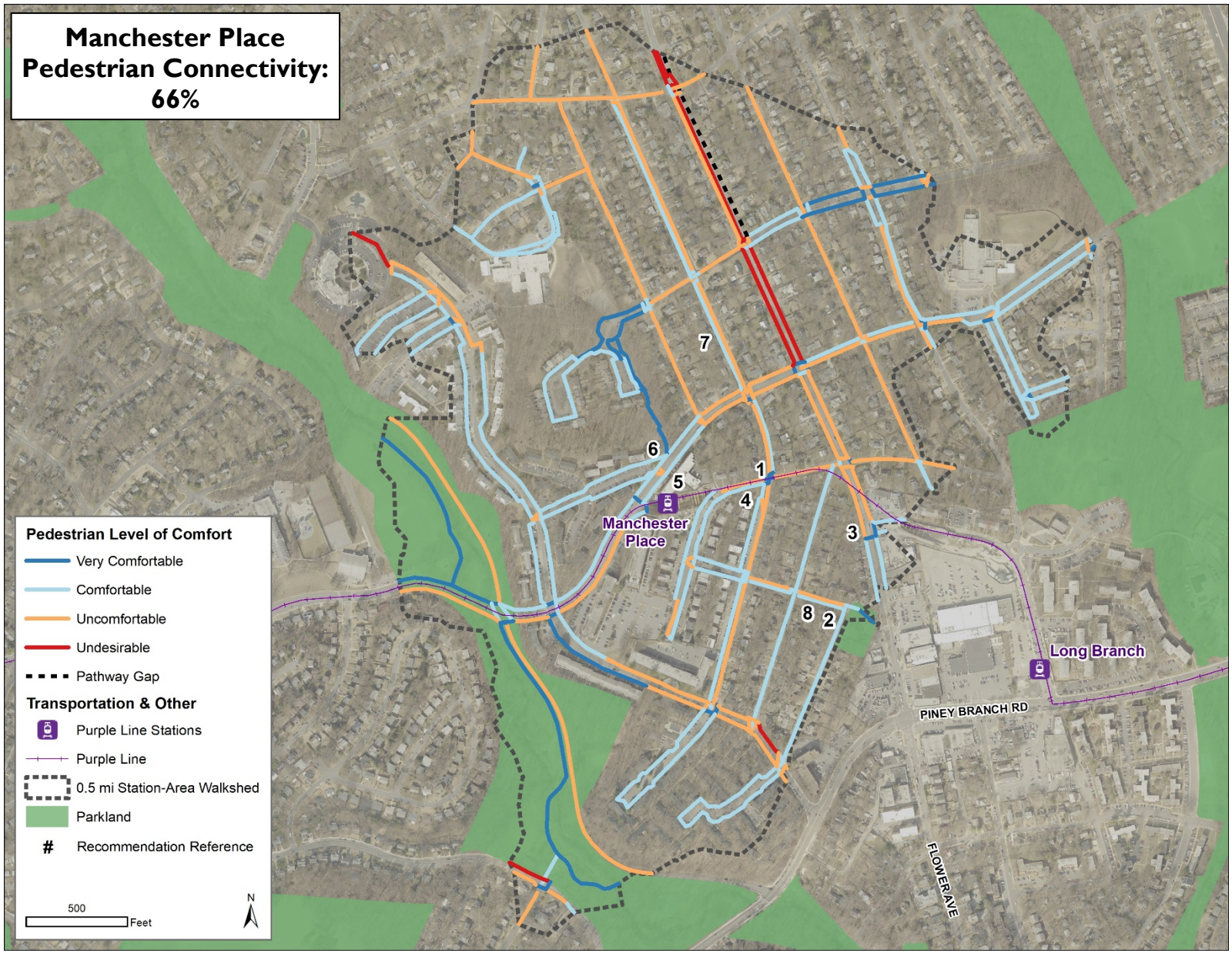
[30] Source: Purple Line Travel Forecasts Results Technical Report. Maryland Transit Administration (MTA). August 2013.

Pedestrian Comfort Evaluation

Map 16. Pedestrian Comfort Evaluation for Manchester Place Station: Conditions at Purple Line Opening



Map 17. Pedestrian Comfort Evaluation for Manchester Place Station: Conditions with All Recommended Improvements



Station Area Recommendations

MANCHESTER PLACE STATION			
TERM	**TYPE**	**#**	**RECOMMENDATION**
SHORT TERM	**Safe Crossings**	1	Provide a four-way stop-controlled crossing with high visibility crosswalk at the Bradford Rd and Plymouth St intersection
		2	Install high visibility crosswalk on the south leg of Hartwell Rd and Geren Rd
		3	Install high visibility crosswalk on Flower Ave and Arliss St
MEDIUM-LONG TERM	**Designated Space for Walking and Bicycling**	4	Extend the sidewalk on south side of Plymouth St to Braford Rd and wrap around to connect with the existing sidewalk on Bradford Rd, which is county-owned land.
		5	Investigate providing a tree buffer between the sidewalk and the street on Wayne Ave, immediately northeast of Manchester Place Station
		6	Investigate extending the paved path from Saffron Ln, which turns into an unpaved path just short of connecting with Wayne Ave.
		7	Add a sidewalk to the west side of Bradford Rd between Wayne Ave and Melbourne Ave
		8	Upgrade existing pathway on south side of Hartwell Rd, from Reading Rd to Geren Rd, to a formal sidewalk.

Long Branch Station

Station Profile

Station Context

- 1,449 residential units
- Non-residential building use: primarily retail[31]
- Station's walkshed is part of an Equity Emphasis Area (EEA)

Forecasted Daily Station Boardings[32]

- 2030: 790
- 2040: 890

Forecasted Mode of Access to Station in 2040[33]

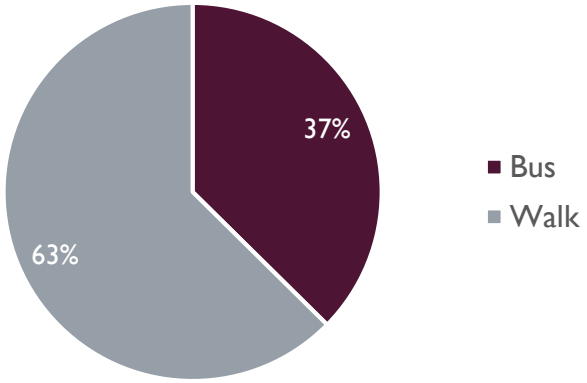


Figure 18. The intersection at the future station (Piney Branch Road and Arliss Street) currently has no high-visibility crosswalks for pedestrians accessing businesses located around the intersection.

Figure 19. Piney Branch Road, between Flower Avenue and University Boulevard, is home to many multi-family buildings, businesses, and bus stops in the station area, but there is no buffer between pedestrians and cars traveling 30 mph.

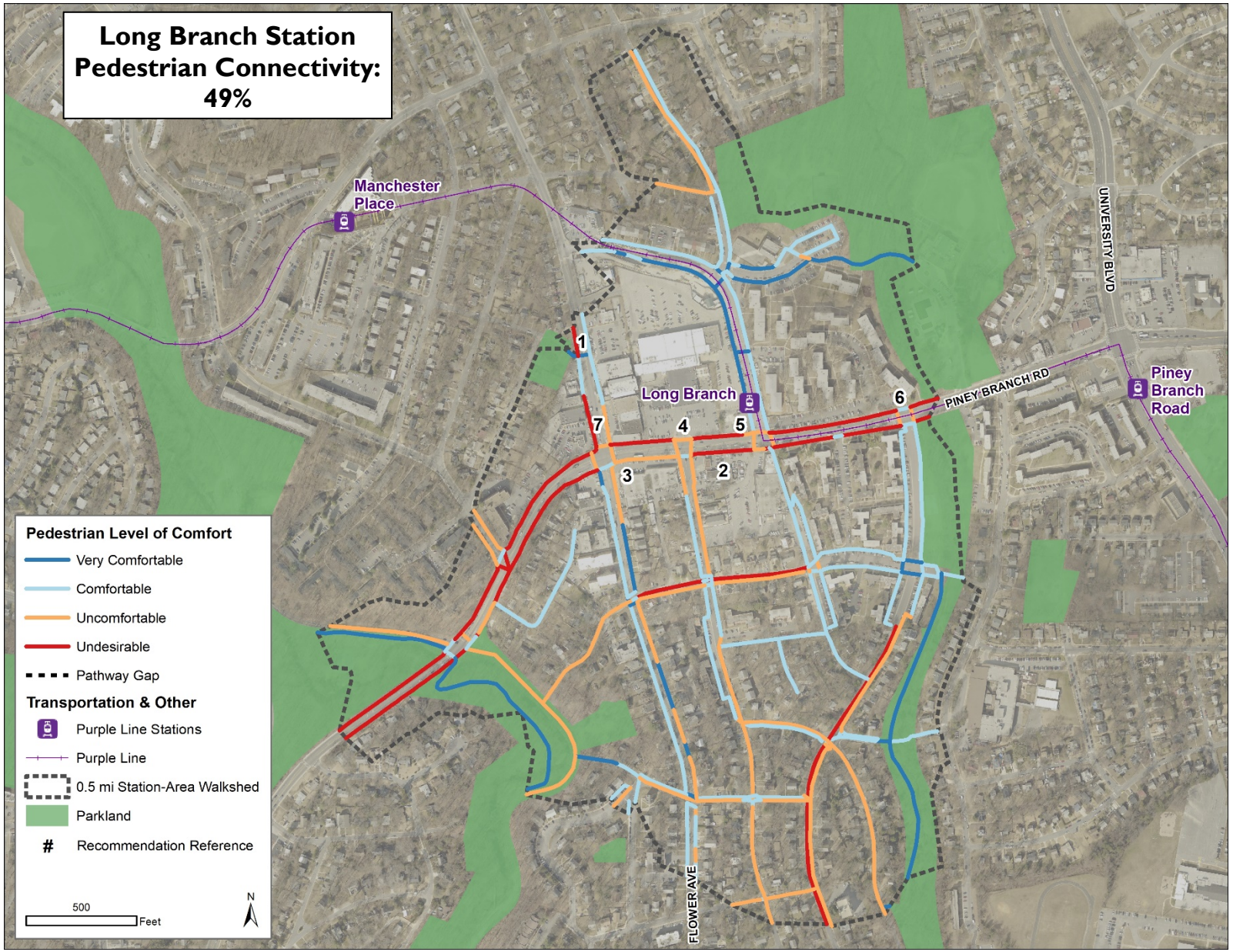
[31] See Appendix 5.

[32] Purple Line Final Environmental Impact, Volume I. Maryland Transit Administration (MTA). August 2013.

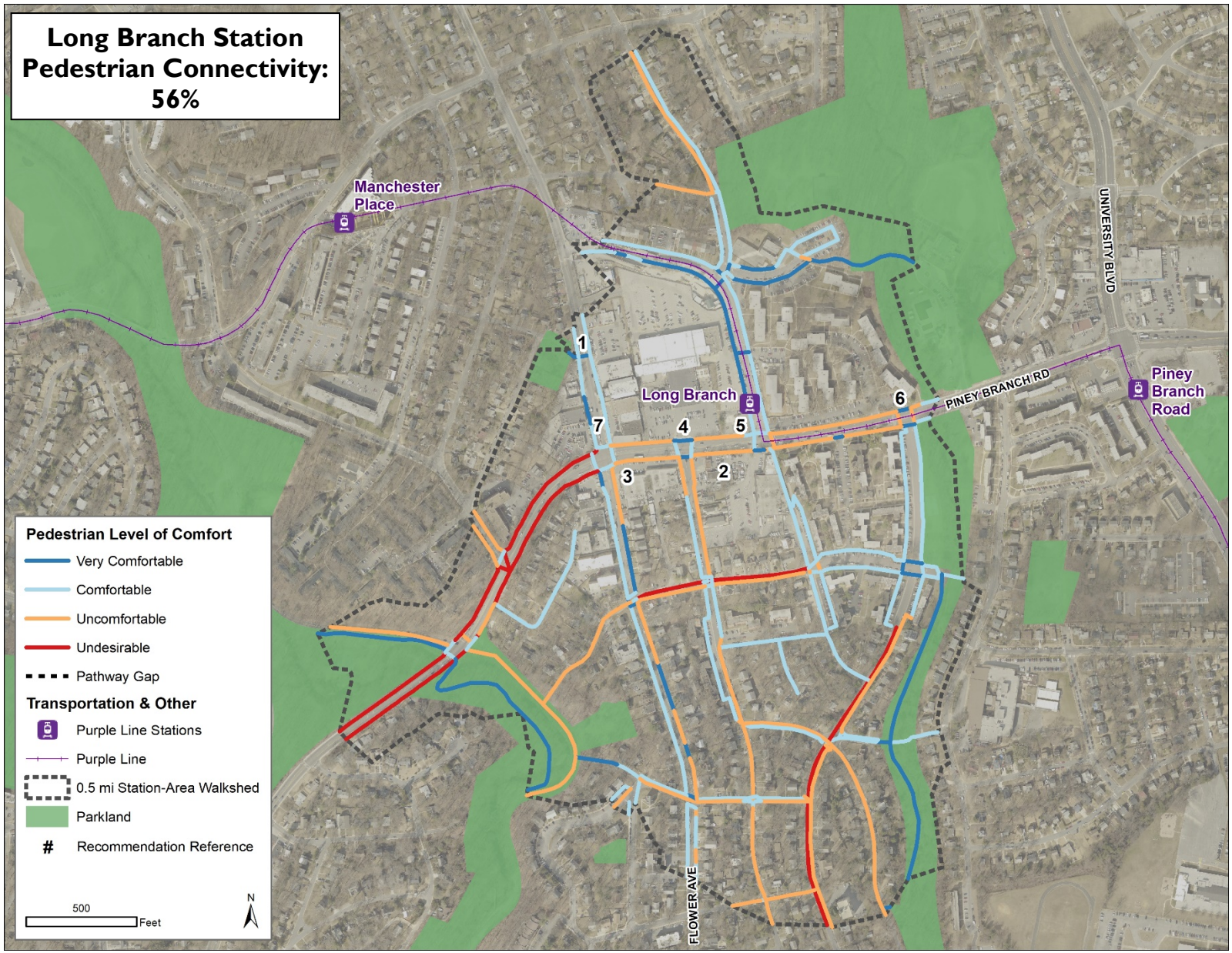
[33] Source: Purple Line Travel Forecasts Results Technical Report. Maryland Transit Administration (MTA). August 2013.

Pedestrian Comfort Evaluation

Map 18. Pedestrian Comfort Evaluation for Long Branch Station: Conditions at Purple Line Opening



Map 19. Pedestrian Comfort Evaluation for Long Branch Station: Conditions with All Recommended Improvements



Station Area Recommendations

LONG BRANCH STATION			
TERM	**TYPE**	**#**	**RECOMMENDATION**
SHORT TERM	**Slower Speeds**	1	Reduce posted speed limit on Flower Ave between Wayne Ave and Piney Branch Rd from 30 to 25 mph
		2	Reduce posted speed limit on Piney Branch Rd between Flower Ave and University Blvd from 30 to 25 mph
	Safe Crossings	3	Install high visibility crosswalks at Piney Branch Rd and Flower Ave
		4	Install high visibility crosswalks at Piney Branch Rd and Greenwood Ave
		5	Install high visibility crosswalks at Piney Branch Rd and Arliss St
		6	Install high visibility crosswalks at Piney Branch Rd and Garland Ave
MEDIUM-LONG TERM	**Designated Space for Walking and Bicycling**	7	Provide one-way separated bike lanes on both sides of Flower Ave between Arliss St and Piney Branch Rd

Piney Branch Road Station

Station Profile

Station Context

- 2,092 residential units
- Non-residential building use: primarily other with some retail[34]
- Station's walkshed is part of an Equity Emphasis Area (EEA)

Forecasted Daily Station Boardings[35]

- 2030: 1,160
- 2040: 1,240

Forecasted Mode of Access to Station in 2040[36]

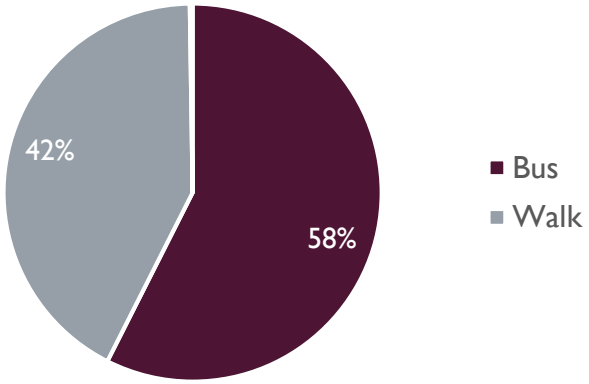


Figure 20. The future station will be constructed at the intersection of two major highways, Piney Branch Road and University Boulevard.

Figure 21. Piney Branch Road, east of University Boulevard, is a major highway with a 40 mph posted speed limit despite many multifamily residences located along it.

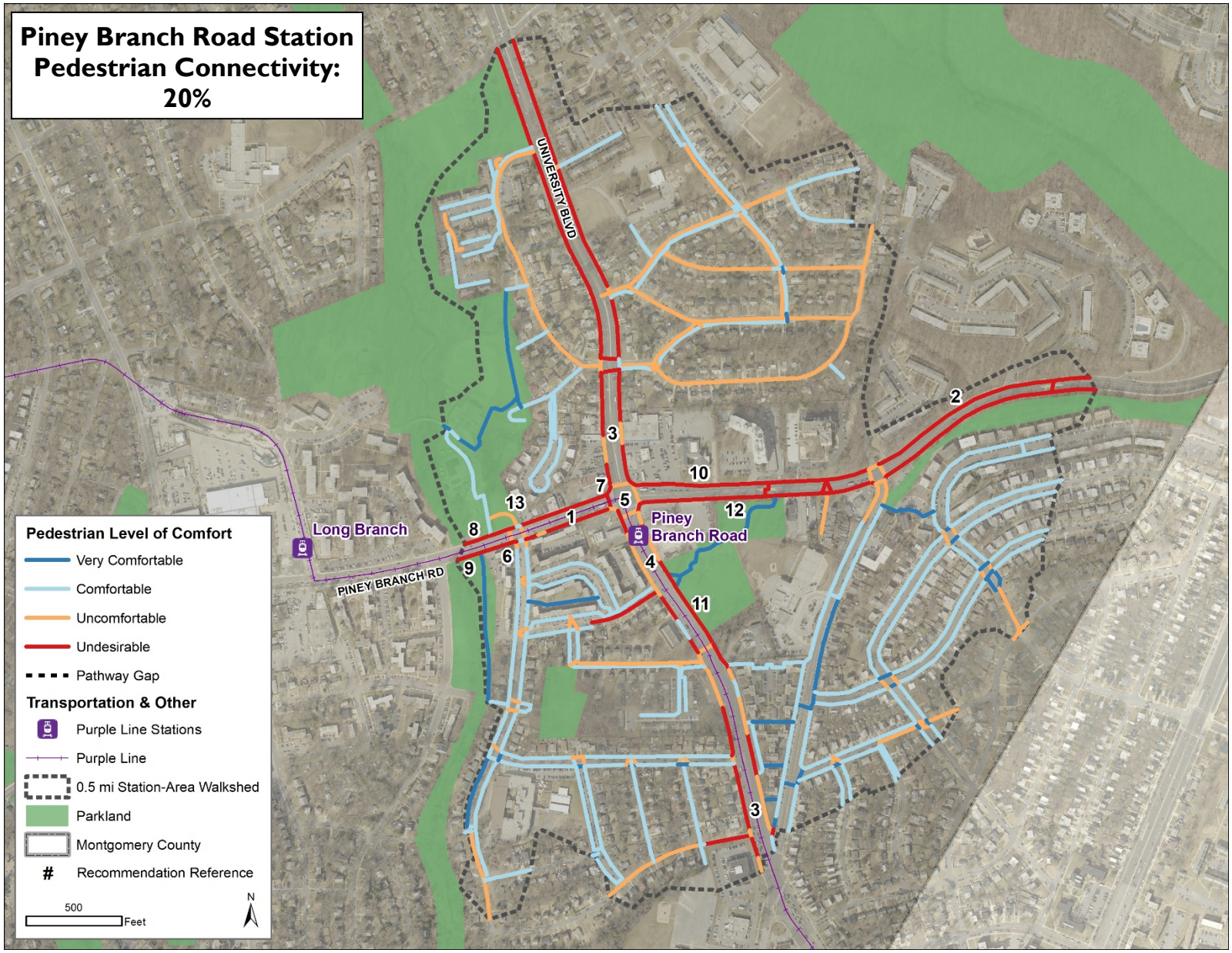
[34] See Appendix 5.

[35] Purple Line Final Environmental Impact, Volume I. Maryland Transit Administration (MTA). August 2013.

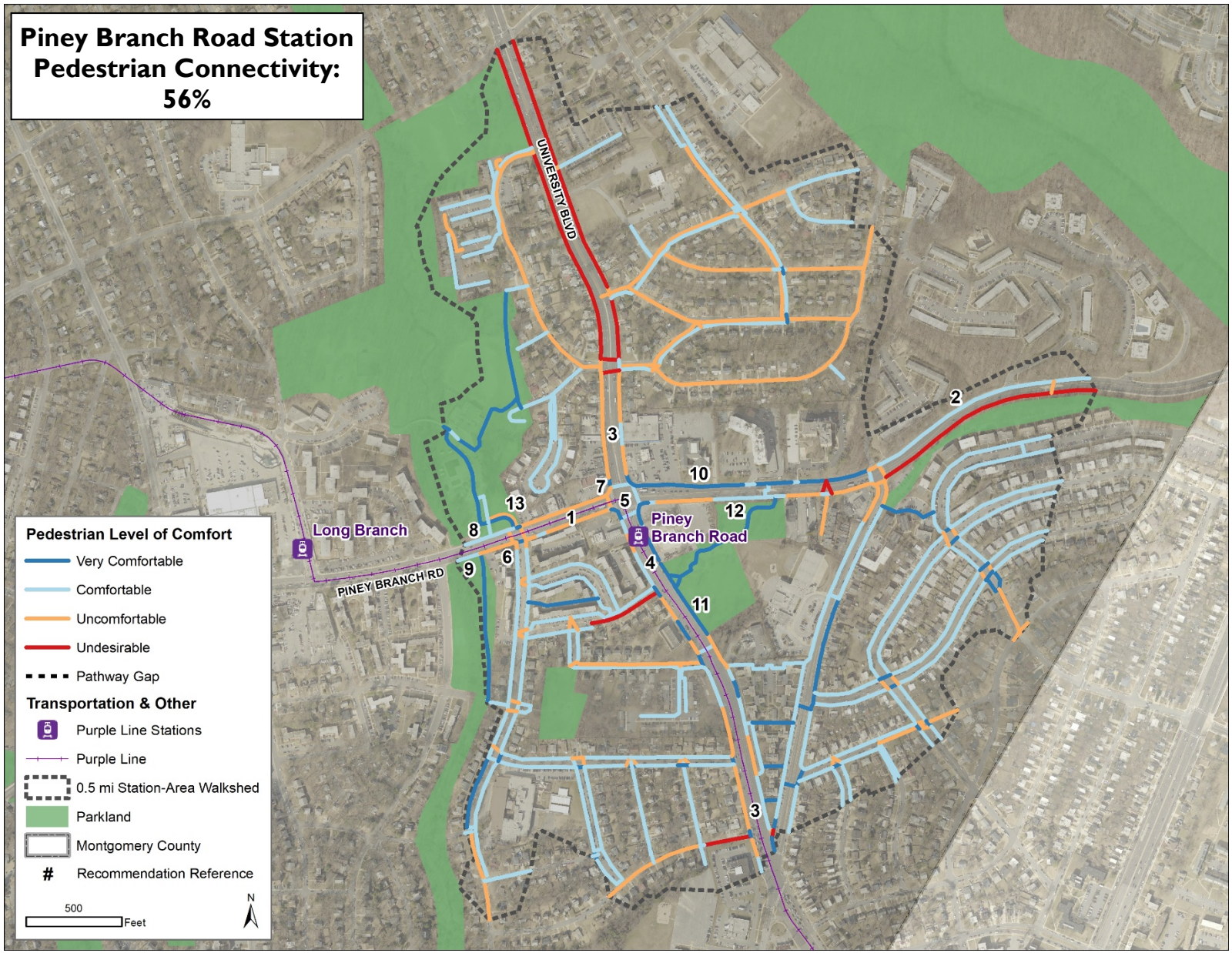
[36] Source: Purple Line Travel Forecasts Results Technical Report. Maryland Transit Administration (MTA). August 2013.

Pedestrian Comfort Evaluation

Map 20. Pedestrian Comfort Evaluation for Piney Branch Road Station: Conditions at Purple Line Opening



Map 21. Pedestrian Comfort Evaluation for Piney Branch Road Station: Conditions with All Recommended Improvements



Station Area Recommendations

PINEY BRANCH ROAD STATION			
TERM	**TYPE**	**#**	**RECOMMENDATION**
SHORT TERM	**Slower Speeds**	1	Reduce posted speed limit on Piney Branch Rd between University Blvd and Carroll Ave from 40 to 25 mph
		2	Reduce posted speed limit on Piney Branch Rd between Carroll Ave and New Hampshire Ave from 40 to 35 mph
		3	Reduce posted speed limit on University Blvd between Glenville Rd/Heron Dr and Carroll Ave from 35 to 25 mph
		4	Provide automated speed enforcement on Piney Branch Rd in the vicinity of the Purple Line station
		5	Provide automated speed enforcement on University Blvd in the vicinity of the Purple Line station
	Safe Crossings	6	Install high visibility crosswalks at Piney Branch Rd and Barron St
	Designated Space for Walking and Bicycling	7	Consider vertical separation (e.g. bollards) at the University Blvd and Piney Branch Rd intersection on segments where the distance between the face of curb and the back edge of the sidewalk is 8 feet or greater
MEDIUM-LONG TERM	**Designated Space for Walking and Bicycling**	8	Upgrade sidewalk on north side of Piney Branch Road fronting the Long Branch Community Center and Library (public property), to have 5' wide buffers and 5' wide minimum sidewalks
		9	Upgrade sidewalk on south side of Piney Branch Road fronting the Long Branch – Garland Neighborhood Park (public property), to have 5' wide buffers and 5' wide minimum sidewalks
		10	Install two-way separated bike lanes on north side of Piney Branch Road from University Boulevard to New Hampshire Avenue
		11	Upgrade sidewalk on east side of University Blvd along the frontage of the New Hampshire Estates Local Park (public property) to a 10' wide side path and 5' wide buffer
		12	Upgrade sidewalk on south side of Piney Branch Rd along the frontage of the New Hampshire Estates Local Park (public property) to be 5' wide with a 5' wide buffer
		13	Add sidepath through the Long Branch Community Center parking lot to align with proposed driveway at the Barron Street intersection

Takoma-Langley Station

Station Profile

Station Context

- 1,088 residential units
- Non-residential building use: mix of office, retail, industrial and other[37]
- Station's walkshed is part of an Equity Emphasis Area (EEA)

Forecasted Daily Station Boardings[38]

- 2030: 1,940
- 2040: 2,190

Forecasted Mode of Access to Station[39]

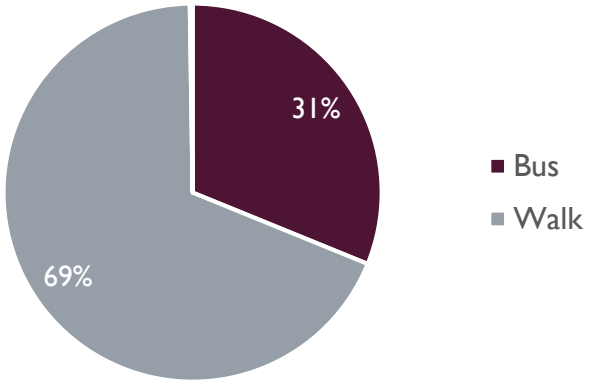


Figure 22. A channelized right turn immediately adjacent to the busy Takoma-Langley Crossroads Transit Center.

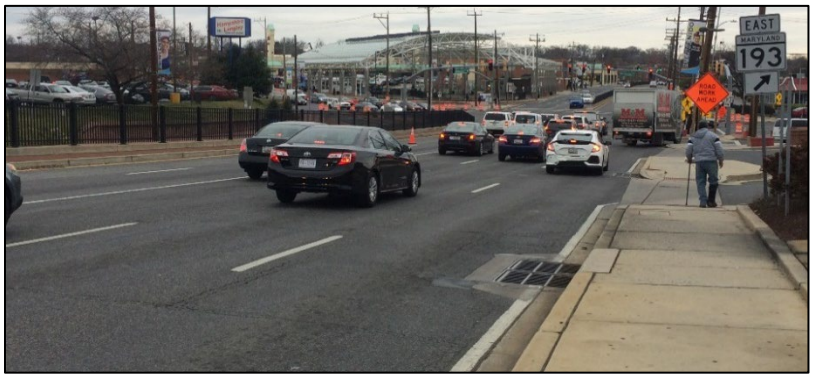


Figure 23. New Hampshire Avenue has no buffer between pedestrians on the sidewalk and the 35 mph roadway.

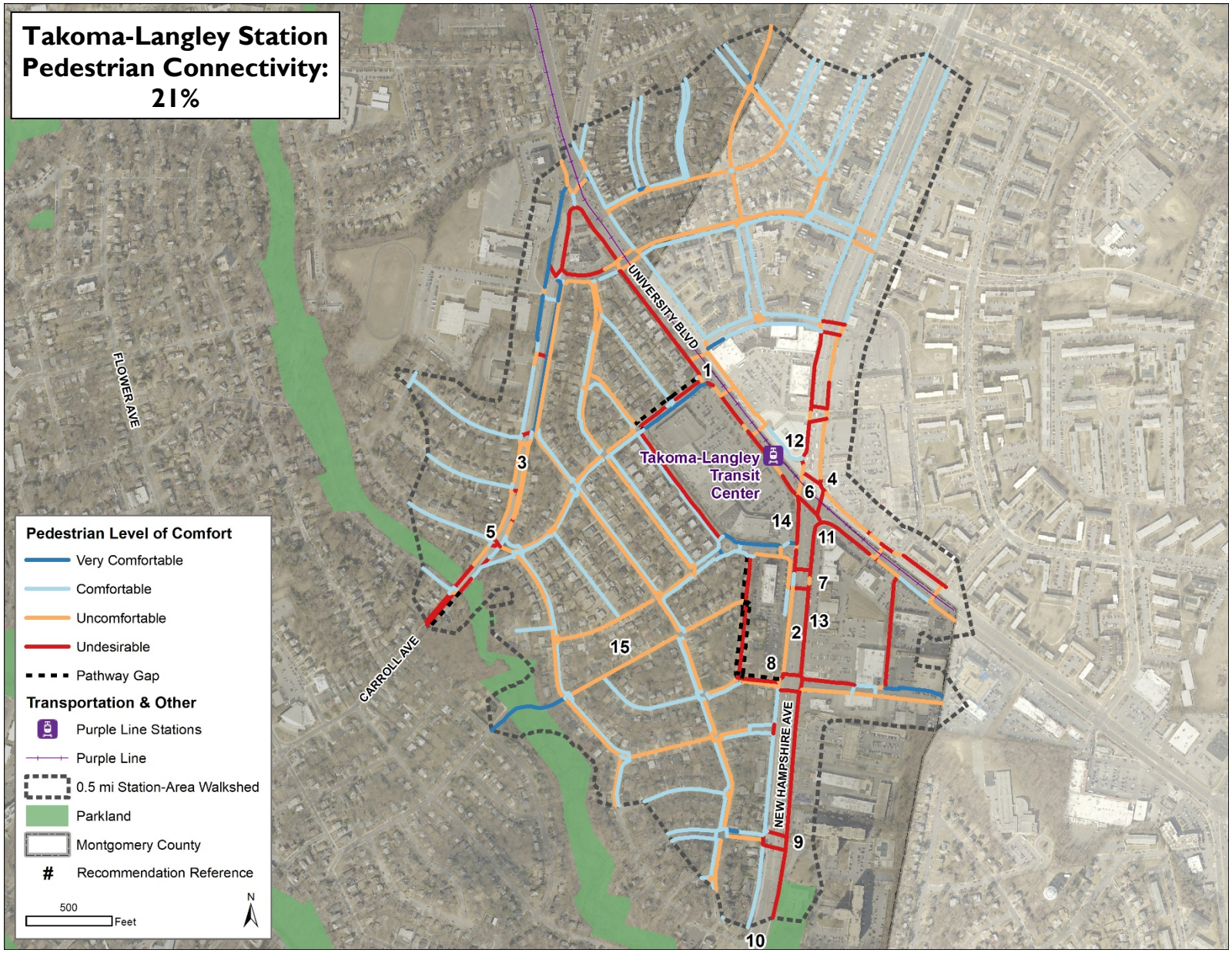
[37] See Appendix 5.

[38] Purple Line Final Environmental Impact, Volume I. Maryland Transit Administration (MTA). August 2013.

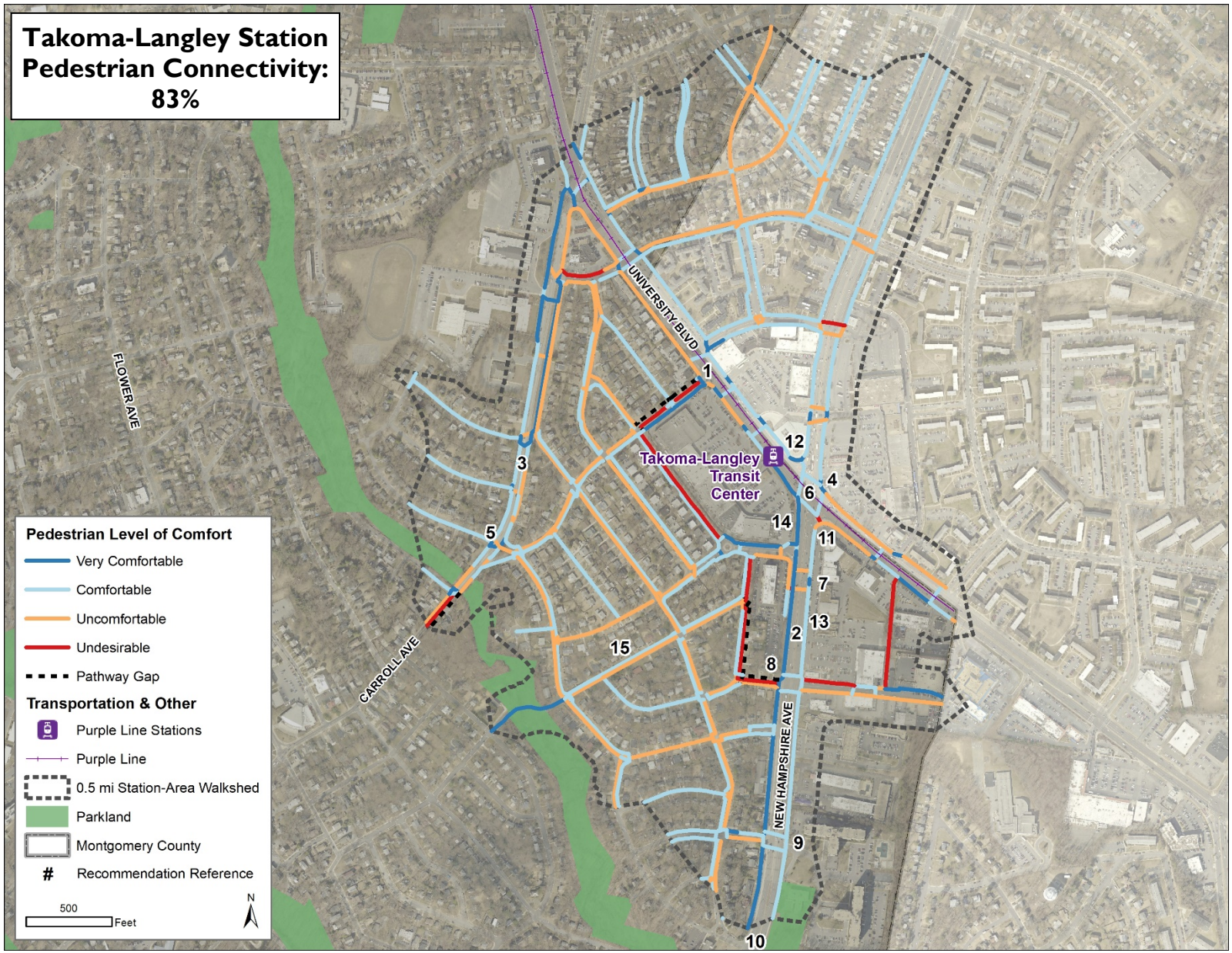
[39] Source: Purple Line Travel Forecasts Results Technical Report. Maryland Transit Administration (MTA). August 2013.

Pedestrian Comfort Evaluation

Map 22. Pedestrian Comfort Evaluation for Takoma-Langley Station: Conditions at Purple Line Opening



Map 23. Pedestrian Comfort Evaluation for Takoma-Langley Station: Conditions with All Recommended Improvements

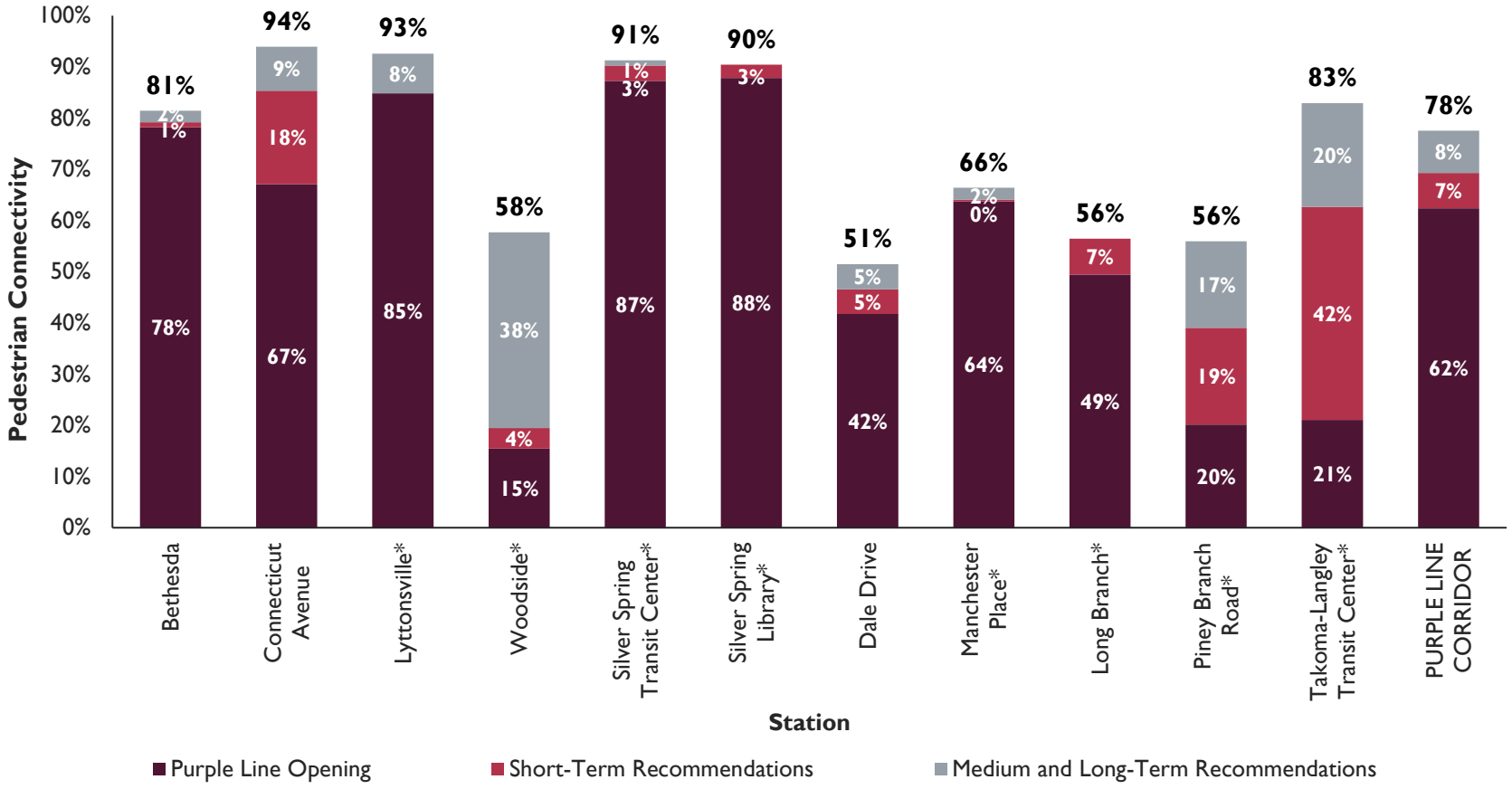


Station Area Recommendations

TAKOMA-LANGLEY STATION			
TERM	**TYPE**	**#**	**RECOMMENDATION**
SHORT TERM	**Slower Speeds**	1	Reduce posted speed limit on University Blvd between Carroll Ave and 14th Ave from 35 to 25 mph
		2	Reduce posted speed limit on New Hampshire Ave between Lebanon St and Sligo Creek Pkwy from 35 to 25 mph
		3	Reduce posted speed limit on Carroll Ave between University Blvd and Flower Ave from 30 to 25 mph
		4	Provide automatic speed enforcement on University Blvd in the vicinity of the Purple Line station
	Safe Crossings	5	Install high visibility crosswalk with pedestrian refuge at Carroll Ave and Glenside Dr
		6	Install high visibility crosswalks at University Blvd and New Hampshire Ave (if not provided already by the Purple Line Construction)
		7	Install high visibility crosswalks at New Hampshire Ave and Takoma-Langley Crossroads Center
		8	Install high visibility crosswalks at New Hampshire Ave and Holton Ln
		9	Install high visibility crosswalks at New Hampshire Ave and Merwood Dr
		10	Install high visibility crosswalks at New Hampshire Ave and Glenside Dr
	Designated Space for Walking and Bicycling	11	Consider vertical separation (e.g. bollards) at the University Blvd and New Hampshire Ave intersection where space between face of the curb and back edge of sidewalk is 8' or greater
MEDIUM-LONG TERM	**Safe Crossings**	12	Explore alternatives to remove the channelized right turn at the northwest corner of University Blvd and New Hampshire Ave
	Designated Space for Walking and Bicycling	13	Provide a 5' wide sidewalk with a 5' wide buffer on the east side of New Hampshire between University Blvd and Erskine St
		14	Construct the "New Ave Bikeway", a two-way, separated bike lane on west side of New Hampshire from University Blvd to Sligo Creek Pkwy
		15	Install a 5' wide sidewalk at the west side of Jackson Ave and Hammond Ave

V. Pedestrian Connectivity Analysis

The goal of the recommendations in this report is to increase the pedestrian connectivity metric for each station. As stated previously, the pedestrian connectivity metric measures *the percentage of the total distance of all residential trips to a station that meets a certain comfort threshold* or the ratio of comfortable to total residence-to-station trip miles, within a half-mile walkshed around the stations. In this line, Figure 24 shows the pedestrian connectivity percentages for a half-mile walkshed around each station at Purple Line opening, with short-term recommendations and with medium-to-long term recommendations being implemented (complete results are included in Appendix 6). In addition, Appendix 7 shows the pedestrian connectivity complete results for a one-mile walkshed around the Purple Line Stations.



* Part of this station's walkshed is within an Equity Emphasis Area (EEA)

Figure 24. Pedestrian Connectivity Comparison by Station at Purple Line Opening, with Short-Term Recommendations and with All Recommendations

The results show that pedestrian connectivity at Purple Line opening varies across stations. On one hand, the stations located in Central Business Districts, like Bethesda, Silver Spring Transit Center, and Silver Spring Library have the highest anticipated pedestrian connectivity, with 78 percent, 87 percent, and 88 percent respectively. On the other hand, stations like Dale Drive and Manchester Place, located in mostly suburban areas, have pedestrian connectivity of 42 percent and 64 percent, respectively. Stations located in auto-oriented commercial areas, like Piney Branch Road and Takoma-Langley Transit Center, have connectivity values as low as 20 percent and 21 percent respectively. Finally, the Woodside station has the lowest overall pedestrian connectivity at Purple Line opening, with only 15 percent.

Significant improvements in pedestrian connectivity could be obtained in several stations by implementing every short-term recommendation included in this report. In particular, Connecticut Avenue, Piney Branch Road, and Takoma-Langley Transit Center stations would experience the largest improvements in connectivity from short term recommendations (18, 19, and 42 percent respectively). In addition, even those stations with the highest connectivity at Purple Line opening, Silver Spring Library and Silver Spring Transit Center, would benefit from implementing short-term recommendations. Silver Spring Library Station would experience a three percent increase in connectivity and Silver Spring Transit Center Station would experience a two percent increase.

In contrast, other stations require the additional implementation of the medium-to-long term recommendations to experience relevant connectivity improvements. For example, Lyttonsville would experience an increase in connectivity of eight percent, while Woodside, which would see an improvement of 4 percent with short-term recommendations, would experience a much larger improvement of 38 percent from implementing the medium-to-long term recommendations.

While this report's recommendations aspire to increase connectivity in all station areas, they particularly aim to improve connectivity in the least-connected areas. Furthermore, the three stations with the lowest overall connectivity at Purple Line opening - Woodside, Piney Branch Road, and Takoma-Langley Transit Center - intersect with an Equity Emphasis Area (EEA), making connectivity improvements around these stations especially important. Woodside, the station with the lowest connectivity, would see connectivity improvement from 15 percent at Purple Line Opening to 58 percent with all recommendations implemented. Piney Branch Road, the station with the second-lowest connectivity, would see connectivity increases of 19 percent and 17 percent, respectively, by implementing the short-term and medium-to-long term recommendations. This means overall connectivity to the station would increase from 20 percent at Purple Line Opening to 56 percent if all recommendations are implemented.

Finally, Takoma-Langley Transit Center, the station with the third-lowest connectivity at 21 percent, would see a substantial increase in connectivity of 42 percent from short term recommendations, and a further increase of 20 percent from medium-to-long term recommendations, for a total increase of 62 percent. Implementing all recommendations could boost Takoma-Langley's connectivity to fifth-highest, at 83 percent.

*Takoma-Langley Transit Center would see the **highest improvement** in pedestrian connectivity: from 21 percent at Purple Line opening to 83 percent with all recommendations.*

Connectivity would substantially increase at the three stations with the lowest overall connectivity at Purple Line opening, all of which overlap with Equity Emphasis Areas: Takoma-Langley, Piney Branch Road, and Woodside.

It is important to note that some stations would only achieve pedestrian connectivity around 50 percent, even after all recommendations are implemented: Dale Drive with 51 percent, and Long Branch and Piney Branch Road with 56 percent each. Redevelopment of these station areas comes with particular challenges, limiting the recommendations that can be made. The Dale Drive station area is composed mainly of residential streets with missing or substandard sidewalks. Recommending additional sidewalks or increasing sidewalk and buffer widths would require purchasing private property. The Long Branch and Piney Branch Road station areas include two major highways, Piney Branch Road and University Boulevard. Improving the quality of sidewalks around these two stations would require significant private redevelopment in the area. However, Montgomery Planning recommended targeted sidewalk improvements along the frontage of publicly owned property.

This report's recommendations would improve pedestrian connectivity for the eight station-area walksheds located within an EEA. Even those stations with high connectivity at Purple Line opening, such as Silver Spring Library, Silver Spring Transit Center, and Lyttonsville, would see improvements. Lastly, substantial improvements in connectivity would be reached in the three stations with the overall lowest pedestrian connectivity at Purple Line opening (Takoma-Langley Transit Center, Piney Branch Road, and Woodside); all of these stations overlap with an EEA.

Finally, Figure 24 shows that the Montgomery County portion of the Purple Line Corridor would increase in pedestrian connectivity by seven percent with implementation of short-term recommendations only, and increase an additional seven percent with implementation of medium-to-long term recommendations, for a total overall pedestrian connectivity of 78 percent.

VI. Conclusions

Walking will be the dominant mode of arrival for riders accessing most of the Purple Line stations, so providing safe and comfortable pedestrian infrastructure around stations is essential. This report assesses pedestrian conditions around the future Purple Line stations and provides a series of recommendations to improve said pedestrian connectivity.

The following are the main conclusions of this study:

- Pedestrian connectivity along the International Corridor (20-49 percent) will be low at Purple Line opening.
- The results showed that implementing the recommendations included in this report would increase the pedestrian connectivity for every Purple Line station. Stations with very low connectivity at the Purple Line opening, such as Piney Branch Road and Takoma-Langley, would significantly increase their connectivity, achieving a connectivity level similar to the average for all stations in Montgomery County.
- For many stations, the short-term, lower-cost recommendations alone would yield substantial pedestrian connectivity increases. Certain other stations, such as Lyttonsville and Woodside, demonstrated substantially greater pedestrian connectivity only with the inclusion of medium-to-long term recommendations. The two stations with the lowest pedestrian connectivity at Purple Line opening, Piney Branch Road and Takoma-Langley Stations, would rely greatly on both short- and medium-to-long-term recommendations to achieve an increase in pedestrian connectivity.
- High pedestrian connectivity (above 80 percent) could be reached at most stations if all recommendations are considered. However, some stations, such as Long Branch and Piney Branch Road, will require private redevelopment in order to achieve higher pedestrian connectivity.
- By implementing this report's recommendations, pedestrian connectivity would improve for the eight stations located in Equity Emphasis Areas (EEA), with substantial increases for the three EEA stations with the lowest overall connectivity at Purple Line opening: Takoma-Langley Transit Center, Piney Branch Road, and Woodside.

The following are the highest priority recommendations for improving pedestrian access to the Purple Line stations serving Montgomery County:

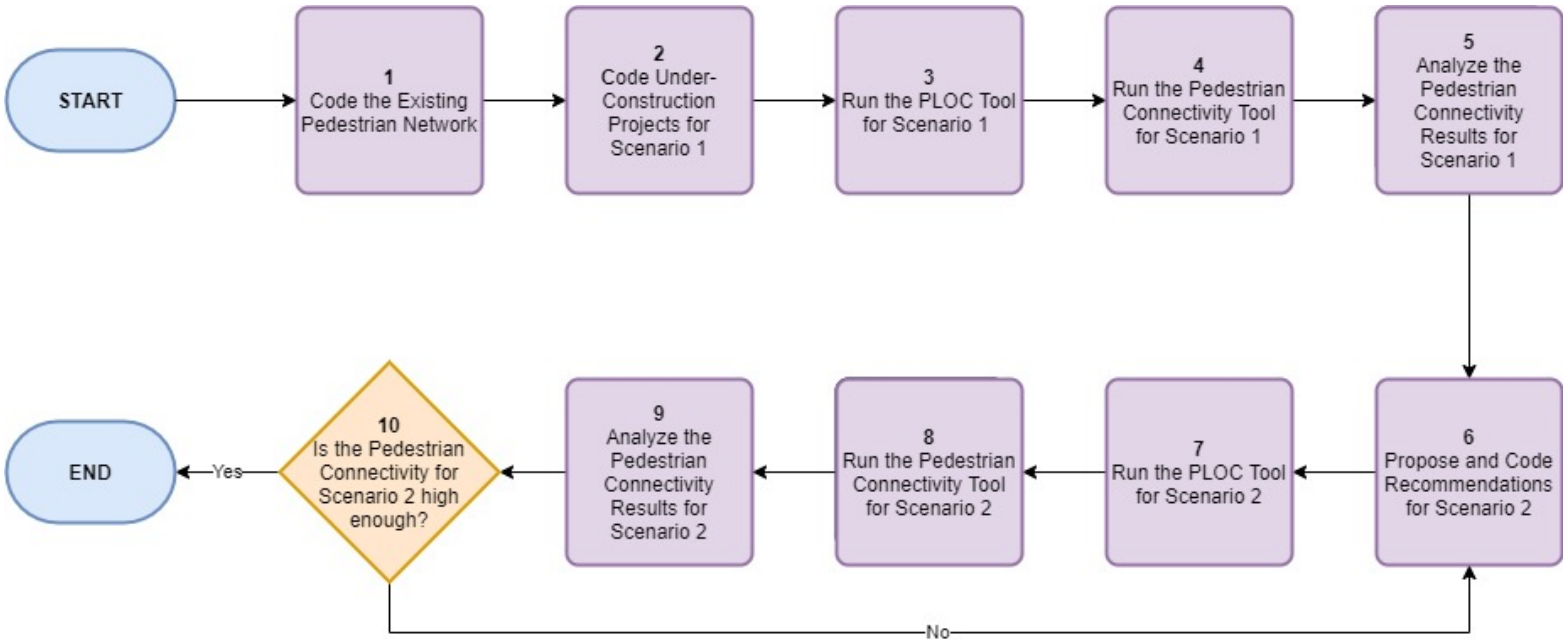
- The recommendation that stands out as the quickest and least costly to implement is reducing the posted speed limit to 25 mph within the vicinity of all Purple Line stations. This should be the rule rather than the exception and is worth exploring as a general policy.
- Finally, consistent with Master Plans from Montgomery Planning and the county, Table 2 includes higher-cost capital projects that should be prioritized for design and construction along the corridor. All of these projects are located within station areas that overlap with EEAs.

Table 2. Purple Line Priority Projects

STATION	TYPE	RECOMMENDATION	JUSTIFICATION	SOURCES
LYTTONSVILLE	**Designated Space for Walking and Bicycling**	Provide two-way separated bike lanes on the east side of Lyttonsville Pl between Brookville Rd and Lyttonsville Rd	Enhance pedestrian comfort by providing a buffer between the road and the sidewalk and improve bicycle access to the Lyttonsville Purple Line station and Capital Crescent Trail.	- Bicycle Master Plan - Greater Lyttonsville Sector Plan
WOODSIDE		Convert the northbound lane on 16th St between Colesville Rd and Georgia Ave to a two-way separated bike lane	Provide a buffer between the sidewalk and 16th Street. And improve access to the Woodside Purple Line Station.	- Bicycle Master Plan - Greater Lyttonsville Sector Plan
PINEY BRANCH ROAD		Upgrade sidewalk on north side of Piney Branch Road fronting the Long Branch Community Center and Library (public property), to have 5' wide buffers and 5' wide minimum sidewalks.	Provide a buffer between the sidewalk and Piney Branch Road. In addition, improvements are to be done along publicly owned property.	Long Branch Sector Plan
		Upgrade sidewalk on south side of Piney Branch Road fronting the Long Branch – Garland Neighborhood Park (public property), to have 5' wide buffers and 5' wide minimum sidewalks.		
		Upgrade sidewalk on east side of University Blvd along the frontage of the New Hampshire Estates Local Park (public property) to a 10' wide side path and 5' wide buffer.		
		Upgrade sidewalk on south side of Piney Branch Rd along the frontage of the New Hampshire Estates Local Park (public property) to be 5' wide with a 5' wide buffer.		
		Install two-way separated bike lanes on north side of Piney Branch Road from University Boulevard to New Hampshire Avenue.	Provide a buffer between the sidewalk and Piney Branch Road and improve bicycle connectivity to the Piney Branch Road Purple Line station and the Northwest Branch Trail (note: this extends slightly into Prince George's County).	Bicycle Master Plan

VII. Appendix

Appendix 1: Step-by Step Pedestrian Access Analysis Process



Appendix 2: List of Projects Included in Near-Future Scenario (Scenario 1)

STATION	PROJECT NAME	PROJECT TYPE
Bethesda	4915 Auburn Avenue*	Development Approval
	7272 Wisconsin Avenue*	Development Approval
	7359 Wisconsin Avenue	Development Approval
	7900 Wisconsin Avenue*	Development Approval
	8280 Wisconsin Avenue	Development Approval
	Capital Crescent Surface Trail (along Bethesda Avenue, 47th Street, and Willow Lane)	Capital Project
	Marriott	Development Approval
	Woodmont Avenue Cycle Track (from Montgomery Lane to Leland Street)	Capital Project
	ZOM*	Development Approval
	Montgomery Avenue/Montgomery Lane Separated Bike Lanes (from Woodmont Ave to Pearl St)	Capital Project
Connecticut Ave	Chevy Chase Lake (Connecticut Ave and Manor Dr)*	Development Approval
	Chevy Chase Lake Apartments (Chevy Chase Lake Dr)*	Development Approval
	Chevy Chase Lake Townhomes (Chevy Chase Lake Dr)*	Development Approval
Lyttonsville	Lyttonsville Bridge	Capital Project
Woodside	Spring Street Separated Bike Lanes Extension	Capital Project
Silver Spring Transit Center	8787 Georgia Avenue*	Development Approval
	Cameron Street to Planning Place Bikeway	Capital Project
	Elizabeth Square*	Development Approval
	Metropolitan Branch Trail (from Silver Spring Transit Center to King St)	Capital Project
	Ripley East*	Development Approval
Silver Spring Library	Sligo Artspace*	Development Approval
	Studio Plaza*	Development Approval
Long Branch	Flower Avenue	Capital Project
Bethesda to Silver Spring Transit Center	Capital Crescent Trail (from Elm Street Park to Silver Spring Transit Center)	Capital Project

STATION	PROJECT NAME	PROJECT TYPE
Silver Spring Transit Center, Silver Spring Library	Wayne Avenue/Second Avenue Separated Bike Lanes	Capital Project
All Montgomery County Stations	Purple Line Improvements	Capital Project

*Denotes project with residential component.

Appendix 3: Pedestrian Level of Comfort Methodology, Version 1.2

I. Introduction

When people walk (or when using a mobility device, roll) along pedestrian pathways, trails and roadways, they may experience varying levels of comfort. A quiet residential street with a 25-mile-per-hour speed limit, low motor vehicle traffic volumes, and pedestrian pathways separated from the road by trees creates a comfortable walking or rolling experience for most people. In contrast, a six-lane suburban highway with a 40-mile-per-hour speed limit and narrow pedestrian pathways directly adjacent to the street may be undesirable. Fewer people are likely to walk or roll in less comfortable environments, and for those who must, the experience is more uncomfortable than it might be with a different design. The Pedestrian Level of Comfort (PLOC) methodology captures how comfortable it is to walk and roll in different conditions in Montgomery County. A variety of pathway and crossing factors are considered to determine a comfort score for each crossing and pathway segment. The four main scores are: undesirable (score = 4), uncomfortable (score = 3), somewhat comfortable (score = 2), and very comfortable (score = 1). Half-point scores are also possible as certain contextual information becomes available. If an area receives a relatively poor score, changes may be needed to make it a place where more people will feel comfortable walking.

Not all factors that influence pedestrian comfort are included due to the lack of available data. However, some such factors can have outsized impacts on comfort (such as pedestrian and street lighting or the presence of a Leading Pedestrian Interval at crossings). Therefore, they are scored separately. As data for these additional factors become available, they will be integrated to provide a more complete analysis of the pathway or crossing. However, the basic PLOC score can be calculated in their absence.

"Comfort" as a concept should be thought of differently from "safety". While safety will always be the bedrock principle of the transportation system, this analysis is a tool to create a pedestrian environment in Montgomery County that is more than safe – one that is enjoyable and comfortable for people of all ages. In situations where comfort and safety may appear to diverge, safety is paramount.

There are four main scoring tables: Pathway, No Pathway (where a pedestrian must share the road with vehicle traffic), Controlled Crossing and Uncontrolled Crossing. These four tables can be found later in this document. An additional table further assesses pathways and crossings on factors related to accessibility. This accessibility evaluation serves as a separate overlay to allow independent consideration of broader factors that impact pedestrian comfort as well as ADA compliance and access for all. Similarly, an additional crossing overlay table assesses crossing characteristics, such as the presence of a Leading Pedestrian Interval and crosswalk lighting standards.

II. Pathway Factors

A "pathway" is a place designated for pedestrians such as sidewalks, shared use paths and trails. "No pathway" describes a place where a pedestrian must share the road with motor vehicles. A variety of factors influence the ultimate PLOC score for a pathway or no-pathway segment. Pathway scores consider land use, pathway width, posted speed limit, pathway buffer width, pathway condition, on-street separation and traffic volume. Since traffic volume is not universally collected in Montgomery County, roadway functional classifications—Major Highway, Arterial, Business District and Primary Residential, for example—stand in for a roadway's traffic volume in this analysis.[40] Major highways are assumed to have high traffic volume while secondary residential roads are assumed to have low traffic volume and so on. "No pathway" scores

[40] References to functional classification will be updated to reflect the street typologies in the Complete Streets Design Guide when that document is approved by County Council and the street classifications have been mapped.

consider land use, posted speed limit, traffic volume or roadway functional classification and whether curbside parking is allowed. Each factor used in the PLOC evaluation is detailed below.

Land Use

Land use, classified as "urban" and "non-urban," indicates the volume of likely pedestrian activity on a given pathway segment. Urban pathways are those within the following zones: Commercial/Residential (CR), Life Sciences Center (LSC) or their floating zone equivalents (areas designated for these purposes but with undetermined locations). Pathways within multifamily residential zones (R-10, R-20, R-30) and townhouse zones (RT) receive an "urban" designation if they are adjacent to CR, LSC or floating zones. Pathways that are not adjacent to these land uses are considered "non-urban." The "urban" versus "non-urban" designation affects the score of the pathway because pathways in urban areas are expected to be wider to accommodate more pedestrians.[41]

Pathway Width

In urban areas, wider pathways are preferred to accommodate more pedestrians and to reduce conflict and discomfort between people walking and biking. Urban pathways that are not sufficiently wide will receive a lower score and can be prioritized for improvements, such as wider shared use paths or separating walking from bicycling.[42] The functional path width is the pedestrian clear space. This excludes the furnishing (space for obstacles like utility poles and signposts) and frontage zones (area adjacent to building fronts where café seating, etc. may be located). Overall width categories are indicated below:

- **Urban score categories (best to worst)**: ≥10 feet, ≥8 feet to 10 feet, ≥5 feet to 8 feet, and <5 feet
- **Non-urban score categories (best to worst)**: ≥8 feet, ≥5 feet to 8 feet, and <5 feet

Posted Speed Limit

Posted speed limit refers to the posted speed limit of the roadway parallel to the pathway. The maximum posted speed limit scoring cutoff is 40 mph because research shows that safety outcomes (injuries and fatalities) do not vary greatly for pedestrians when struck by a vehicle traveling at speeds higher than 40 mph. Posted speed limits are a stand-in for observed vehicular travel speeds which are not widely available in Montgomery County. Posted speeds cannot typically be changed in isolation to improve the PLOC score. Additional engineering efforts will likely be required. If observed speed data are available, it can be used with Planning staff and MCDOT approval.

- **Score categories (best to worst):** <25 mph, 25 mph, 30 mph, 35 mph, and ≥40 mph

Pathway Buffer Width

[41] References to "urban" and "non-urban" will be updated to reflect the Downtown and Town Center designations identified by the Complete Streets Design Guide when that document is approved by County Council.

[42] For more detailed width determination when designing a shared use facility, bicycle and pedestrian volume data are required and the FHWA Shared Use Path Level of Service Calculator is the recommended analytical tool to use: https://www.fhwa.dot.gov/publications/research/safety/pedbike/05138/.

Pathway buffer refers to the distance between the pedestrian clear space (path width) and the curb or edge of pavement. Buffers of different widths provide varying benefits. Those between two and five feet separate moving vehicles from pedestrians which affords some amount of comfort benefit compared to no buffer at all. Having no buffer at all may force pedestrians to "shy" away from travel lanes, thereby reducing the effective width of the pathway.[43] Pathway buffers of at least five feet allow the planting of larger street trees to provide robust physical separation from traffic, shade canopy and a sense of enclosure for pedestrians.[44] [45] Vertical buffers, such as railings, guardrails or jersey barriers are scored as equivalent to a five-foot buffer. Pathway buffers exceeding eight feet may provide all the benefits afforded by a five-foot buffer plus additional physical separation from traffic.

- **Score categories (best to worst):** ≥8 feet, 5 feet to <8 feet (includes vertical buffers), 2 to <5 feet, 0 to <2 feet

[43] San Francisco Department of Public Health. 2012. "Pedestrian Environmental Quality Index: Street Auditor's Manual." San Francisco, CA.

[44] Ibid.

[45] Toole, J. 2010. Update of the AASHTO Guide for the Planning, Design, and Operation of Pedestrian Facilities. Transportation Research Board of The National Academies, National Cooperative Highway Research Program. (NCHRP 20-07/Task 263)

On-Street Buffer (Designated Parking Lane or Separated Bike Lane)

Research shows that the presence of an on-street buffer, such as a parking lane or bike lane, can increase pedestrian comfort by providing additional separation between pedestrians and moving vehicles.[46] [47] Designated parking lanes include striped parking lanes, parking between curb extensions and metered parking. On-street parking that is not identified with striping, curb extensions or parking meters is not considered designated parking as vehicles may travel in that space in the absence of parked cars. The wider the on-street separation, the larger the effect on the overall score.

- **Score categories (best to worst):** Two-way separated bike lanes or combined designated parking lane and separated bike lanes (one- or two-way), designated parking lane or one-way separated bike lane, no designated parking lane or separated bike lane

Traffic Volume or Roadway Functional Classification

Traffic volume or roadway functional classification (which may serve as a proxy for traffic volume) can influence a pathway score in two possible ways. First, pathways without buffers and no-pathway segments with lower roadway functional classifications (and presumably lower traffic volume) may score better than those with higher traffic volume.

Second, "no pathway" segments receiving an "uncomfortable" score may be improved to "somewhat comfortable" due to low traffic volume. The PLOC accounts for a "low volume" variable which is applied to Tertiary Residential streets, residential cul-de-sacs (that do not terminate in a parking lot), and connector streets that serve as redundant residential routes with assumed low traffic volumes. A pathway that is already receiving a "somewhat comfortable" or "very comfortable" ranking remains unchanged.

Parking ("No Pathway" Segments Only)

On "No Pathway" segments (roadways without sidewalks or shared use paths), on-street parking forces pedestrians to walk in the path of motor vehicles. On streets without parking, pedestrians can more easily walk curbside, away from motor vehicles. Therefore, prohibition of on-street parking on streets with low speed limits may positively impact the PLOC score.

[46] Landis, Bruce W., Vattijuti R Venkat, Russell M. Ottenberg, Douglas S. McLeod, and Martin Guttenplan. 2001. "Modeling the Roadside Walking Environment: Pedestrian Level of Service." Transportation Research Record: Journal of the Transportation Research Board.

[47] Moyano et al. 2019. "Station avenue: high speed rail's missing link. Assessing pedestrian city station routes for edge stations in Spanish small cities." Journal of Housing and the Built Environment: 175-193.

III. Crossing Factors

Crossings are scored using different metrics, depending on whether they are uncontrolled (no stop sign or traffic signal present) or controlled (stop sign or traffic signal present). Factors considered in all crossing evaluations include crossing control, presence of a channelized right turn or interstate ramp, number of lanes crossed, highest posted speed limit of the intersection, median type and crosswalk type. Only signalized crossings are affected and scored by the presence of a "No Right Turn on Red" sign.

Crossing Control

Traffic control can improve pedestrian safety and the specific controls used have varying pedestrian comfort benefits. Data providing the types of phasing at signalized intersections are currently unavailable. Therefore, crossings are characterized as controlled or uncontrolled. Controlled crossings include signalized and stop-controlled intersections (where a stop sign is present). Controlled crossings and uncontrolled crossings are scored differently. With all other factors equal, a controlled crossing is scored as more comfortable than an uncontrolled crossing.

Right Turn on Red

At signalized intersections, the presence of a "No Right Turn on Red" sign improves the final crossing score by a half point.

Channelized Right Turn or Interstate Ramp

Channelized turn lanes (separated from the main intersection by curbs or other delineators) and interstate on- and off-ramps encourage higher vehicle speeds and present unique safety challenges for pedestrian crossings—especially for people with visual disabilities.[48] The crossing of a channelized right turn lane or interstate ramp without traffic control automatically scores "undesirable" unless a raised crosswalk, vehicle-slowing geometry, or other treatments are in place that reduce speeds, improve visibility, and further mitigate conflicts between pedestrians and motor vehicles. In instances where such treatments are in place, an "uncomfortable" score is possible. Ramps and channelized right turns with signals are scored the same as one-lane signalized crossings.

Number of Lanes Crossed

[48] Schroeder, B. J., Rouphail, N. M., & Emerson, R. S. W. 2006. Exploratory Analysis of Crossing Difficulties for Blind and Sighted Pedestrians at Channelized Turn Lanes. Transportation Research Record, 1956(1): 94–102. https://doi.org/10.1177/0361198106195600112

As pedestrians cross more travel lanes to cross the street, exposure to crash risk increases and comfort decreases. [49] [50] [51] [52] The total number of lanes should be used (not lanes per direction); this variable does not change with the presence of a raised refuge island.[53]

- **Score categories (best to worst):** 1-3 lanes, 4-5 lanes, 6+ lanes

Highest Posted Speed Limit of the Intersection

The highest posted speed limit of all roads comprising an intersection is taken into account for both oncoming traffic and the speed of turning vehicles. Part of the discomfort pedestrians experience while traveling along high-speed roads is vehicles turning into their path. Even if those vehicles are turning onto a low-speed street, they can rapidly approach and be perceived as still travelling at high speed. Additionally, drivers turning left across a high-speed street onto a low-speed street may be more focused on finding a gap in traffic than on any pedestrians crossing the low-speed street. Residential crossings may benefit from traffic calming improvements, such as hardened centerlines on the perpendicular street, crossing islands, turn wedges, or curb extensions.[54] For midblock crossings, the scoring uses the posted speed limit of the road being crossed.

- **Score categories (best to worst):** <25 mph, 25 mph, 30 mph, 35 mph, and ≥40 mph.

Median Type

While raised refuge islands have the greatest crossing safety and comfort benefits, medians that do not meet the criteria for a refuge may also have pedestrian safety benefits.[55] A raised refuge island is a median of six feet to accommodate the width of a bicycle, a person using a

[49] Oregon DOT. 2018.

[50] Fitzpatrick et al. 2006. "Improving Pedestrian Safety at Unsignalized Crossings." Transit Cooperative Research Program Report 112, National Cooperative Highway Research Program Report 562.

[51] Fitzpatrick et al. 2016. Will You Stop for Me? Roadway Design and Traffic Control Device Influences on Drivers Yielding to Pedestrians in a Crosswalk with a Rectangular Rapid-Flashing Beacon. Center for Transportation Safety, Texas A&M Transportation Institute.

[52] Turner et al. 2017. Synthesis of Methods for Estimating Pedestrian and Bicyclist Exposure to Risk at Areawide Levels and on Specific Transportation Facilities. Federal Highway Administration, U.S. Department of Transportation.

[53] If available, the curb to curb (or edge of pavement to edge of pavement) width of a crossing can be used instead of the number of lanes. The crossing width translates to the number of lanes by dividing total width by 11.

[54] NYCDOT. 2016. Don't Cut Corners: Left Turn Pedestrian and Bicyclist Crash Study. http://home.nyc.gov/html/dot/downloads/pdf/left-turn-pedestrian-and-bicycle-crash-study.pdf

[55] Federal Highway Administration, U.S. Department of Transportation. 2019. Proven Safety Countermeasures. https://safety.fhwa.dot.gov/provencountermeasures/.

wheelchair or a person pushing a stroller.[56] In addition, raised medians that are narrower than six feet may have safety benefits for pedestrians compared to no median.[57] Hardened centerlines and grass medians also fall in this category as they provide physical separation between travel lanes but do not provide the full safety and comfort benefits of a raised refuge island. This variable is categorized as follows:

- **Score categories (best to worst):** Raised refuge island (raised median ≥6'); raised median <6', curbless landscaped (including grass) median of any width, or hardened centerline; painted/no median

Crosswalk Type

High-visibility crosswalks have proven pedestrian safety benefits over standard crosswalk markings.[58] [59] High-visibility crosswalk markings include continental, ladder, zebra and solid. Standard crosswalk markings include stamped concrete, standard and dashed marking patterns. Unmarked crossings have no pavement markings to denote the crosswalk.[60]

- **Score categories (best to worst):** High-visibility, standard, or unmarked

Traffic Volume

Uncontrolled crossings on roads that are designated as low volume (Tertiary Residential streets, residential cul-de-sacs that do not terminate in a parking lot, and connector streets that serve as redundant residential routes with assumed low traffic volumes) will receive an automatic score of 'somewhat comfortable' unless the uncontrolled crossing parallels a road with a speed limit >25mph or MPOHT class of primary residential or higher.

Comfort Levels

The comfort level scale allows for distinction between the lowest and highest priority projects, as well as those that still could use improvements but are not the highest priority. Half-points add further nuance when additional data are available to refine the evaluation. For example, a crossing might be upgraded from a score of 3 to 2.5 if an additional safety/comfort treatment, such as lighting or a "No Turn on Red" sign, is present.

1 = Very Comfortable

1.5 = Comfortable

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[56] Rosenbloom, Toval, and Avihu Pereg. 2012. "A within-subject design of comparison of waiting time of pedestrians before crossing three successive road crossings." Transportation Research Part F 625-634.

[57] Bahar, Geni, Maurice Masliah, Rhys Wolff, and Peter Park. 2008. Desktop Reference for Crash Reduction Factors. Washington, D.C.: Federal Highway Administration, U.S. Department of Transportation.

[58] FHWA. 2019. Proven Safety Countermeasures.

[59] Knoblauch , Richard, and Paula D Raymond. 2000. The Effect of Crosswalk Markings on Vehicle Speeds in Maryland, Virginia, and Arizona Report No. FHWA-RD-00-101. Washington, D.C.: Federal Highway Administration, U.S. Department of Transportation.

[60] Locations where crossings are legally prohibited are treated as "unmarked" for purposes of PLOC assessment.

2 = Somewhat Comfortable

2.5 = Somewhat Uncomfortable

3 = Uncomfortable

3.5 = Very Uncomfortable

4 = Undesirable

Tables A.3.1. to A.3.4 include the corresponding score to be assigned for each pathway or crossing segment based on the indicated factors.

Table A.3.1. Pedestrian Level of Comfort Score for "No Pathway" (i.e. on-street) segments

CONTEXT	MPOHT ROAD CLASSIFCIATION	PARKING ALLOWED	POSTED SPEED LIMIT				
			< 25 mph	25 mph	30 mph	35 mph	≥ 40 mph
URBAN	Any	No / Yes	4	4	4	4	4
NON-URBAN	Less than Primary Residential	No	2	3	4	4	4
		Yes	2	3	4	4	4
	Primary Residential or Greater	No	2	4	4	4	4
		Yes	3	4	4	4	4

Table A.3.2. Pedestrian Level of Comfort Score for "Pathways" (i.e. sidewalks, shared-use paths, trails, etc.)

	PATHWAY WIDTH	POSTED SPEED LIMIT	PATHWAY BUFFER WIDTH / ON-STREET SEPARATION^											
			0 ft to <2 ft			2 to <5 ft			5 to <8 ft			≥8 ft		
			No DPL or SBL	DPL or 1SBL	2SBL or DPL & SBL	No DPL or SBL	DPL or 1SBL	2SBL or DPL & SBL	No DPL or SBL	DPL or 1SBL	2SBL or DPL & SBL	No DPL or SBL	DPL or 1SBL	2SBL or DPL & SBL
URBAN	No pathway		Use "No Pathway" Table											
	< 5ft	< 25 mph	4	3	1	4	3	1	3	2	1	2	1	1
		25 mph	4	3	1	4	3	1	3	2	1	2	1	1
		30 mph	4	3	1	4	3	1	3	2	1	2	1	1
		35 mph	4	3	2	4	3	2	3	2	1	2	1	1
		>= 40 mph	4	4	3	4	3	2	3	2	2	2	1	1
	≥5 to 8 ft	< 25 mph	2	2	1	2	2	1	2	1	1	1	1	1
		25 mph	2/3*	2	1	2/3*	2	1	2	1	1	1	1	1
		30 mph	4	3	1	3	2	1	2	1	1	1	1	1
		35 mph	4	3	2	3	2	2	3	2	1	2	1	1
		>= 40 mph	4	4	3	4	3	2	3	2	2	2	1	1
	≥8 to 10 ft	< 25 mph	2	2	1	2	1	1	1	1	1	1	1	1
		25 mph	2	2	1	2	1	1	1	1	1	1	1	1
		30 mph	4	3	1	3	2	1	2	1	1	1	1	1
		35 mph	4	3	2	3	2	2	3	2	1	2	1	1
		>= 40 mph	4	4	3	4	3	2	3	2	2	2	1	1
	≥10 ft	< 25 mph	2	1	1	2	1	1	1	1	1	1	1	1
		25 mph	2	2	1	2	1	1	1	1	1	1	1	1
		30 mph	3	2	1	3	2	1	2	1	1	1	1	1
		35 mph	4	3	2	3	2	2	3	2	1	1/2♦	1	1
		>= 40 mph	4	4	3	4	3	2	3	2	2	1/2♦	1	1

	PATHWAY WIDTH	POSTED SPEED LIMIT	PATHWAY BUFFER WIDTH / ON-STREET SEPARATION^											
			0 ft to <2 ft			2 to <5 ft			5 to <8 ft			≥8 ft		
			No DPL or SBL	DPL or 1SBL	2SBL or DPL & SBL	No DPL or SBL	DPL or 1SBL	2SBL or DPL & SBL	No DPL or SBL	DPL or 1SBL	2SBL or DPL & SBL	No DPL or SBL	DPL or 1SBL	2SBL or DPL & SBL
NON-URBAN	No pathway		Use "No Pathway" Table											
	Less than 5ft	< 25 mph	2	2	1	2	1	1	2	1	1	1	1	1
		25 mph	2/3*	2	1	2	1	1	2	1	1	1	1	1
		30 mph	4	3	1	3	2	1	2	1	1	1	1	1
		35 mph	4	3	2	3	2	2	3	2	1	2	1	1
		>= 40 mph	4	4	3	4	3	2	3	2	2	2	1	1
	≥5 to 8 ft	< 25 mph	2	2	1	2	1	1	2	1	1	1	1	1
		25 mph	2/3*	2	1	2	1	1	2	1	1	1	1	1
		30 mph	4	3	1	3	2	1	2	1	1	1	1	1
		35 mph	4	3	2	3	2	2	3	2	1	2	1	1
		>= 40 mph	4	4	3	4	3	2	3	2	2	2	1	1
	≥8 ft	< 25 mph	2	1	1	2	1	1	1	1	1	1	1	1
		25 mph	2	2	1	2	1	1	1	1	1	1	1	1
		30 mph	4	3	1	3	2	1	2	1	1	1	1	1
		35 mph	4	3	2	3	2	2	3	2	1	1/2♦	1	1
		>= 40 mph	4	4	3	4	3	2	3	2	2	1/2♦	1	1

^ DPL: dedicated parking lane, 1SBL: one-way separated bike lane, 2SBL: two-way separated bike lane, SBL: one-way or two-way separated bike lane.

* If MPOHT road category is less than Primary Residential, segment score is 2; otherwise, score is 3.

♦If pathway buffer width is 15 feet or greater, segment score is 1; otherwise, score is 2.

Table A.3.3. Pedestrian Level of Comfort Score for "Controlled Crossings" (signalized or stop-controlled)

# OF LANES	MEDIAN TYPE	CROSSWALK TYPE	POSTED SPEED LIMIT				
			< 25 mph	25 mph	30 mph	35 mph	>= 40
2 to 3	Raised Refuge Island	High Visibility	1	1	1	2	2
		Marked	1	1	2	2	2
		Unmarked	1	1	3	3	4
	Raised/Hardened Centerline	High Visibility	1	1	2	2	3
		Marked	1	1	2	2	3
		Unmarked	1	2	3	4	4
	Painted/None	High Visibility	1	1	2	3	3
		Marked	1	1	2	3	3
		Unmarked	1	2	3	4	4
4 to 5	Raised Refuge Island	High Visibility	1	1	2	3	3
		Marked	1	1	2	3	3
		Unmarked	1	3	3	4	4
	Raised/Hardened Centerline	High Visibility	2	2	2	3	3
		Marked	2	2	3	3	4
		Unmarked	2	3	4	4	4
	Painted/None	High Visibility	2	2	2	3	3
		Marked	3	3	3	3	4
		Unmarked	4	4	4	4	4
6 +	Raised Refuge Island	High Visibility	2	2	2	3	3
		Marked	3	3	3	3	3
		Unmarked	4	4	4	4	4
	Raised/Hardened Centerline	High Visibility	2	2	2	3	4
		Marked	3	3	3	4	4
		Unmarked	4	4	4	4	4
	Painted/None	High Visibility	2	3	3	3	4
		Marked	3	3	3	4	4
		Unmarked	4	4	4	4	4

Table A.3.4. Pedestrian Level of Comfort Score for "Uncontrolled Crossings"

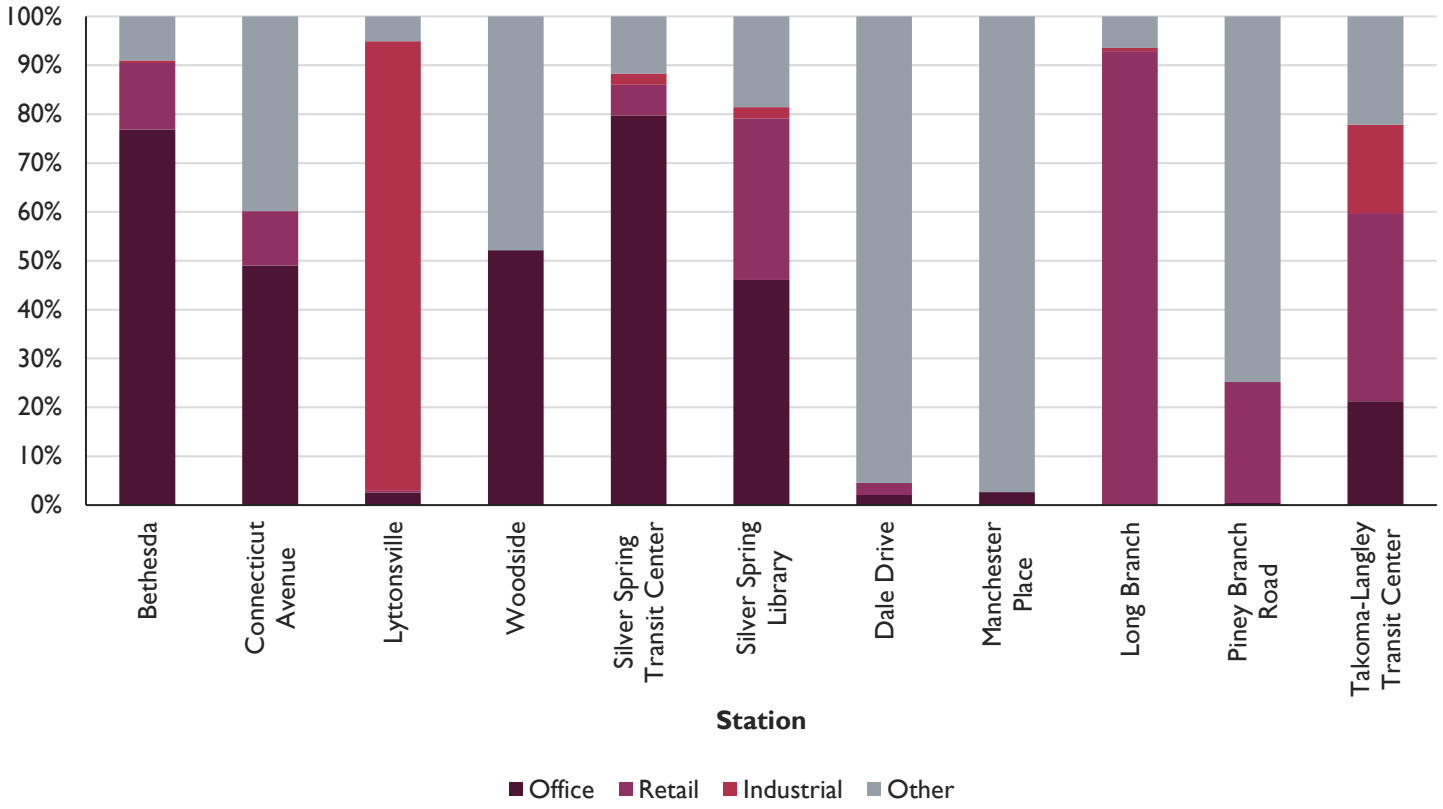
# OF LANES	MEDIAN TYPE	CROSSWALK TYPE	POSTED SPEED LIMIT				
			< 25 mph	25 mph	30 mph	35 mph	>= 40
2 to 3	Raised Refuge Island	High Visibility	1	1	2	3	4
		Marked	1	1	3	3	4
		Unmarked	2	2	4	4	4
	Raised/Hardened Centerline	High Visibility	1	1	2	3	4
		Marked	1	2	3	3	4
		Unmarked	2	2	4	4	4
	Painted/None	High Visibility	1	2	2	3	4
		Marked	1	2	3	3	4
		Unmarked	2	3	4	4	4
4 to 5	Raised Refuge Island	High Visibility	1	2	2	3	4
		Marked	1	2	2	3	4
		Unmarked	2	3	4	4	4
	Raised/Hardened Centerline	High Visibility	2	2	3	4	4
		Marked	3	3	3	4	4
		Unmarked	4	4	4	4	4
	Painted/None	High Visibility	4	4	4	4	4
		Marked	4	4	4	4	4
		Unmarked	4	4	4	4	4
6+	Raised Refuge Island	High Visibility	3	3	3	4	4
		Marked	3	3	3	4	4
		Unmarked	4	4	4	4	4
	Raised/Hardened Centerline	High Visibility	3	3	4	4	4
		Marked	3	3	4	4	4
		Unmarked	4	4	4	4	4
	Painted/None	High Visibility	4	4	4	4	4
		Marked	4	4	4	4	4
		Unmarked	4	4	4	4	4

Appendix 4: List of Station-Area Recommendations with Master or Sector Plan Source

STATION	#	RECOMMENDATION	MASTER / SECTOR PLAN SOURCE
Bethesda	1	Reduce posted speed limit on Woodmont Ave between Wisconsin Ave (North) and Wisconsin Ave (South) from 30 to 25 mph	Bethesda Downtown Plan
	2	Reduce posted speed limit on Battery Ln between Old Georgetown Rd and Wisconsin Ave from 30 to 25 mph	Bethesda Downtown Plan
	3	Reduce posted speed limit on Arlington Rd between Old Georgetown Rd and Bradley Blvd from 30 to 25 mph	Bethesda Downtown Plan
	4	Reduce posted speed limit on Montgomery Ln between Woodmont Ave and Wisconsin Ave from 30 to 25 mph	Bethesda Downtown Plan
	11	Improve the sidewalk on the north side of Bradley Blvd from Arlington Rd to Wellington Dr to be at least 5' wide with a 5' wide buffer.	Bethesda Downtown Plan Street Design Guidelines (p 220)
Connecticut Ave	3	Reduce posted speed limit on Manor Rd between Connecticut Ave and Jones Bridge Rd from 30 to 25 mph	Chevy Chase Lake Sector Plan (p 39)
	9	Investigate a signalized crossing with high visibility crosswalks at Connecticut Ave and Laird Pl or Newdale Rd	Chevy Chase Lake Sector Plan (p 41)
	10	Improve east sidewalk of Connecticut Ave between Chevy Chase Lake Dr and Dunlop St to be 5' wide with a 5' wide buffer	Chevy Chase Lake Sector Plan (p 43)
	11	Improve east sidewalk of Connecticut Ave between Jones Bridge Rd and Manor Rd to be a sidepath with a 6' wide buffer	Chevy Chase Lake Sector Plan (p 43)
Lyttonsville	1	Reduce posted speed limit on Brookville Rd between the bus depot and the CSX tracks from 30 to 25 mph	Greater Lyttonsville Sector Plan (p 46)
	6	Provide two-way separated bike lanes on the east side of Lyttonsville Pl between Brookville Rd and Lyttonsville Rd	Greater Lyttonsville Sector Plan (p 51,55)
Woodside	2	Reduce posted speed limit on 16th St between the CSX tracks and the District of Columbia from 35 to 25 mph	Greater Lyttonsville Sector Plan (p 46)
	6	Provide a HAWK signal on 16th St between the Woodside Station and Summit Hills apartments	Greater Lyttonsville Sector Plan (p 57)
	9	Convert the northbound lane on 16th St between Colesville Rd and Georgia Ave to a two-way separated bike lane	Greater Lyttonsville Sector Plan (p 41,55)

STATION	#	RECOMMENDATION	MASTER / SECTOR PLAN SOURCE
Silver Spring Library	5	Support the Grove St Neighborhood Greenway	Bicycle Master Plan (p 323)
Long Branch	1	Reduce posted speed limit on Flower Ave between Wayne Ave and Piney Branch Rd from 30 to 25 mph	Long Branch Sector Plan (p 42)
	7	Provide one-way separated bike lanes on both sides of Flower Ave between Arliss St and Piney Branch Rd	Bicycle Master Plan (p 279)
Piney Branch Road	8	Upgrade sidewalk on north side of Piney Branch Rd fronting the Long Branch Community Center and Library (public property), to have 5' wide buffers and 5' wide minimum sidewalks	Long Branch Sector Plan (p 47)
	9	Upgrade sidewalk on south side of Piney Branch Rd fronting the Long Branch – Garland Neighborhood Park (public property), to have 5' wide buffers and 5' wide minimum sidewalks	Long Branch Sector Plan (p 47)
	10	Install two-way separated bike lanes on north side of Piney Branch Rd from University Blvd to New Hampshire Avenue	Bicycle Master Plan (p 279)
	11	Upgrade sidewalk on east side of University Blvd along the frontage of the New Hampshire Estates Local Park (public property) to a 10' wide side path and 5' wide buffer	Long Branch Sector Plan (p 55)
	12	Upgrade sidewalk on south side of Piney Branch Rd along the frontage of the New Hampshire Estates Local Park (public property) to be 5' wide with a 5' wide buffer	Long Branch Sector Plan (p 47)
Takoma-Langley Transit Center	12	Explore alternatives to remove the channelized right turn at the northwest corner of University Blvd and New Hampshire Ave	Takoma Langley Crossroads Sector Plan (p 41)
	13	Provide a 5' wide sidewalk with a 5' wide buffer on the east side of New Hampshire between University Blvd and Erskine St	Takoma Langley Crossroads Sector Plan (p 38)
	14	Construct the "New Ave Bikeway", a two-way, separated bike lane on west side of New Hampshire from University Blvd to Sligo Creek Pkwy	Bicycle Master Plan (p 333)

Appendix 5: Office/Retail/Industrial/Other[61] (Non-Residential) Use Split across Station Areas



[61] "Other" includes non-commercial property aside from office, retail or industrial, such as warehouses and some institutional or community facilities.

Appendix 6: Pedestrian Connectivity Analysis Results for Half-Mile Walkshed Around Purple Line Stations

Conditions at Purple Line Opening, with Short-Term Recommendations, and with All Recommendations (Half-Mile Walkshed)

STATION	CONDITIONS AT PURPLE LINE OPENING (Scenario 1)			CONDITIONS WITH SHORT-TERM RECOMMENDATIONS (Scenario 2)				CONDITIONS WITH ALL RECOMMENDATIONS (Scenario 3)			
	Resid. trips comfortable miles (A)	Resid. trips total miles (B)	Pedestrian Connectivity (C=A/B)	Resid. trips comfortable miles (D)	Resid. trips total miles (E)	Pedestrian Connectivity (F=D/E)	Increase in Pedestrian Connectivity vs Scenario 1 (F-C)	Resid. trips comfortable miles (G)	Resid. trips total miles (H)	Pedestrian Connectivity (I=G/H)	Increase in Pedestrian Connectivity vs Scenario 2 (I-F)
Bethesda	1,002	1,280	**78%**	1,014	1,280	**79%**	**1%**	1,044	1,281	**81%**	**2%**
Connecticut Avenue	157	234	**67%**	199	234	**85%**	**18%**	222	236	**94%**	**9%**
Lyttonsville*	177	209	**85%**	177	209	**85%**	**0%**	193	209	**93%**	**8%**
Woodside*	115	744	**15%**	145	744	**19%**	**4%**	429	744	**58%**	**38%**
Silver Spring Transit Center*	1,680	1,926	**87%**	1,738	1,926	**90%**	**3%**	1,758	1,926	**91%**	**1%**
Silver Spring Library*	537	611	**88%**	552	611	**90%**	**3%**	552	611	**90%**	**0%**
Dale Drive	116	278	**42%**	129	278	**47%**	**5%**	143	278	**51%**	**5%**
Manchester Place*	263	413	**64%**	265	413	**64%**	**0%**	275	414	**66%**	**2%**
Long Branch*	176	356	**49%**	201	356	**56%**	**7%**	201	356	**56%**	**0%**
Piney Branch Road*	135	670	**20%**	262	670	**39%**	**19%**	375	670	**56%**	**17%**
Takoma-Langley Transit Center*	83	395	**21%**	248	395	**63%**	**42%**	332	401	**83%**	**20%**
PURPLE LINE CORRIDOR	**4,440**	**7,116**	**62%**	**4,930**	**7,116**	**69%**	**7%**	**5,524**	**7,126**	**78%**	**8%**

* Part of this station's walkshed is within an Equity Emphasis Area (EEA)

Appendix 7: Pedestrian Connectivity Analysis Results for One-Mile Walkshed Around Purple Line Stations

Conditions at Purple Line Opening, with Short-Term Recommendations, and with All Recommendations (One-Mile Walkshed)

STATION	CONDITIONS AT PURPLE LINE OPENING (Scenario 1)			CONDITIONS WITH SHORT-TERM RECOMMENDATIONS (Scenario 2)				CONDITIONS WITH ALL RECOMMENDATIONS (Scenario 3)			
	Resid. trips comfortable miles (A)	Resid. trips total miles (B)	Pedestrian Connectivity (C=A/B)	Resid. trips comfortable miles (D)	Resid. trips total miles (E)	Pedestrian Connectivity (F=D/E)	Increase in Pedestrian Connectivity vs Scenario 1 (F-C)	Resid. trips comfortable miles (G)	Resid. trips total miles (H)	Pedestrian Connectivity (I=G/H)	Increase in Pedestrian Connectivity vs Scenario 2 (I-F)
Bethesda	4,906	6,356	**77%**	5,011	6,356	**79%**	**2%**	5,050	6,357	**79%**	**1%**
Connecticut Avenue	773	1,306	**59%**	906	1,306	**69%**	**10%**	1,060	1,308	**81%**	**12%**
Lyttonsville*	1,444	1,999	**72%**	1,477	1,999	**74%**	**2%**	1,562	1,999	**78%**	**4%**
Woodside*	397	1,366	**29%**	460	1,366	**34%**	**5%**	850	1,366	**62%**	**29%**
Silver Spring Transit Center*	2,531	2,883	**88%**	2,610	2,883	**91%**	**3%**	2,644	2,883	**92%**	**1%**
Silver Spring Library*	1,398	1,719	**81%**	1,442	1,719	**84%**	**3%**	1,442	1,719	**84%**	**0%**
Dale Drive	237	603	**39%**	266	603	**44%**	**5%**	297	603	**49%**	**5%**
Manchester Place*	626	1,340	**47%**	628	1,340	**47%**	**0%**	682	1,342	**51%**	**4%**
Long Branch*	561	1,295	**43%**	620	1,295	**48%**	**5%**	620	1,295	**48%**	**0%**
Piney Branch Road*	291	1,383	**21%**	472	1,383	**34%**	**13%**	723	1,382	**52%**	**18%**
Takoma-Langley Transit Center*	292	980	**30%**	540	980	**55%**	**25%**	715	984	**73%**	**18%**
PURPLE LINE CORRIDOR	**13,455**	**21,230**	**63%**	**14,433**	**21,230**	**68%**	**5%**	**15,644**	**21,239**	**74%**	**6%**

* Part of this station's walkshed is within an Equity Emphasis Area (EEA)