COMFORTABLE CONNECTIVITY

MONTGOMERY COUNTY'S
PEDESTRIAN PLAN

Montgomery Planning

Introduction

This appendix describes the Pedestrian Level of Comfort (PLOC) comfortable connectivity approach and provides tables and maps that illustrate comfortable pedestrian connectivity to specific community destinations (parks, recreation centers, libraries, and transit stations) and public schools. The first section describes the approach used for parks, recreation centers, libraries, and transit centers. The second section uses a modified approach for connectivity to public schools. The connectivity analysis approach for community destinations and transit stations is provided below. The introduction to the public school comfortable connectivity section details the school-specific approach used.

Comfortable Connectivity to Community Destinations

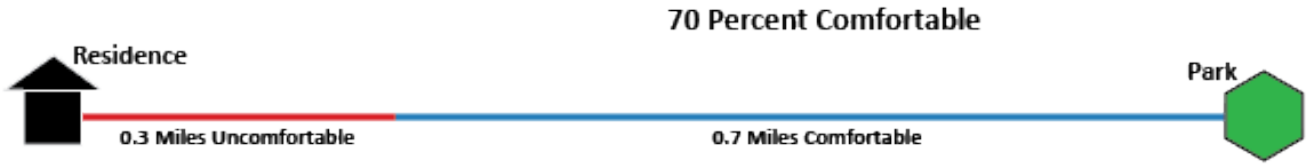
Comfortable pedestrian connectivity to each park, library, recreation center, and transit station in the county was evaluated by measuring how comfortable it is to walk to the public facility from residences within a one-mile walkshed. The shortest-path pedestrian "network" distance was used to define the walkshed, rather than an "as-the-crow-flies" distance, to better approximate the realities of pedestrian access to these facilities. The total distance of all these trips forms the denominator of the respective comfortable pedestrian connectivity equations (pathways and crossings). The numerator of those is equations is the total distance traveling to the specific destination along very comfortable or somewhat comfortable links only. Figure 1 shows the pathway comfort equation.

Figure 1: Pathway Comfortable Connectivity

$$comfortable\ pathway\ connectivity\ to\ destination = \frac{total\ comfortable\ distance\ of\ all\ residential\ trips\ along\ pathways\ to\ the\ destination}{total\ distance\ of\ all\ residential\ trips\ along\ pathways\ to\ the\ destination}$$

Figure 2 illustrates this concept. Where 0.7 miles of a one-mile trip from a residence to a park is comfortable, the comfortable pathway connectivity is 70 percent.

Figure 2: Pathway Connectivity Example



More than one residence is making a pedestrian trip to each park, and they aren't all exactly one mile, so all of the comfortable distances for all of the residences are summed and divided by all of the total distances traveled for all of the residences to provide the appropriate connectivity score.

Park Access

Park Comfortable Connectivity Tables

The tables that follow identify these connectivity scores for both pathways and crossings, break out the scores by whether the residence was in an Equity Focus Area (EFA), and indicate how many residences are within a specific park's one-mile walkshed. The connectivity scores of parks with walksheds that extend into Rockville or Gaithersburg (denoted with an asterisk) are inflated because the pedestrian network in those jurisdictions was assumed to be comfortable when that may not be the case.

Table 1: Park Comfortable Connectivity

Name	Overall			EFA			Non-EFA		
	Pathways	Crossings	Residences within Walkshed	Pathways	Crossings	Residences within Walkshed	Pathways	Crossings	Residences within Walkshed
Black Hill Regional	89%	24%	3,059	N/A	N/A	N/A	89%	24%	3,059
Cabin John Regional	46%	27%	2,854	74%	9%	1,312	34%	34%	1,542
Damascus Recreational	74%	72%	913	N/A	N/A	N/A	74%	72%	913
Fairland Recreational	94%	33%	2,971	94%	39%	2,414	93%	22%	557
Laytonia Recreational	37%	4%	1,173	28%	4%	848	64%	4%	325
Little Bennett Regional	58%	0%	46	N/A	N/A	N/A	58%	0%	46
MLK Jr. Recreational	47%	56%	1,670	N/A	N/A	N/A	47%	56%	1,670
Northwest Branch Recreational	17%	48%	1,027	45%	61%	241	2%	16%	786
Olney Manor Recreational	74%	32%	655	N/A	N/A	N/A	74%	32%	655
Ovid Hazen Wells Recreational	71%	45%	3,048	N/A	N/A	N/A	71%	45%	3,048
Ridge Road Recreational	37%	10%	2,503	7%	11%	36	38%	10%	2,467
Rock Creek Regional	48%	45%	399	N/A	N/A	N/A	48%	45%	399
South Germantown Recreational	82%	12%	1,548	N/A	N/A	N/A	82%	12%	1,548
Wheaton Regional	89%	49%	7,553	92%	39%	4,875	85%	77%	2,678
Weighted Average	**71%**	**34%**	**2,101**	**83%**	**34%**	**1,621**	**66%**	**34%**	**1,404**

Library Access

Library Comfortable Connectivity Tables

The tables that follow provide connectivity scores for pathways and crossings, break out the scores by whether the residence was in an Equity Focus Area (EFA), and indicate how many residences are within a specific library's one-mile walkshed. The connectivity scores of libraries with walksheds that extend into Rockville or Gaithersburg are inflated because the pedestrian network in those jurisdictions was assumed to be comfortable when that may not be the case. Libraries located in Rockville, Gaithersburg, and Poolesville were not included in this analysis because they are outside the purview of Montgomery Planning. The connectivity scores of libraries with walksheds that extend into Rockville or Gaithersburg (denoted with an asterisk) are inflated because the pedestrian network in those jurisdictions was assumed to be comfortable when that may not be the case.

Table 2: Library Comfortable Connectivity

Name	Overall			EFA			Non-EFA		
	Pathways	Crossings	Residences within Walkshed	Pathways	Crossings	Residences within Walkshed	Pathways	Crossings	Residences within Walkshed
Aspen Hill	99%	91%	3,300	100%	90%	1,673	99%	92%	1,627
Bethesda	91%	85%	12,144	N/A	N/A	N/A	91%	85%	12,144
Chevy Chase	57%	41%	3,093	N/A	N/A	N/A	57%	41%	3,093
Damascus	59%	20%	860	N/A	N/A	N/A	59%	20%	860
Davis/Special Needs	75%	66%	2,344	N/A	N/A	N/A	75%	66%	2,344
Fairland	48%	15%	714	38%	0%	15	48%	16%	699
Gaithersburg	65%	16%	5,641	43%	12%	3,491	83%	25%	2,150
Germantown	82%	26%	6,917	79%	17%	1,544	82%	29%	5,373
Kensington Park	77%	81%	2,126	N/A	N/A	N/A	77%	81%	2,126
Little Falls	58%	24%	3,572	N/A	N/A	N/A	58%	24%	3,572
Long Branch	69%	58%	7,525	66%	51%	5,396	75%	80%	2,129
Noyes Children's Center	63%	72%	2,124	N/A	N/A	N/A	63%	72%	2,124
Olney	63%	65%	2,913	N/A	N/A	N/A	63%	65%	2,913
Potomac	47%	18%	772	N/A	N/A	N/A	47%	18%	772
Quince Orchard*	71%	34%	2,413	N/A	N/A	N/A	71%	34%	2,413
Silver Spring	96%	93%	15,182	99%	93%	5,895	95%	93%	9,287
Wheaton	93%	62%	5,630	93%	59%	4,055	90%	72%	1,575
White Oak	26%	25%	2,408	22%	31%	710	28%	21%	1,698
Weighted Average	**77%**	**62%**	**4,427**	**77%**	**55%**	**2,847**	**77%**	**66%**	**3,161**

Recreation Center Access

Recreation Center Comfortable Connectivity Tables

The tables that follow provide connectivity scores for pathways and crossings, break out the scores by whether the residence was in an Equity Focus Area (EFA), and indicate how many residences are within a specific recreation center's one-mile walkshed. If a residence could access multiple recreation centers within a one-mile walk, only access to the closest recreation center was scored.

The connectivity scores of recreation centers with walksheds that extend into Rockville or Gaithersburg are inflated because the pedestrian network in those jurisdictions was assumed to be comfortable when that may not be the case. Recreation centers located in Rockville, Gaithersburg, and Poolesville were not included in this analysis because they are outside the purview of Montgomery Planning. The connectivity scores of recreation centers with walksheds that extend into Rockville or Gaithersburg (denoted with an asterisk) are inflated because the pedestrian network in those jurisdictions was assumed to be comfortable when that may not be the case.

Table 3: Recreation Center Comfortable Connectivity

Name	Overall			EFA			Non-EFA		
	Pathways	Crossings	Residences within Walkshed	Pathways	Crossings	Residences within Walkshed	Pathways	Crossings	Residences within Walkshed
Bauer Drive Recreation Center*	79%	68%	1,906	94%	79%	31	78%	68%	1,875
Clara Barton Recreation Center	78%	88%	947	N/A	N/A	N/A	78%	88%	947
Damascus Community Recreation Center	65%	41%	873	N/A	N/A	N/A	65%	41%	873
East County Community Recreation Center	94%	20%	4,056	94%	20%	4,050	52%	0%	6
Germantown Recreation Center	53%	47%	2,966	N/A	N/A	N/A	53%	47%	2,966
Good Hope Neighborhood Recreation Center	55%	96%	1,019	N/A	N/A	N/A	55%	96%	1,019
Gwendolyn E. Coffield Recreation Center	81%	79%	4,217	N/A	N/A	N/A	81%	79%	4,217
Heffner Park Community Center	83%	71%	2,511	96%	95%	751	75%	54%	1,760
Jane E. Lawton Center	92%	90%	8,484	N/A	N/A	N/A	92%	90%	8,484

Name	Overall			EFA			Non-EFA		
	Pathways	Crossings	Residences within Walkshed	Pathways	Crossings	Residences within Walkshed	Pathways	Crossings	Residences within Walkshed
Lake Marion Community Center	41%	53%	1,710	N/A	N/A	N/A	41%	53%	1,710
Leonard D. Jackson Ken Gar Center	84%	81%	2,704	92%	100%	6	84%	81%	2,698
Long Branch Community Recreation Center	71%	57%	6,736	67%	52%	5,435	84%	83%	1,301
Longwood Community Recreation Center	75%	59%	823	N/A	N/A	N/A	75%	59%	823
Marilyn J. Praisner Community Recreation Center	47%	11%	785	48%	7%	39	47%	12%	746
Mid County Community Center	69%	22%	1,616	75%	25%	1,414	84%	83%	202
North Creek Community Center	83%	40%	610	83%	40%	609	90%	47%	1
North Potomac Recreation Center	97%	41%	1,289	N/A	N/A	N/A	97%	41%	1,289
Plum Gar Neighborhood Recreation Center	77%	40%	3,232	77%	40%	3,232	N/A	N/A	N/A
Potomac Community Recreation Center	37%	58%	1,022	N/A	N/A	N/A	37%	58%	1,022
Ross Boddy Recreation Center	3%	0%	179	N/A	N/A	N/A	3%	0%	179
Scotland Neighborhood Recreation Center	47%	49%	1,079	N/A	N/A	N/A	47%	49%	1,079
Stedwick Community Center	88%	39%	2,135	82%	0%	5	88%	39%	2,130
Takoma Park Community Center	96%	90%	3,790	N/A	N/A	N/A	96%	90%	3,790
Takoma Park Recreation Center	82%	32%	2,061	88%	50%	224	81%	28%	1,837

Name	Overall			EFA			Non-EFA		
	Pathways	Crossings	Residences within Walkshed	Pathways	Crossings	Residences within Walkshed	Pathways	Crossings	Residences within Walkshed
Upper County Neighborhood Recreation Center	79%	23%	3,646	76%	42%	887	79%	20%	2,759
Wheaton Neighborhood Recreation Center	92%	64%	5,913	92%	62%	4,485	93%	74%	1,428
Whetstone Community Center	57%	10%	2,473	40%	22%	475	62%	6%	1,998
White Oak Community Recreation Center	87%	64%	2,855	87%	64%	2,855	N/A	N/A	N/A
Wisconsin Place Community Center	85%	90%	5,512	N/A	N/A	N/A	85%	90%	5,512
Weighted Average	**79%**	**62%**	**2,660**	**82%**	**49%**	**1,633**	**77%**	**68%**	**1,950**

Transit Station Access

Transit Station Comfortable Connectivity Tables

The tables that follow provide connectivity scores for pathways and crossings, break out the scores by whether the residence was in an Equity Focus Area (EFA), and indicate how many residences are within a specific transit station's one-mile walkshed. If a residence could access multiple transit stations on the same route within a one-mile walk, only access to the closest transit station was scored. The stations for each transit route are in their own table.

Transit stations located in Rockville and Gaithersburg were not included in this analysis because they are outside the purview of Montgomery Planning. The connectivity scores of transit stations with walksheds that extend into Rockville or Gaithersburg (denoted with an asterisk) are inflated because the pedestrian network in those jurisdictions was assumed to be comfortable when that may not be the case.

Table 4: MARC Station Comfortable Connectivity

Name	Overall			EFA			Non-EFA		
	Pathways	Crossings	Residences within Walkshed	Pathways	Crossings	Residences within Walkshed	Pathways	Crossings	Residences within Walkshed
Barnesville	0%	0%	75	N/A	N/A	N/A	0%	0%	75
Boyds	5%	0%	101	N/A	N/A	N/A	5%	0%	101
Dickerson	0%	0%	98	N/A	N/A	N/A	0%	0%	98
Garrett Park	95%	92%	3,095	87%	89%	1,046	99%	93%	2,049
Germantown	85%	42%	5,683	93%	45%	1,507	83%	41%	4,176
Kensington	63%	73%	3,602	88%	72%	48	62%	73%	3,554
Silver Spring	93%	87%	15,393	98%	97%	5,895	91%	83%	9,498
Washington Grove*	48%	71%	1,132	36%	75%	665	66%	61%	467
Weighted Average	**84%**	**72%**	**3,647**	**88%**	**79%**	**1,832**	**83%**	**69%**	**2,502**

Table 5: WMATA Station Comfortable Connectivity

Name	Overall			EFA			Non-EFA		
	Pathways	Crossings	Residences within Walkshed	Pathways	Crossings	Residences within Walkshed	Pathways	Crossings	Residences within Walkshed
Bethesda	90%	83%	11,112	N/A	N/A	N/A	90%	83%	11,112
Forest Glen	80%	69%	3,339	N/A	N/A	N/A	77%	63%	3,339
Friendship Heights	88%	86%	5,387	N/A	N/A	N/A	87%	77%	5,387
Glenmont	86%	41%	5,225	89%	53%	5,225	N/A	N/A	N/A
Grosvenor-Strathmore	94%	66%	5,521	N/A	N/A	N/A	83%	53%	5,564

Name	Overall			EFA			Non-EFA		
	Pathways	Crossings	Residences within Walkshed	Pathways	Crossings	Residences within Walkshed	Pathways	Crossings	Residences within Walkshed
Medical Center	66%	21%	2,645	N/A	N/A	N/A	64%	21%	2,645
Shady Grove*	89%	59%	4,424	100%	100%	417	87%	54%	4,007
Silver Spring	87%	78%	15,899	92%	99%	5,895	86%	89%	10,004
Takoma	96%	99%	3,244	N/A	N/A	N/A	95%	98%	3,249
Wheaton	81%	56%	6,566	78%	59%	2,688	81%	51%	3,878
White Flint	70%	51%	6,513	N/A	N/A	N/A	70%	67%	3,491
Weighted Average	**86%**	**66%**	**6,352**	**88%**	**59%**	**3,556**	**85%**	**68%**	**5,268**

Table 6: Purple Line Station Comfortable Connectivity

Name	Overall			EFA			Non-EFA		
	Pathways	Crossings	Residences within Walkshed	Pathways	Crossings	Residences within Walkshed	Pathways	Crossings	Residences within Walkshed
Bethesda	90%	92%	12,506	N/A	N/A	N/A	90%	92%	12,506
Connecticut Avenue	60%	31%	2,380	N/A	N/A	N/A	60%	31%	2,380
Dale Drive	69%	82%	1,479	N/A	N/A	N/A	69%	82%	1,479
Long Branch	68%	60%	2,158	69%	60%	2,133	35%	62%	25
Lyttonsville†	0%	0%	0	N/A	N/A	N/A	0%	0%	0
Manchester Place	72%	81%	3,126	84%	55%	1,050	69%	87%	2,076
Piney Branch Road	36%	36%	3,043	37%	39%	2,788	21%	9%	255
Silver Spring Library	95%	87%	4,949	100%	85%	1,642	94%	87%	3,347
Silver Spring Transit Center	92%	86%	9,991	99%	99%	4,253	89%	79%	5,658
Takoma/ Langley Transit Center	64%	36%	1,903	81%	45%	368	60%	33%	1,535
Woodside	53%	33%	1,630	N/A	N/A	N/A	53%	33%	1,630
Weighted Average	**79%**	**79%**	**3,924**	**73%**	**73%**	**2,039**	**81%**	**80%**	**2,808**

† The Lyttonsville Station will be accessible using the Capital Crescent Trail when the Purple Line opens, but it is not currently accessible.

Comfortable Connectivity to Public Schools

Comfortable connectivity to public schools was evaluated the same as other public facilities with two modifications. First, rather than a standard one-mile distance, the walkshed was defined by the specific school's attendance boundary and the Montgomery County Public Schools walking distance for that type of school (elementary, middle, and high schools). The elementary school distance is one mile. The middle school distance is one and a half miles. The high school distance is two miles. Second, because it is not reasonable to expect or encourage school-aged children to walk along undesirable pathways or crossings, trips requiring travel along such a segment were not included in the numerator of the school-comfort equations. So, if 75 percent of a residential trip to school was along comfortable segments, but 25 percent was along undesirable segments, that total trip distance would count for the denominator, but the comfortable (25 percent) distance would not be included in the numerator. Figure 3 shows the school-pathway comfort equation.

Figure 3: Pathway Comfortable Connectivity for School Access

$$comfortable\ pathway\ connectivity\ to\ a\ school = \frac{total\ comfortable\ distance\ of\ all\ residential\ trips\ along\ pathways\ to\ the\ school\ (without\ any\ travel\ along\ undesirable\ segments)}{total\ distance\ of\ all\ residential\ trips\ along\ pathways\ to\ the\ school}$$

Public School Access

Public School Comfortable Connectivity Tables

The tables that follow provide connectivity scores for pathways and crossings, indicate how many total residences can access the school within the prescribed walkshed, and what percentage of those residences can do so without using an undesirable PLOC segment.

Schools located in Rockville, Gaithersburg, and Poolesville were not included in this analysis because they are outside the purview of Montgomery Planning. The connectivity scores of schools with walksheds that extend into Rockville or Gaithersburg (denoted with an asterisk) are inflated because the pedestrian network in those jurisdictions was assumed to be comfortable when that may not be the case.

Table 7: Elementary School Comfortable Connectivity

Name	Segments	Crossings	Total Residences within Walkshed	Accessible Residence Percentage
Arcola	76%	67%	3,141	84%
Ashburton	18%	13%	2,130	40%
Bannockburn	45%	67%	772	88%
Barnsley	77%	67%	1,302	87%

Name	Segments	Crossings	Total Residences within Walkshed	Accessible Residence Percentage
Bel Pre	40%	71%	955	76%
Bells Mill	35%	34%	2,059	69%
Belmont	17%	46%	515	46%
Bethesda	17%	16%	10,552	25%
Beverly Farms	49%	30%	1,457	86%
Bradley Hills	25%	41%	1,589	63%
Brooke Grove	40%	8%	1,734	62%
Brookhaven	82%	67%	890	87%
Burning Tree	37%	67%	970	80%
Burnt Mills	17%	14%	2,166	36%
Burtonsville	0%	0%	417	0%
Candlewood	43%	67%	383	82%
Cannon Road	22%	40%	1,169	63%
Carderock Springs	5%	34%	626	69%
Cashell	3%	4%	1,139	8%
Cedar Grove	0%	0%	70	0%
Chevy Chase	31%	30%	2,472	42%
Clarksburg	1%	0%	399	5%
Clearspring	46%	50%	438	71%
Clopper Mill	20%	23%	1,062	78%
Cloverly	8%	4%	414	21%
Cold Spring	2%	1%	913	19%
Cresthaven	47%	39%	1,101	68%
Daly	50%	52%	1,850	56%
Damascus	0%	0%	423	0%
Darnestown	0%	0%	343	3%
Drew	44%	49%	599	82%
DuFief	7%	28%	1,028	35%
East Silver Spring	30%	17%	3,267	48%
Fairland	6%	4%	552	25%
Farmland*	15%	22%	1,082	51%
Flora M. Singer	46%	40%	2,168	69%

Name	Segments	Crossings	Total Residences within Walkshed	Accessible Residence Percentage
Flower Hill	68%	18%	1,919	86%
Flower Valley	21%	29%	961	45%
Forest Knolls	49%	32%	1,845	61%
Fox Chapel	6%	0%	933	65%
Galway	65%	64%	2,029	93%
Garrett Park	86%	76%	2,955	95%
Georgian Forest	47%	53%	819	80%
Germantown	26%	33%	1,081	31%
Glen Haven	43%	43%	2,030	58%
Glenallan	18%	8%	2,277	23%
Goshen	1%	0%	1,220	10%
Great Seneca Creek	31%	37%	2,297	63%
Greencastle	63%	21%	3,886	79%
Greenwood	30%	50%	1,262	72%
Harmony Hills	7%	5%	1,648	19%
Highland	84%	65%	1,753	97%
Highland View	24%	22%	2,145	59%
Jackson Road	49%	61%	1,087	92%
JoAnn Leleck	45%	49%	1,199	79%
Jones Lane	21%	15%	914	65%
Kemp Mill	93%	66%	1,323	100%
Kensington-Parkwood	50%	57%	1,308	75%
Lake Seneca	53%	49%	2,197	60%
Laytonsville	0%	1%	276	3%
Little Bennett	68%	49%	1,353	78%
Luxmanor	1%	1%	2,577	6%
Marshall	38%	35%	798	74%
McAuliffe	47%	50%	2,289	91%
McNair	32%	23%	1,686	44%
Mill Creek Towne	0%	0%	1,100	0%
Monocacy	0%	0%	52	0%
Montgomery Knolls	25%	17%	1,682	42%

Name	Segments	Crossings	Total Residences within Walkshed	Accessible Residence Percentage
New Hampshire Estates	32%	27%	1,380	60%
North Chevy Chase	11%	21%	1,621	29%
Oak View	60%	66%	1,749	90%
Oakland Terrace	64%	47%	2,770	82%
Olney	15%	14%	1,384	41%
Page	38%	63%	834	85%
Pine Crest	6%	9%	1,938	58%
Piney Branch	70%	79%	4,200	93%
Potomac	4%	0%	671	7%
Resnik	55%	36%	1,023	90%
Ride	18%	41%	784	92%
Rock Creek Forest	41%	38%	2,016	65%
Rock Creek Valley	87%	57%	1,069	99%
Rock View	19%	12%	2,925	34%
Rockwell	53%	57%	468	84%
Rolling Terrace	27%	27%	2,621	49%
Roscoe R. Nix	10%	10%	1,378	23%
Rosemary Hills	90%	88%	1,995	98%
Sargent Shriver	40%	25%	2,070	57%
Sequoyah	0%	0%	82	0%
Seven Locks	4%	0%	722	8%
Sherwood	0%	0%	453	4%
Sligo Creek	7%	9%	3,326	26%
Snowden Farm	35%	20%	1,179	43%
Somerset	45%	50%	6,360	77%
South Lake	33%	100%	1,878	100%
Spark M. Matsunaga	7%	3%	776	20%
Stedwick	16%	33%	1,002	46%
Stone Mill	74%	58%	1,443	83%
Stonegate	0%	6%	1,047	6%
Strathmore	31%	32%	1,967	51%
Strawberry Knoll	20%	38%	1,551	70%

Name	Segments	Crossings	Total Residences within Walkshed	Accessible Residence Percentage
Takoma Park	77%	86%	3,896	96%
Travilah	8%	4%	817	11%
Viers Mill	70%	46%	1,926	84%
Washington Grove	20%	21%	924	51%
Waters Landing	24%	10%	4,326	35%
Watkins Mill*	80%	0%	3,120	95%
Wayside	28%	56%	1,008	66%
Weller Road	49%	35%	1,813	62%
Westbrook	11%	13%	1,674	70%
Westover	0%	13%	670	12%
Wheaton Woods	59%	41%	1,872	66%
Whetstone	9%	0%	1,866	50%
William B. Gibbs Jr.	69%	45%	1,338	83%
Wilson Wims	63%	33%	1,521	74%
Wood Acres	37%	50%	2,390	80%
Woodfield	60%	76%	766	80%
Woodlin	25%	22%	2,104	39%
Wyngate	12%	7%	1,124	77%
Average	**40%**	**32%**		

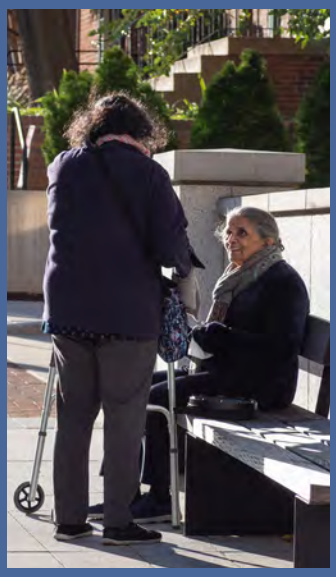
Table 8: Middle School Comfortable Connectivity

Name	Segments	Crossings	Total Residences within Walkshed	Accessible Residence Percentage
Argyle	7%	1%	5,429	16%
Baker	0%	0%	1,737	0%
Banneker	0%	0%	2,279	4%
Briggs Chaney	9%	28%	993	35%
Cabin John	13%	22%	2,606	36%
Clemente	83%	54%	3,106	90%
Eastern	1%	1%	5,552	4%
Farquhar	22%	15%	841	25%

Name	Segments	Crossings	Total Residences within Walkshed	Accessible Residence Percentage
Hallie Wells	47%	34%	3,505	58%
Hoover	35%	42%	3,050	50%
Key	6%	7%	5,252	17%
King	6%	3%	5,013	11%
Kingsview	9%	5%	5,157	25%
Loiederman	10%	6%	4,430	21%
Montgomery Village*	40%	5%	7,406	37%
Neelsville	10%	0%	1,126	28%
Newport Mill	5%	4%	6,587	15%
North Bethesda	41%	28%	4,279	67%
Odessa Shannon	87%	74%	5,206	97%
Parkland	35%	23%	3,162	49%
Pyle	11%	18%	5,219	35%
Redland	4%	41%	501	42%
Ridgeview*	34%	13%	1,519	69%
Rocky Hill	8%	10%	654	39%
Rosa Parks	30%	30%	2,892	49%
Shady Grove	48%	49%	609	60%
Silver Creek	4%	9%	1,796	26%
Silver Spring International	7%	5%	10,893	21%
Sligo	8%	6%	5,018	14%
Takoma Park	34%	31%	8,915	48%
Tilden*	0%	0%	8,392	9%
Westland	0%	0%	6,047	0%
White Oak	18%	32%	1,403	58%
Wood*	68%	45%	4,311	71%
Average	**20%**	**13%**		

Table 9: High School Comfortable Connectivity

Name	Segments	Crossings	Total Residences within Walkshed	Accessible Residence Percentage
Bethesda-Chevy Chase	15%	19%	18,777	29%
Blair	1%	3%	3,944	14%
Blake	0%	0%	1,256	0%
Churchill	15%	17%	5,936	34%
Clarksburg	19%	8%	4,870	27%
Damascus	1%	2%	2,268	7%
Einstein	5%	3%	8,036	15%
Kennedy	5%	2%	5,631	11%
Magruder	0%	0%	600	0%
Northwest	1%	0%	8,320	13%
Northwood	21%	7%	9,553	26%
Paint Branch	0%	0%	7,482	0%
Quince Orchard*	2%	1%	7,011	8%
Seneca Valley	3%	2%	12,322	7%
Sherwood	2%	1%	849	19%
Springbrook	0%	0%	2,947	5%
Walter Johnson	0%	0%	13,299	0%
Watkins Mill	10%	7%	6,856	23%
Wheaton	7%	6%	5,732	18%
Whitman	9%	14%	6,554	31%
Average	**7%**	**5%**		



MONTGOMERY COUNTY'S PEDESTRIAN PLAN

DESIGN TOOLKIT | 2023

Montgomery Planning

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Introduction

This Pedestrian Master Plan Design Toolkit presents design treatments that encourage safe and accessible pedestrian travel throughout Montgomery County. Each treatment in the toolkit includes a description, along what types of streets the treatment should be considered, its expected crash reduction potential, as well as design considerations, estimated cost, and additional resources.

Safety Objectives

The toolkit's crash reduction treatments are designed to achieve the following primary safety objectives:

- Reduce speeds
- Reduce pedestrian crossing widths
- Increase frequency of safer crossings for pedestrians and bicyclists
- Increase visibility
- Increase motor vehicle stopping for pedestrians
- Separate pedestrians, bicyclists, and motor vehicles on higher speed or busier roads

Which treatments are effective?

Researchers have estimated the reduction in crashes that can be achieved by implementing many roadway safety treatments. Where research has shown a reduction in crashes for a given treatment, that is noted in the toolkit. Crash reduction estimates do not exist for all treatments, but other research and data gathered from prior use can provide an indication of safety benefits. Multiple treatments at the same location often have complementary benefits. Caution and engineering judgement should be exercised when extrapolating the safety impact in these cases.

According to the Federal Highway Administration[1]:

- **A crash reduction estimate should be regarded as a generic guide of safety effectiveness.**
- **Environmental, traffic volume, traffic mix, geometric, and operational conditions may affect the safety impact of a treatment.**
- **Engineers must exercise judgement and consider these factors to ensure that a treatment applies to the conditions.**

Where should treatments be applied?

Roadways throughout the county have different characteristics. Based on the number of lanes, daily vehicles, travel speeds, and other factors, different safety treatments may be appropriate on different roadways. In addition, some treatments are generally applied along segments, while others improve safety at intersections. Montgomery County has published a Complete Streets Design Guide, which assigns each county roadway a street type based on the roadway's surrounding context and transportation function for all travel modes. The table below summarizes the applicable locations, including both location type and street type, associated with each of the treatments included in the toolkit.

Treatment	Location Type				Street Type*												
	Along Segment	Midblock Crossing	Signalized Intersection	Unsignalized Intersection	Downtown Boulevards	Downtown Streets	Boulevards	Town Center Boulevards	Town Center Streets	Area Connectors	Neighborhood Connectors	Neighborhood Streets	Neighborhood Yield Streets	Industrial Streets	Country Connectors	Country Roads	Major Highways
Channelized RIght Turn Removal/ Redesign			•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Corner Radius Reduction			•	•	•	•	•	•	•	•	•	•	•	•	•	•	
Crossing Islands		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Curb Extensions/Bulb Outs			•	•	•	•	•	•	•	•	•	•	•	•	•	•	
Floating Curb Extensions	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
Floating Transit Islands	•				•	•	•	•	•	•	•						
Hardened Centerlines and Turn Wedges		•	•	•	•	•	•	•	•	•	•	•					
High-Visibility Crosswalks		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Leading Bicycle Intervals and Leading Pedestrian Intervals			•		•	•	•	•	•	•	•			•			
Lighting	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Mini-Roundabouts				•								•	•				
Neighborhood Slow Zones	•										•	•	•				
No Turn on Red			•		•	•	•	•	•	•	•						•
Parking Restrictions at Crossings Locations/Daylighting		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
Pedestrian Channelization	•	•					•							•			

Treatment	Location Type				Street Type*												
	Along Segment	Midblock Crossing	Signalized Intersection	Unsignalized Intersection	Downtown Boulevards	Downtown Streets	Boulevards	Town Center Boulevards	Town Center Streets	Area Connector	Neighborhood Connectors	Neighborhood Streets	Neighborhood Yield Streets	Industrial Streets	Country Connectors	Country Roads	Major Highways
Pedestrian Hybrid Beacons (PHB)		•			•	•	•	•	•	•	•	•	•	•	•	•	
Protected Crossing Spacing for Managing Conflicts	•	•			•	•	•	•	•	•	•	•	•	•	•	•	•
Protected Signal Phases			•		•	•	•	•	•	•	•	•	•	•	•	•	•
Porous Flexible Sidewalk Pavement	•				•	•	•	•	•	•	•	•	•	•	•	•	•
Raised Crossings		•	•	•		•			•	•	•	•	•				
Raised Medians	•	•	•	•	•	•	•	•	•	•	•	•		•	•	•	•
Rectangular Rapid Flashing Beacons		•			•	•	•	•	•	•	•	•	•	•	•	•	
Shared Streets	•					•			•								

*For definitions of the street types, see the Montgomery County Complete Streets Design Guide.

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CHANNELIZED RIGHT TURN REMOVAL/REDESIGN

Purpose

Improve pedestrian safety and accessibility at intersections by removing channelized right turns (slip lanes) or redesigning them to slow motor vehicle turning speeds and improve sight lines between drivers and pedestrians.

Description

Removing channelized right turns, redesigning the intersection approach so the right turn lane is immediately adjacent to the through lanes.[2]

Estimated Cost

$ $$ **$$$** $$$$

Applicable Locations

- Intersections

Applicable Street Types

All street types

Safety Benefits

- Crashes involving motor vehicles and pedestrians are more likely with conventional channelized right turn lanes than with an "urban smart channel" slip lane design, unchannelized right turn lanes, and shared through/right lanes.[3]
- Well-designed slip lanes provide better sight lines between drivers and pedestrians, reduce motor vehicle turning speeds, encourage motor vehicle yielding at the crosswalk, and reduce overall pedestrian crossing distances.[4] Well-designed slip lanes are also easier for pedestrians with vision disabilities to navigate.

Expected Crash Reduction

- Slip lane removal: An estimate has not been determined.
- Slip lane redesign: 56% overall crash reduction and 59% fatal and serious injury crash reduction when slip lanes are redesigned to enter the cross street at approximately 70 degrees.[5]

Design Guidance

- Remove the slip lane and use the reclaimed space for pedestrian amenities, bicycle/scooter parking, public art, green infrastructure, and other purposes.
- Where the slip lane cannot be removed due to intersection skew, redesign the slip lane to:
  A fabric barrier should be installed between the subgrade and subbase to prevent tree and plant roots from growing into the pavement.

- » Adjust the angle of the slip lane to intersect the cross street at 55-70 degrees. 70 degrees is preferred for its greater ability to improve sight lines and encourage motorist yielding.
- » Reduce the width of the slip lane to 11 feet (14 feet maximum).
- » Position the crosswalk 20 feet back from the slip lane yield point for cross-traffic and orient it at a 90-degree angle to the slip lane.
- » Encourage driver yielding at the crosswalk through ladder-style high visibility crosswalk markings, pedestrian crossing signage, flashing beacons, raised crosswalks, and other measures as appropriate for the context. Raised crosswalks should be considered where motorists do not face stop or traffic signal control. They may also be beneficial at yield, stop, and signal control intersections where it is desirable to reduce encroachments into the crosswalk.
- » Ensure that the channelizing island that forms the slip lane is large enough to accommodate waiting pedestrians and accessibility features, such as cut throughs (preferred) or curb ramps
- » Include features to enable people with vision disabilities to find the crosswalk location, align properly to cross, determine when it is safe to cross if the crossing is uncontrolled, and navigate across the island to the next leg of the crossing.

Considerations

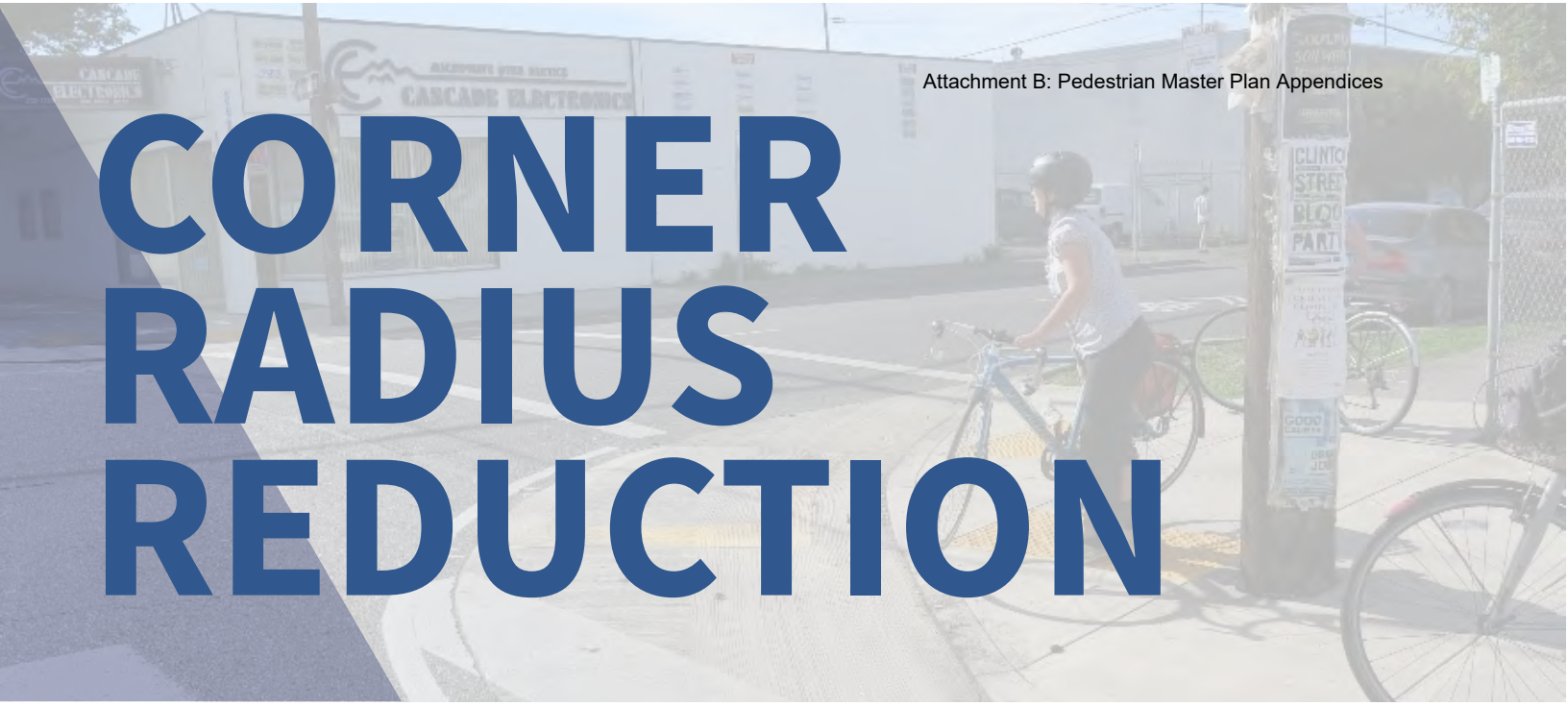
- If necessary, truck aprons or edge lines with cross-hatching can be incorporated into the design to narrow the perceived width of the lane while accommodating larger vehicles.
- Poorly designed slip lanes can create significant navigational challenges for people with vision disabilities due to the positioning of the crosswalk away from the corner and the unreliability of parallel and perpendicular traffic as navigational cues. To address this, people with a range of vision disabilities, orientation and mobility specialists, and others with expertise on how people with different types of vision disabilities navigate should be actively engaged in the planning and design process.
- Crosswalks should not be placed too close to either end of the slip lane. Otherwise, people with vision disabilities may miss the island entirely.
- Slip lanes may be closed temporarily to allow for assessment of potential implications of a permanent closure. For temporary closures, use crash-worthy materials like concrete planters instead of flexible bollards. (If concrete planters are not allowed or cannot be maintained then water filled jersey barriers are recommended.)
- Consider potential impacts on people with vision disabilities.

Systemic Safety Potential

- Closing slip lanes or redesigning them to intersect cross streets 55-70 degrees will lower the speed of turning vehicles, improve sight lines between drivers and pedestrians and between drivers and other drivers, and decrease fatal, serious injury and property damage crashes.[6]

Additional Information

- Montgomery County Complete Streets Design Guide, p. 204, montgomeryplanning.org/wp-content/uploads/2022/03/Montgomery-County-CSDG_Approved-2021.pdf
- PEDSAFE, Improved Right-Turn Slip-Lane Design, www.pedbikesafe.org/pedsafe/countermeasures_detail.cfm?CM_NUM=24
- Developing Design Guidelines for Right-Turn Slip Lanes, texite.org/wp-content/uploads/papers/Gemar_Right-Turn-Slip-Lanes_TexITE-2016.pdf
- City of Los Angeles Supplemental Street Design Guide, eng2.lacity.org/techdocs/streetd/Supplemental_Design_Guide-040220-FINAL.pdf
- National Cooperative Highway Research Program (NCHRP) Research Report 834, Crossing Solutions at Roundabouts and Channelized Turn Lanes for Pedestrians with Vision Disabilities: A Guidebook, www.trb.org/Main/Blurbs/175586.aspx
- Planning and Designing Streets to Streets to Be Safer and More Accessible for People with Disabilities, p. 60, www.montgomerycountymd.gov/DOT/Resources/Files/MC%20Designing%20Streets%20for%20PVD%20Toolkit_20211007_ADA.pdf



CORNER RADIUS REDUCTION

Purpose

Reduce motor vehicle turning speeds, reduce pedestrian crossing distances, increase pedestrian visibility, and expand waiting areas for pedestrians crossing.

Description

Reduced corner radius by changing the curb line or using temporary materials such as paint and bollards. Motorists will generally reduce their speed to navigate a sharper turn.

Estimated Cost

$ **$$** $$$ $$$$

Applicable Locations

- Corner radius reduction can be applied to intersections in an urban, suburban, or rural context.
- Intersections with low truck volumes can also make use of corner radius reduction.

Applicable Street Types

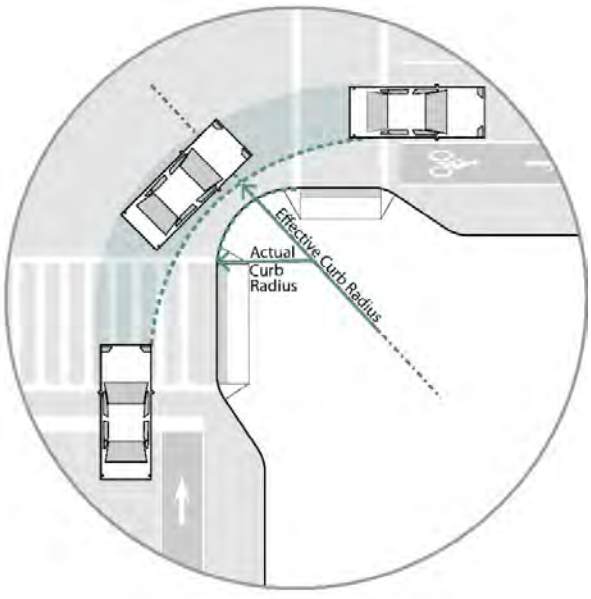
All street types.

Safety Benefits

- Reduce turning motor vehicle speeds.
- May reduce the risk of pedestrians in collisions with right-turn vehicles.
- Reduce crossing distance for pedestrians and thus reduces pedestrian exposure.
- A reduced crossing distance may allow for shorter traffic signal cycle lengths, increasing compliance.[7]

Expected Crash Reduction

Initial research indicates curb radius reduction may reduce turning speeds, which can increase motor vehicle yielding to crossing pedestrians and reduce the severity of crashes.[8]



Design Guidance

- Implementation should tailor design to the largest design vehicle size that frequently uses the intersection. This effective turning radius should determine actual curb radius.
- See the Montgomery County Complete Streets Design Guide and Montgomery County Bill 33-13 for recommended curb radius dimensions and design vehicle designation.
- Install with curb ramps and high-visibility crosswalk markings. Corner radius reduction allows for better placement of curb ramps and crosswalks.
- Mountable truck aprons can be implemented to encourage a smaller effective radius for passenger cars or small trucks, while accommodating larger vehicles as well.

Considerations

- The corner radius should make intersections as compact as possible while accommodating large vehicles that frequent the intersection.
- Corner radii that are too small may encourage motor vehicles to drive over the curb and onto sidewalks and bikeways.
- In some instances, large vehicles may encroach on the opposing travel lane when turning. See Montgomery County Complete Streets Design Guide for specific guidance on allowable encroachment.

Systemic Safety Potential

Systemic safety improvement to all intersections. Careful consideration should be applied for intersection with high truck or bus volumes.

Additional Information

- PEDSAFE: Pedestrian Safety and Countermeasure Selection System

CROSSING ISLANDS

Purpose

Protect pedestrians and bicyclists crossing by slowing motor vehicle speeds, increasing motor vehicle yielding, increasing pedestrian visibility, providing a pedestrian waiting area, and allowing two-stage crossings for slower pedestrians.

Description

Median crossing islands have a cut-out area for pedestrian and bicyclist refuge and are used as a supplement to a crosswalk. Also known as pedestrian refuge islands or raised refuge islands.

Estimated Cost

$ **$$** $$$ $$$$

Applicable Locations

- Crossings at the midblock or at intersections.
- Most beneficial at uncontrolled crossings, multi-lane roads, wide signalized crossings, or complex intersections.
- On roads with two or more lanes of through traffic.
- Roads with insufficient gaps in traffic.
- Roads with high pedestrian crossing volumes.

Applicable Street Types

All street types.

Safety Benefits

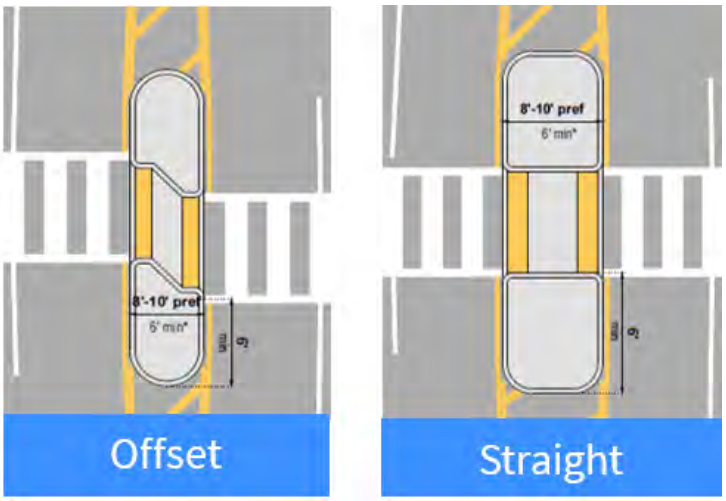
- Reduces maximum distance and time pedestrians exposed to crash risk.
- Allow pedestrians to cross the street one direction of travel or fewer lanes at a time.
- Ease crossing for slower pedestrians (e.g. youth, elderly, and disabled).
- Provide space for additional lighting at the crossing.
- May slow motorist through speed.
- May slow motorists turning left.

Expected Crash Reduction

32 percent for vehicle-pedestrian crashes.[9]

Design Guidance

- Median crossing islands should be a minimum of 6 feet wide. To provide bicyclist refuge or for high pedestrian volumes, crossing islands should be a minimum of 8 feet wide. The refuge is ideally 40 feet long.
- Ramps or island cut-throughs are required for accessibility. They should be the full width of the crosswalk, 5 feet minimum.
- All medians at intersections should have a “nose” which extends past the crosswalk. The nose protects people waiting on the median and slows turning drivers.



- At mid-block locations:
  - » Install advance stop lines on multi-lane approaches.
  - » Install with applicable warning sign (MUTCD W11-1, W11-2, W11-15, or S1-1).[10]
  - » On multi-lane approaches, place "Stop Here for Pedestrians" or "Yield Here to Pedestrians" signs (MUTCD R1-5 series).[11]
- Mark with a high-visibility crosswalk.

Considerations

- Pedestrians may get caught on the crossing island if motorists do not yield or signal timing is too short.
- Crossing islands at intersections may restrict left turning.
- Curb extensions can be built along with crossing islands to restrict on-street parking and reduce crossing distance.
- Temporary crossing islands can be constructed with temporary curbing or flex posts.

Systemic Safety Potential

Potential for systemic safety application at mid-block crossings and at intersections along corridors with poor motor vehicle yielding, operating speeds over 30 mph, or motor vehicle volumes above 9,000 vehicles per day.

Additional Information

- Chapter 8 of Designing Sidewalks and Trails for Access: Part II of II: Best Practices Design Guide
- Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities
- FHWA Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations

CURB EXTENSIONS/ BULB OUTS

Purpose

Shorten crossing distances and increase pedestrian comfort and visibility.

Description

Also called bulb outs or neck downs, curb extensions extend a section of sidewalk into the roadway at intersections and other crossing locations.

Estimated Cost

$ **$$** $$$ $$$$

Applicable Street Types

- Downtown Boulevard
- Downtown Street
- Boulevard
- Town Center Boulevard
- Town Center Street
- Area Connector
- Neighborhood Connector
- Neighborhood Street
- Neighborhood Yield Street
- Industrial Street
- Country Connectors
- Country Roads

Applicable Locations

- Curb extensions can make crossings safer and more comfortable everywhere from a mid-block crosswalk to a large signalized intersection.
- Curb extensions can be built in all-day parking lanes or wide shoulders.
- Transitions to lower-speed areas.

Safety Benefits (see graphic on next page)

1. Shorten crossing distance.
2. Increase visibility between drivers and pedestrians.
3. Crosswalk is more noticeable to drivers.
4. Narrow the roadway to slow through speeds.
5. Reduce vehicular turning speed.
6. Add space for ADA curb ramps aligned with crosswalk.

7. Create physical barrier from parking encroachment on crosswalk.

Expected Crash Reduction

Initial research indicates this treatment may be effective at increasing driver yielding and improving pedestrian safety.[12]

Design Guidance

- Limit planting and street furniture height within curb extensions to preserve sight lines.
- Consider expanding curb extensions at bus stops to produce bus bulbs.
- Where curb extension installation on one side is infeasible or inappropriate (i.e., no parking lane), this should not preclude installation on the opposite side.
- Maximum length can vary to accommodate sight lines, manage stormwater, facilitate transit loading, or restrict parking. Minimum length is the width of the crosswalk.
- Designers should refer to the Montgomery County Bicycle Master Plan to ensure that curb extensions not preclude the implementation of the designated low stress network of bikeways.

Considerations

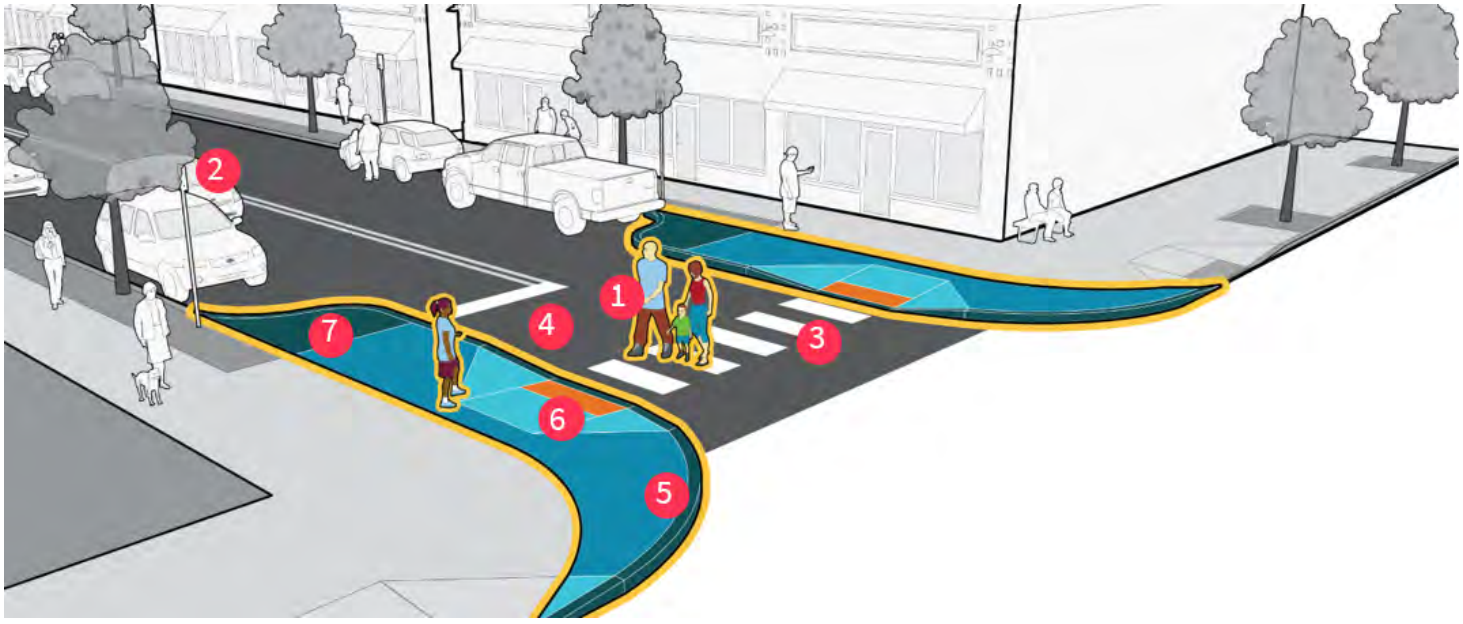
- If funding for permanent curb extension construction is unavailable, use lower cost alternatives, such as bollards, temporary curbs, planters, or paint and striping.
- Curb extensions should not extend into travel lanes or bicycle lanes. Generally designed with one foot of shy distance between the face of curb and the edge of travel lane.
- When designing the corner radius on a curb extension, consider the appropriate large vehicle turning path to prevent encroachment into the pedestrian space.
- Curb extensions can require modifications to or relocation of drainage structures. If modification is not possible, consider installing a floating curb extension (described on subsequent pages) to allow use of the existing drainage structures.

Systemic Safety Potential

Spot treatment or systemic safety improvement. Consider at all locations with on-street parking.

Additional Information

- Montgomery County Complete Streets Design Guide
- NACTO Urban Street Design Guide
- FHWA Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations



FLOATING CURB EXTENSIONS

Purpose

Slow motor vehicle speeds, shorten pedestrian crossing distances, and increase pedestrian visibility while maintaining existing drainage infrastructure.

Description

Floating curb extensions are standard curb extensions with a drainage channel along the existing curb line.

Estimated Cost

$ **$$** $$$ $$$$

Applicable Locations

- Intersections, mid-block crossings, bus stops, streets with bike lanes

Applicable Street Types

- Downtown Boulevard
- Downtown Street
- Boulevard
- Town Center Boulevard
- Town Center Street
- Area Connector
- Neighborhood Connector
- Neighborhood Street
- Neighborhood Yield Street
- Industrial Street
- County Connectors
- County Roads

Safety Benefits

Floating curb extensions have the same safety benefits as standard curb extensions.

Expected Crash Reduction

Initial research indicates this treatment may be effective at increasing driver yielding and improving pedestrian safety.[13]

Design Guidance

- The width of the drainage channel between the existing curb and the floating curb extension should be two feet. Wider channels may be confused for bike lanes or make it more difficult to fit a constructed curb extension into the space available without reallocating roadway space.
    - » Where bike lanes exist, are planned, or otherwise desired, floating curb extensions should be designed with channels wide enough for bicyclists to pass through or the bikeway should be accommodated at the sidewalk level or an intermediate grade.
- Where a drainage channel wider than two feet is determined to be necessary, flex posts or bollards should

be considered to define the extension rather than concrete curbs.

- The drainage channel between the existing curb and the floating curb extension does not need to be covered, except in cases where pedestrians are intended to traverse it without ramping down to street level, such as at a bus stop.
it more difficult to fit a constructed curb extension into the space available without reallocating roadway space.

- In cases where a floating curb extension is integrated into a signalized pedestrian crossing, the pedestrian pushbutton should be positioned on the existing curb adjacent to the curb ramp, and the timing for the pedestrian clearance interval should be based on the existing curb line rather than the floating island.

    - Exception: When there is a cover over the channel and the curb ramp is located on the floating curb extension, the pedestrian pushbutton may be located adjacent to the curb ramp on the island and pedestrian crossing time calculated based on the edge of the island.

Considerations

- Floating curb extensions may be designed to incorporate stormwater management features, such as permeable pavement or bioswales.

- It can be challenging to design floating curb extensions with ADA curb ramps on the island due to space limitations. An option for accommodating ADA ramps is illustrated above.

- In cases where there is an existing diagonal ramp and sufficient space, it may be possible to reduce motor vehicle turning radii and speeds by installing vertical delineation along the design vehicle path (illustrated below).

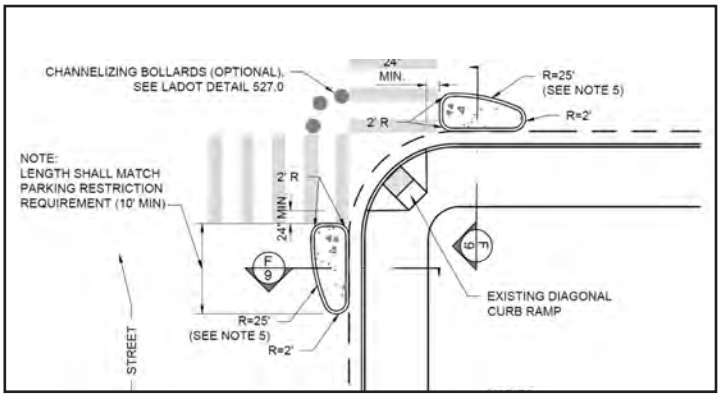
- Where appropriate, reflective markers should be included on the leading edge of the curb extension to provide advance warning to approaching motorists and other road users.

Systemic Safety Potential

- Best suited as spot treatment

Additional Information

- City of Los Angeles Supplemental Street Design Guide, eng2.lacity.org/techdocs/streetd/Supplemental_Design_Guide-040220-FINAL.pdf



FLOATING TRANSIT ISLANDS

Purpose

To eliminate the conflict between bicyclists traveling in bike lanes and transit vehicles that must pull into conventional bike lanes to load and unload passengers.

Description

A concrete island located between transit/traffic lanes and bike lanes where transit passengers board and alight transit vehicles.

Estimated Cost

$ **$$** $$$ $$$$

Applicable Locations

Where bike lanes (separated, conventional, etc.) run along a transit stop. This treatment is compatible with near-side, far-side and midblock transit stop locations.

Applicable Street Types

- Downtown Boulevard
- Downtown Street
- Boulevard
- Town Center Boulevard
- Town Center Street
- Area Connector
- Neighborhood Connector

Safety Benefits

Eliminates conflict between transit vehicles and bicyclists.

Expected Crash Reduction

A crash reduction rate has not yet been determined.

Design Guidance

- Provide a buffer of 6 to 12 inches between the transit shelter and the bike lane. This buffer is narrower than the shy distance normally used for vertical surfaces (2 feet), but this is acceptable for short distances in constrained spaces.
- Channelizing railings, planters or other treatments can be used to help direct people to the crossing location(s).
- Multiple pedestrian crossings are recommended, but not required.
- Provide a minimum 4-foot-wide walkway between the curb and the transit shelter.
- Minimum 8 feet of clear width at the location where the bus doors will open to accommodate people using wheelchairs.
- Refer to the MCDOT Planning and Designing Streets to be Safer and More Accessible for People with Vision Disabilities Toolkit for additional guidance.

Considerations

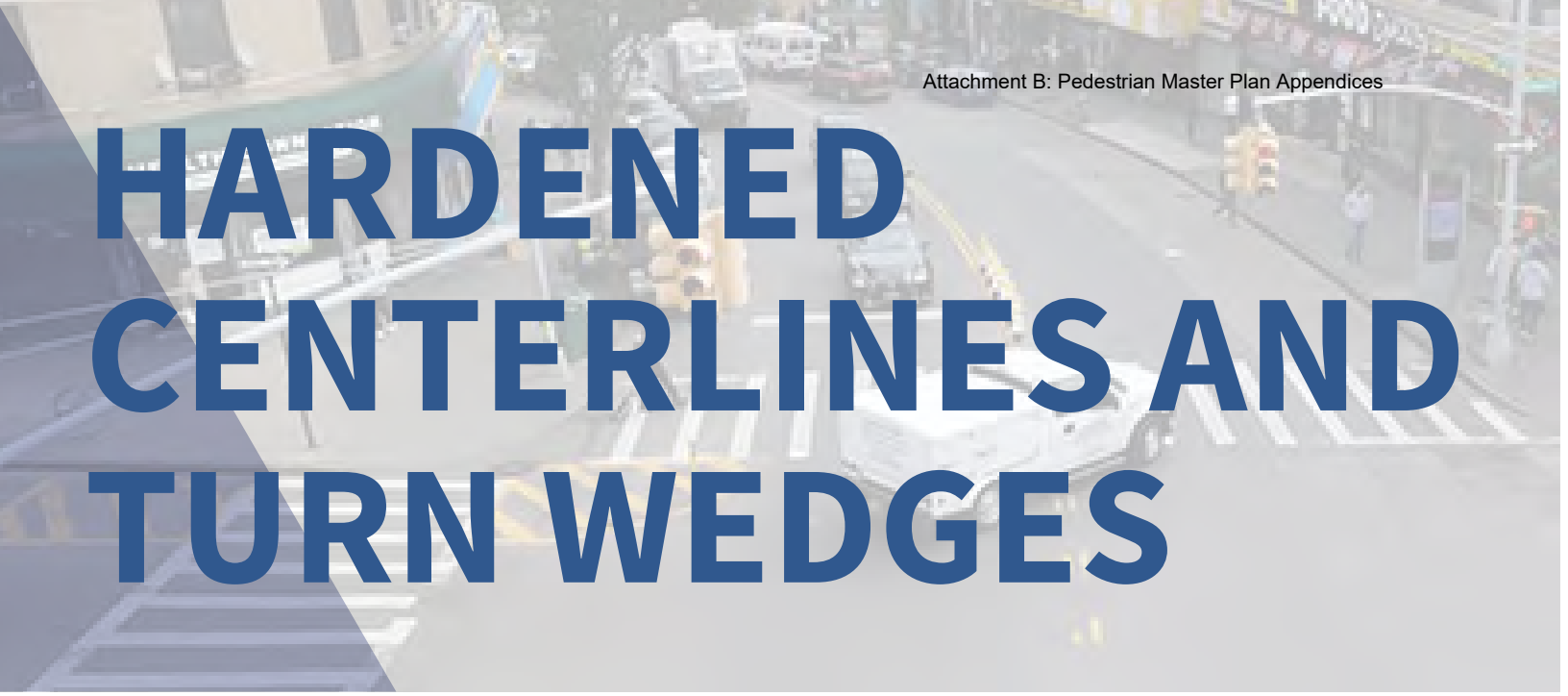
- The space between the bike lane and the sidewalk must have a detectable edge so pedestrians with vision disabilities can distinguish between the two. The bike lane may be located at street level, intermediate level, or sidewalk level. The bike lane elevation can affect the treatment used and can itself be a treatment for creating the detectable edge. The following design treatments can help provide this tactile cue:
  - » Street furniture or other vertical objects.
  - » A curb.
  - » Curb height changes.
  - » Continuous low landscaping.
  - » A directional indicator (International Standard 23599) installed linearly on the sidewalk adjacent to the edge.
- Consider transit queuing and vehicle length to determine island length and pedestrian crossing placement.
- Ensure visibility between bicyclists and pedestrians for safety.
- Consider raised pedestrian crossings between the floating transit island and the sidewalk to prioritize pedestrians.

Systemic Safety Potential

Potential for systemic safety application at bus stops located along separated bike lanes. Best suited as a spot treatment along buffered bike lanes and conventional bike lanes.

Additional Information

- NACTO Transit Street Design Guide
- MCDOT Planning and Designing Streets to be Safer and More Accessible for People with Vision Disabilities Toolkit



HARDENED CENTERLINES AND TURN WEDGES

Purpose

Reduce motor vehicle turning speed and increase motor vehicle yielding to pedestrians.

Description

Hardened centerlines are flexible delineators placed between opposing travel lanes. Turn wedges are raised curbs or flexible delineators and pavement markings on both sides of a crosswalk at an intersection.

Estimated Cost

$ **$$** $$$ $$$$

Applicable Locations

- Hardened centerlines can be installed at intersections of midblock crossing locations.
- Where left turning vehicles do not yield sufficiently.
- Turn wedges can be installed at corners of an intersection.

Applicable Street Types

- Downtown Boulevard
- Downtown Street
- Boulevard
- Town Center Boulevard
- Town Center Street
- Area Connector
- Neighborhood Connector
- Neighborhood Street

Safety Benefits

- Slow left-turning motor vehicles.
- Guide motor vehicles to wider turning angle for safer and more predictable turns.
- Increase visibility of pedestrians in crosswalk to turning motorists.
- Mitigate visibility issues caused by metal reinforcement between vehicle windshields and windows.

Expected Crash Reduction

46 percent for all crashes at raised medians.[14]

A crash reduction estimate has not been established for turn wedges.

Design Guidance

Hardened centerlines

- Raise centerline with flexible delineators and separators (e.g. Leitboy Bollard with Guide Curb separator).
- Install a rubber speed bump, mountable curb, or flexible

delineators and separators along the centerline, on one or both sides of the crosswalk.

- Paint lane extensions through the intersection with yellow markings.
- Vertical elements should not be present in the crosswalk.

Turn wedges

- Have similar geometry and materials as a curb extension – typically placed in line with a parking lane. See curb extension treatment for design guidance.
- Reduce the effective turning radius for vehicles.

Considerations

- Can be constructed rapidly and inexpensively using paint and flexible bollards.
- The turning radius of trucks and buses should be considered when installing turn wedges.

Systemic Safety Potential

Both hardened centerlines and turn wedges slow left-turning vehicles. Potential for systemic implementation at intersections where turn speeds are high or motorists are not yielding.

Additional Information

- Chapter 8 of Designing Sidewalks and Trails for Access: Part II of II: Best Practices Design Guide
- Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities
- FHWA Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations
- FHWA Proven Safety Countermeasures

HIGH-VISIBILITY CROSSWALKS

Purpose

Improves visibility of pedestrians to approaching motorists.

Description

High-visibility crosswalks use markings that motorists see more easily compared with traditional crosswalk markings located only perpendicular to the motor vehicle path of travel.

Estimated Cost

$ $$ $$$ $$$$

Applicable Locations

- High-visibility crosswalks are appropriate at all controlled intersections.
- Uncontrolled intersections should meet requirements in MUTCD Section 3B.18.

Applicable Street Types

All street types.

Safety Benefits

- Increase motorist awareness of crosswalk location.
- Reduce crashes between pedestrians, bicyclists, and motor vehicles.
- Designate pedestrian right-of-way, and may reduce pedestrian crossings at unmarked locations.[15]

Expected Crash Reduction

48 percent for vehicle-pedestrian crashes.[16]

Design Guidance

- Crosswalks should be a minimum of 10 feet wide. If the sidewalk or sidepath is wider than 10 feet, the crosswalk should match the width of the sidewalk or sidepath.
- Install with curb ramps.
- At signalized intersections, install a stop bar in advance of the crosswalk at least four feet from the nearest edge of the crosswalk.
- Parking should be restricted in advance of a crosswalk to provide adequate sight distance.

Considerations

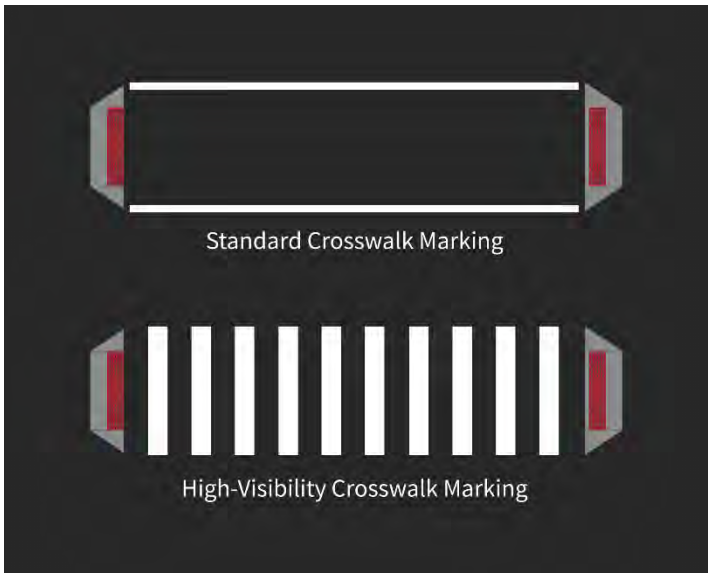
- Crosswalk location should be convenient for pedestrian access.
- Width may be wider than 10 feet at crossings with high pedestrian or bicycling demand.
- Artistic crosswalks, with approval from MCDOT, may be installed in the center of the intersection to add a unique design feature.

Systemic Safety Potential

Apply as a systemic countermeasure at all controlled crossings. At uncontrolled crossings, apply in accordance with FHWA Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations, Table 1.

Additional Information

- Manual on Uniform Traffic Control Devices
- FHWA Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations



LEADING BICYCLE INTERVALS AND LEADING PEDESTRIAN INTERVALS

Purpose

Extends crossing time for pedestrians and bicyclists at signalized intersections.

Description

Leading bicycle intervals (LBIs) or leading pedestrian intervals (LPIS) are adjustments to traffic signals to give bicyclists or pedestrians a three-to-seven-second head start before motorists enter the intersection.

Estimated Cost

$ **$$** $$$ $$$$

Applicable Locations

LBIs are a treatment option at:

- Intersections with high bicycle volumes
- Intersections with separated bike lanes or contraflow bike lanes
- Intersections where shared-use paths or other bicycle routes cross a major, signalized intersection

LPIs are a treatment option at:

- Signalized intersections.
- Intersections with a significant number of turning vehicles and pedestrian volumes.

Applicable Street Types

- Downtown Boulevard
- Downtown Street
- Boulevard
- Town Center Boulevard
- Town Center Street
- Area Connector
- Neighborhood Connector
- Industrial Street

Safety Benefits

- Increase visibility of pedestrians and bicyclists.
- Increase motorist yielding.
- More crossing time provided for pedestrians and bicyclists.

Expected Crash Reduction

Thirteen percent for vehicle-pedestrian crashes.[17]

An estimated crash reduction has not yet been determined for LBIs.

Design Guidance

LBIs should be installed with:

- Bicycle Signal sign (MUTCD R10-10) if bicycle signal is present, otherwise, direct bicyclists to follow pedestrian signal (MUTCD R9-5). [18]

- "No Right Turn on Red" sign (MUTCD R10-11). [19]

LPIs should be installed with:

- High-visibility crosswalk markings, curb ramps, accessible pedestrian signals, and "No Right Turn on Red" sign (MUTCD R10-11). [20]

Considerations

- LBIs or LPIs can be provided actively or provided only when actuated. Active detection requires an accessible pushbutton.
- The length of LPIs or LBIs can be increased where pedestrian or bicyclist volumes are high.
- Right-turn-on-red rules may limit the effectiveness of LBIs and LPIs.
- At locations with an Accessible Pedestrian Signal, LPI must be accompanied by an audible noise for visually-impaired pedestrians.

Systemic Safety Potential

LBIs are best as a spot treatment, or on corridors with high bicycle volumes and vehicle turning.

LPIs are suited for systemic use in areas with existing or planned pedestrian signals and high pedestrian and vehicle volumes.

Additional Information

- Pedestrian and Bicycle Information Center — Signals and Signs
- PEDSAFE: Pedestrian Safety Guide and Countermeasure Selection System

LIGHTING

Purpose

Increase visibility for all road users at dusk and darkness, especially at crossings.

Description

Well-placed lighting improves visibility for all road users. Pedestrian-scale lighting illuminates sidewalks and crossings and light fixtures are shorter than roadway-scale light fixtures.

Estimated Cost

$ **$$** $$$ $$$$

Applicable Locations

- Controlled and uncontrolled intersections.
- On crossing approaches.
- Along sidewalks.
- Beneficial at intersections in areas with high volumes of pedestrians, such as commercial or retail areas.
- Near schools, parks, and recreation centers.

Applicable Street Types

All street types.

Safety Benefits

- Improves visibility for all parties.
- May reduce crashes and injuries for all road users.
- May increase yielding and compliance with traffic control devices.
- Improves comfort levels.

Expected Crash Reduction

23 percent for injury crashes.[21]

Design Guidance

- Adhere to MCDOT lighting standards developed through 2022 MWCOG TLC planning process.
- Lighting should be consistent and uniform.
- Consider placement of existing buildings and trees to reduce spillover.
- Install lighting to Illuminating Engineering Society and DarkSky guidelines.

Considerations

- Uniform lighting can suggest pedestrian use and create a sense of enclosure.

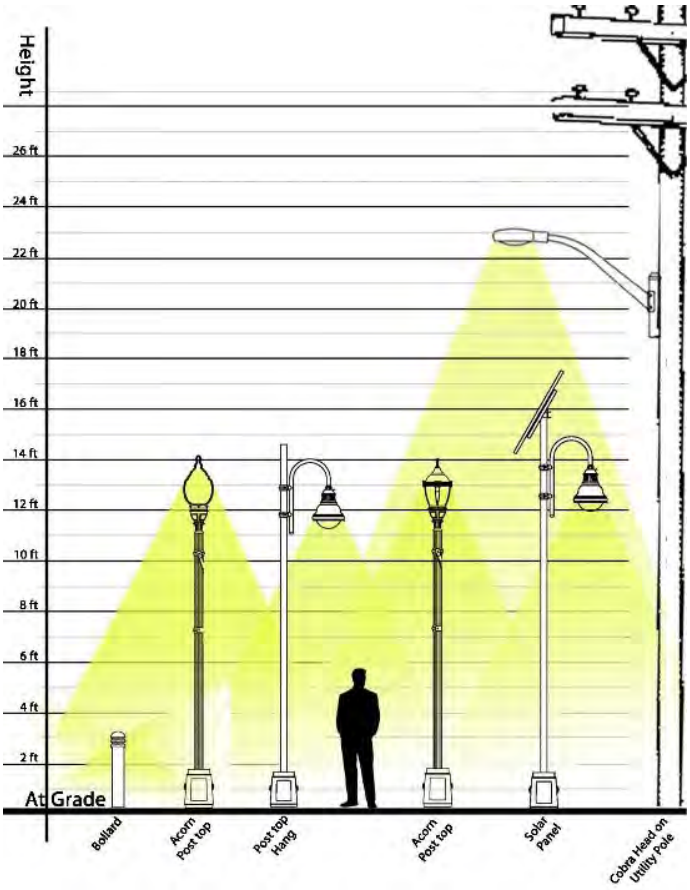
- Lighting should be provided on crosswalk approaches. If a crossing has a crossing island, additional lighting may be provided.
- Consider energy usage and environmental impacts.
- Consider quality and color of light.

Systemic Safety Potential

Potential for systemic safety application at all controlled and uncontrolled crossings.

Additional Information

- FHWA Lighting Handbook
- FHWA Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations
- ANSI/IES RP-8 Standard Practice for Roadway Lighting
- International DarkSky Association Outdoor Lighting Guidelines



MINI-ROUNDABOUTS

Purpose

Reduce traffic speeds at low-speed and low-volume intersections.

Description

Mini roundabouts, or mini traffic circles, are circular raised islands in the center of intersections.

Estimated Cost

$ **$$** $$$ $$$$

Applicable Locations

- Intersections with one travel lane in each direction.
- Roadways with posted speeds of 30 mph or lower.
- Residential streets.
- Neighborhood bikeways.
- Stop-controlled intersections with high delay.

Applicable Street Types

- Neighborhood Street
- Neighborhood Yield Street

Safety Benefits

- Reduces motor vehicle through speeds by forcing motorists to maneuver around the island.
- Eliminates left-turn crashes.
- Reduces right-turn speed.

Expected Crash Reduction

Initial research indicates mini roundabouts can reduce vehicle speeds [22] and crashes.[23]

Design Guidance

- Use yield rather than stop controls.
- Install signs to instruct vehicles to proceed to the right of the mini roundabout.
- May be used with shared lane markings, (sharrows) to indicate bicyclist usage.
- May also be used with W11-2, W11-2, S1-1, or W11-15 crossing warning sign.
- May be landscaped with low shrubs or vegetation that does not impede visibility.

Considerations

- Increasing turn radii for motor vehicles can compromise pedestrian and bicyclist safety.
- Chicanes or other traffic-calming treatments can be installed on adjacent roadways.

- Consider restricting large vehicles from these streets. Large vehicles, such as emergency response vehicles or school buses, may need to make left turns at intersections preceding the mini roundabout.
- Implement parking restrictions on the approach to the traffic circle or create mountable curbs on the outside of the mini roundabout to allow for emergency-response-vehicle access.

Systemic Safety Potential

Best suited as a spot treatment.

Additional Information

- PEDSAFE: Pedestrian Safety Guide and Countermeasure Selection System
- Mini-Roundabouts: Technical Summary

NEIGHBORHOOD SLOW ZONES

Purpose

Reduce speeds in residential neighborhoods.

Description

Gateways with speed limit signs on both sides of the street introduce the presence of a Slow Zone. Self-enforcing traffic calming measures such as speed humps are needed to ensure effectiveness.

Estimated Cost

$ **$$** $$$ $$$$

Applicable Locations

Neighborhood streets where speeds could be lowered below the current limit with:

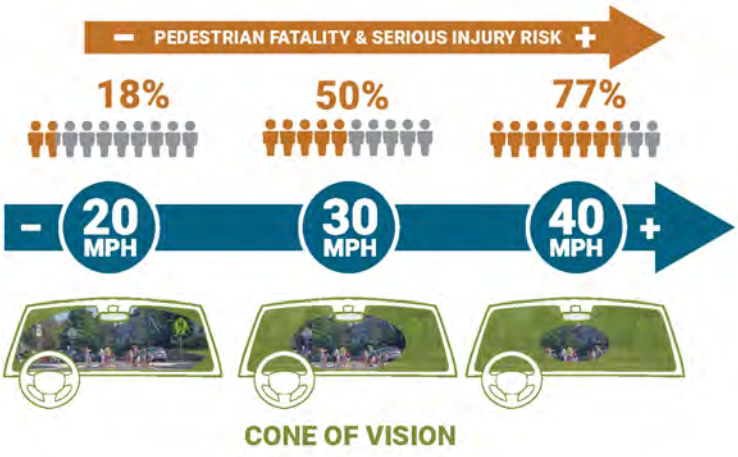
- A history of serious injury or fatal crashes.
- A high amount of vulnerable pedestrians such as children and older adults.

Applicable Street Types

- Neighborhood Connector
- Neighborhood Street
- Neighborhood Yield Street

Safety Benefits

- Manage speeds in residential neighborhoods.
- Create spaces where children may be safer from motor vehicle crashes.



Expected Crash Reduction

- A crash reduction estimate has not yet been developed for this treatment. Slow zones have reduced injuries by 30 percent in some jurisdictions.[24]

Design Guidance

- Place speed limit and slow zone signage on both sides of the roadway at neighborhood slow zone entrances.
- Implement traffic calming measures throughout the slow zone to self-enforce speed limits, such as:
  - » Curb Extensions
  - » Mini Roundabouts
  - » Speed Humps
  - » Raised Crossings
- Slow zones can encompass a small neighborhood, with entrances at higher-speed bordering streets.
- Lower-cost temporary materials such as pavement markings and flexible bollards can be applied quickly and broadly.

Considerations

- Neighborhood slow zones should be prioritized for communities with concerns about speeding and historic disinvestment.

Systemic Safety Potential

Appropriate as a systemic treatment in residential neighborhoods.

Additional Information

- Philadelphia Neighborhood Slow Zone Program Application
- NACTO Urban Design Guide

NO TURN ON RED

Purpose

Reduces conflicts between turning vehicles and pedestrians and bicyclists.

Description

A sign or signal used to prohibit motor vehicles turning right when the traffic light is red.

Estimated Cost

$ $$ $$$ $$$$

Applicable Locations

Signalized intersections. Especially important at:

- Intersections with crossing guards or at school crossings.
- Intersections with inadequate sight distances.
- Intersections with bike facilities.

Applicable Street Types

- Downtown Boulevard
- Downtown Street
- Boulevard
- Major Highway
- Town Center Boulevard
- Town Center Street
- Area Connector
- Neighborhood Connector

Safety Benefits

Eliminates conflict between right-turning vehicles and pedestrians and bicyclists traveling through.

Expected Crash Reduction

No turn on red is expected to significantly reduce crashes. One study found a 69 percent crash increase for non-motorized users where the right-turn prohibition was removed.[22]

Design Guidance

- Install "No Turn on Red" signs (MUTCD R10-11) on each applicable approach.[25]
- Dynamic electronic signs can be used to restrict right turns to certain times of day or during certain signal phases.
- Signs restricting right turns on red should be visible to motorists stopped in the curb lane at the crosswalk.

- May increase the number of right turn on green conflicts. May be used with a leading pedestrian interval (LPI) to address the increased numbers of vehicles turning right on green.

Considerations

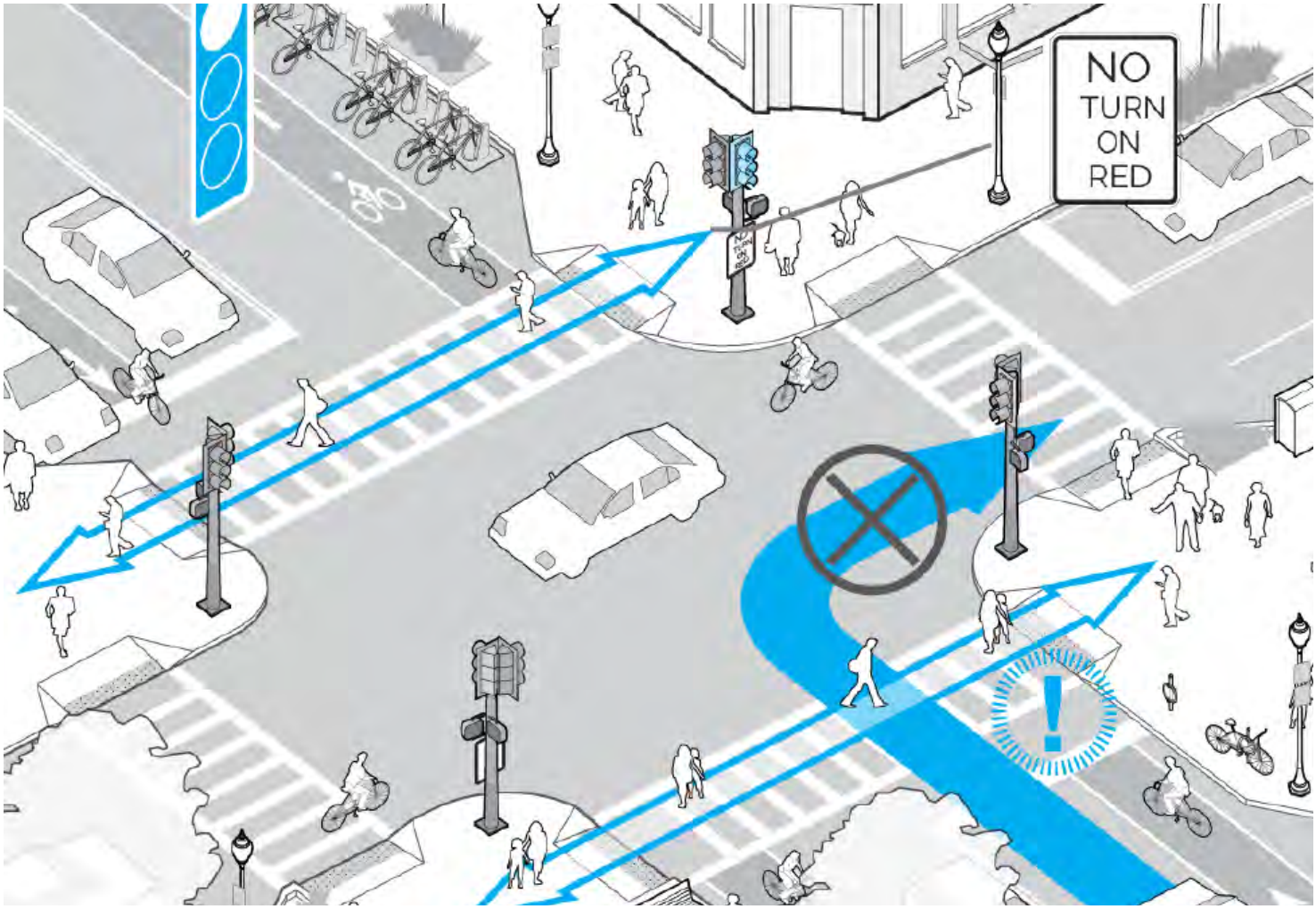
- Research indicates that dynamic signs may be more effective at reducing motorists turning right on red.
- Restricting right turns on red during times of high pedestrian volumes may be sufficient.

Systemic Safety Potential

Restricting right turns on red can be used as a systemic safety improvement in areas with frequent conflicts between turning motor vehicle and bicyclists or pedestrians.

Additional Information

- Manual on Uniform Traffic Control Devices
- PEDSAFE and BIKESAFE
- Highway Safety Manual



PARKING RESTRICTIONS AT CROSSING LOCATIONS/ DAYLIGHTING

Purpose

Improve sightlines between motorists and pedestrians or bicyclists crossing the street.

Description

Signs, pavement markings, curb extensions, or vertical delineators that restrict on-street parking near a crossing.

Estimated Cost

$ $$ $$$ $$$$

Applicable Locations

- Approaches to crossings where parked vehicles block sightlines.
- Approaches to crossings with high pedestrian volumes.

Applicable Street Types

- Downtown Boulevard
- Downtown Street
- Boulevard
- Town Center Boulevard
- Town Center Street
- Area Connector
- Neighborhood Connector
- Neighborhood Street
- Neighborhood Yield Street
- Industrial Street
- Country Connector
- Country Road

Safety Benefits

- Prevent motorists from parking in a crosswalk, giving sufficient space for pedestrians to wait to cross the street.
- Increase sightlines for all road users.
- Encourage safer turning speeds when used on crosswalks at intersections.
- Restrict illegal parking near crosswalks.

Expected Crash Reduction

30 percent for vehicle-pedestrian crashes.[26]

Design Guidance

- Parking shall be restricted at least 20 feet from the back of the crosswalk on all sides. Parking may be restricted up to 40 feet on all sides.
- In locations with sight distance obstructions, the parking restriction should be extended as necessary.
- Area with parking restriction can be defined using curb extensions, planters, painted curb, or flexible delineators.
- Install a "No Parking" sign (MUTCD R7 series).
- Install with a high-visibility crosswalk and curb ramps.

Considerations

- Converted parking spaces can be reallocated for green infrastructure or dockless vehicle.
- Parking restrictions without physical barriers are less effective and may require enforcement.
- Parking restrictions may be tailored to certain times of day.
- May require removal of existing parking space markings and possibly meters.

Systemic Safety Potential

Potential for systemic implementation at all intersections with high pedestrian crossing volumes.

Additional Information

- ITE Unsignalized Intersection Improvement Guide

PEDESTRIAN CHANNELIZATION

Purpose

Discourage pedestrians from crossing into motor vehicle travel lanes at locations with likely safety issues where other countermeasures have proven ineffective.

Description

Vertical barriers made of fences, planters, or low-growing dense plants that separates pedestrians from the roadway.

Estimated Cost

$ $$ $$$ $$$$

Applicable Locations

- Locations with pedestrian safety issues where mid-block protected crossings have been deemed infeasible and traffic calming measures have not been effective. Channelization can be located in the median or the street buffer.

Applicable Street Types

- Boulevards
- Industrial Streets

Safety Benefits

Pedestrian channelization can discourage unsafe pedestrian movements but may also introduce new safety risks, e.g., if a car driver strikes a pedestrian barrier, it is possible that the driver or a pedestrian may be injured by the barrier.

Expected Crash Reduction

A 2017 Maryland study found fewer fatal, severe, and total crashes at locations after fencing was installed in the median to discourage midblock pedestrian crossings.[27] The crash reduction benefit of barriers placed between the sidewalk and motor vehicle travel lanes has not been sufficiently studied.

Design Guidance

- Pedestrian channelization should not be implemented where it is feasible to address pedestrian safety concerns through the installation of mid-block protected crossings or traffic calming. Examples of countermeasures that should be considered before implementing pedestrian channelization are:
  - » High-visibility crosswalk markings
  - » Pedestrian crossing signage
  - » Pedestrian refuge islands
  - » Curb extensions
  - » Rectangular rapid flashing beacons (RRFBs)
  - » Pedestrian hybrid beacons (PHBs)
  - » Full signalization

  - » Road diets
  - » Lane diets
- The type of channelization depends on context. Key contextual factors include motor vehicle speeds and volumes, surrounding land use, and street cross section.
- Pedestrian channelization should direct pedestrians to preferred crossing locations and should be designed to discourage pedestrians from not complying.
- Pedestrian channelization that is installed in the motor vehicle clear zone must either be breakaway or crashworthy. The American Association of State Highway and Transportation Officials (AASHTO) Roadside Design Guide provides additional guidance on assessing clear zones and using crashworthy barriers.
- Median placement is generally preferred, particularly on streets with higher speeds and volumes due to the above-referenced need for crashworthy barriers to break away on impact, creating a risk of pedestrian injury from projectiles.
- Street buffer placement should generally be reserved for low-speed environments (30 mph or less) where there is no parking lane and there is sufficient sidewalk space to provide channelization while maintaining bidirectional accessibility for people using wheelchairs and other assistive mobility devices.
- If channelization devices are placed in the street buffer, they must be cane-detectable and visible to people with low vision. Bollards by themselves and bollards that are linked by chains or ropes or that have horizontal ornamental projections should be avoided.
- Channelizers should be set back from the curb to minimize the likelihood of being struck by a motor vehicle. The precise set back depends on a range of factors, including motor vehicle speeds and volumes and street cross section. When placed adjacent to the sidewalk, the set back should be small enough to discourage pedestrians from walking on the motor vehicle travel lane side of the channelizer.

Considerations

- Consider all options for reducing unsafe midblock crossings prior to installing pedestrian channelization.
- Consider ongoing maintenance as a factor in determining which barrier type to install.

Systemic Safety Potential

- Best suited as spot treatment

Additional Information

- FHWA Pedestrian Barriers fact sheet
- AASHTO Roadside Design Guide

PEDESTRIAN HYBRID BEACON (PHB)

Purpose

Signalized crossing for pedestrians allowing motor vehicles to proceed unless pedestrians are present.

Description

Signals at major street crossing locations that remain dark until pedestrian activates via a pushbutton. Also called High Intensity Activated Crosswalks, or HAWKs.

Estimated Cost

$ $$ **$$$** $$$$

Applicable Locations

Can be used at the midblock or at corners, but not placed in the functional area of signalized intersections. PHBs can also be used:

- Where traffic signals do not meet MUTCD warrants.
- Outside of turn lanes.
- Along bicycle routes where bicyclists must cross a major road.
- On roads with three or more lanes and where the number of daily vehicles is greater than 9,000.

Applicable Street Types

- Downtown Boulevard
- Downtown Street
- Boulevard
- Town Center Boulevard
- Town Center Street
- Area Connector
- Neighborhood Connector
- Neighborhood Street
- Neighborhood Yield Street
- Industrial Street
- Country Connector
- Country Road

Safety Benefits

- Reduce pedestrian delay.
- May reduce multiple threat crashes.
- May reduce pedestrian crossing at undesignated crossings.

Expected Crash Reduction

55 percent for vehicle-pedestrian crashes.

Design Guidance

- Install pedestrian signal heads and pedestrian pushbuttons on either side of the crossing.
- Mark crosswalk with high-visibility markings.
- May be installed with pedestrian warning sign (MUTCD W11-2 or MUTCD R1-5 series).
- See Maryland MUTCD Chapter 4f and the Montgomery County Complete Streets Design Guide for additional information.

Considerations

- Beacons are preferably placed above the crosswalk, rather than the side of the road.
- Most effective when motor vehicle speeds are too high or gaps in traffic are too infrequent or for pedestrians to cross safely.
- PHBs are not common; consider outreach efforts when implementing a PHB to educate drivers and pedestrians.

Systemic Safety Potential

- Pedestrian Hybrid Beacons have the potential for systemic implementation at crossings on multi-lane roadways with higher traffic volumes, speed limits at 30 mph or more, and longer intervals between crossings.
- Can be a systemic treatment for all midblock crossings where roadway speed limits are 40 mph or higher.

Additional Information

- NCHRP 562 & TCRP 112: Improving Pedestrian Safety at Unsignalized Intersections
- Pedestrian Hybrid Beacon Guide, Recommendations and Case Study
- FHWA Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations
- Safety Effectiveness of the HAWK Pedestrian Crossing Treatment

PROTECTED CROSSING SPACING FOR MANAGING CONFLICTS

Purpose

Create gaps in motor vehicle traffic flow for pedestrians and bicyclists to cross safely without unnecessary delay or detour.

Description

Protected crossings located along streets according to the Montgomery County Complete Streets Design Guide.

Estimated Cost

$ $$ **$$$** $$$$

Applicable Locations

Any road with pedestrian detour between protected crossings that exceeds the protected intersection spacing guidance in the Montgomery County Complete Streets Design Guide.

Applicable Street Types

All street types.

Safety Benefits

- Reduce crash risk between crossing pedestrians or bicyclists and motor vehicles through conflict elimination.
- Encourage crossing at safer locations, especially on higher speed or volume roads.
- Increase predictability of pedestrian or bicyclist and motor vehicle interactions.

Expected Crash Reduction

Varies by specific treatment selection for each protected crossing. See each treatment for crash reduction estimates.

Design Guidance

- See Complete Streets Design Guide for maximum protected crossing spacing and minimum signalized intersection spacing by street type.
- Specific design guidance for protected crossings varies based on crossing configuration and treatment selection.
- See other treatments in this toolkit for design guidance on constituent elements of a protected crossing.

Considerations

- There are instances when more frequent crossing distances are appropriate based on land use patterns or pedestrian uses along a given corridor.
- The protected crossing spacing in the Complete Street Guide should be considered a "rule of thumb" and flexibility is necessary in implementation.
- May reduce corridor vehicle capacity

Systemic Safety Potential

Consider for systemic application based on Montgomery County Complete Streets Design Protected Crossing Guide spacing guidelines.

Additional Information

- Montgomery County Complete Streets Design Guide
- FHWA Pedestrian Safety Guide and Countermeasure Selection System
- Manual on Uniform Traffic Control Devices

PROTECTED SIGNAL PHASES

Purpose

Separate vehicular turns from pedestrian and bicyclist movement to eliminate conflicts.

Description

Green- or red-arrow signals to restrict left or right motorist turning, allowing pedestrians and bicyclists to use crossings without interactions from turning vehicles.

Estimated Cost

$ $$ $$$ $$$$

Applicable Locations

- Intersections with high turning volumes.
- Intersections in urban areas.
- Intersections with a high volume of pedestrians or bicyclists.

Applicable Street Types

All street types.

Safety Benefits

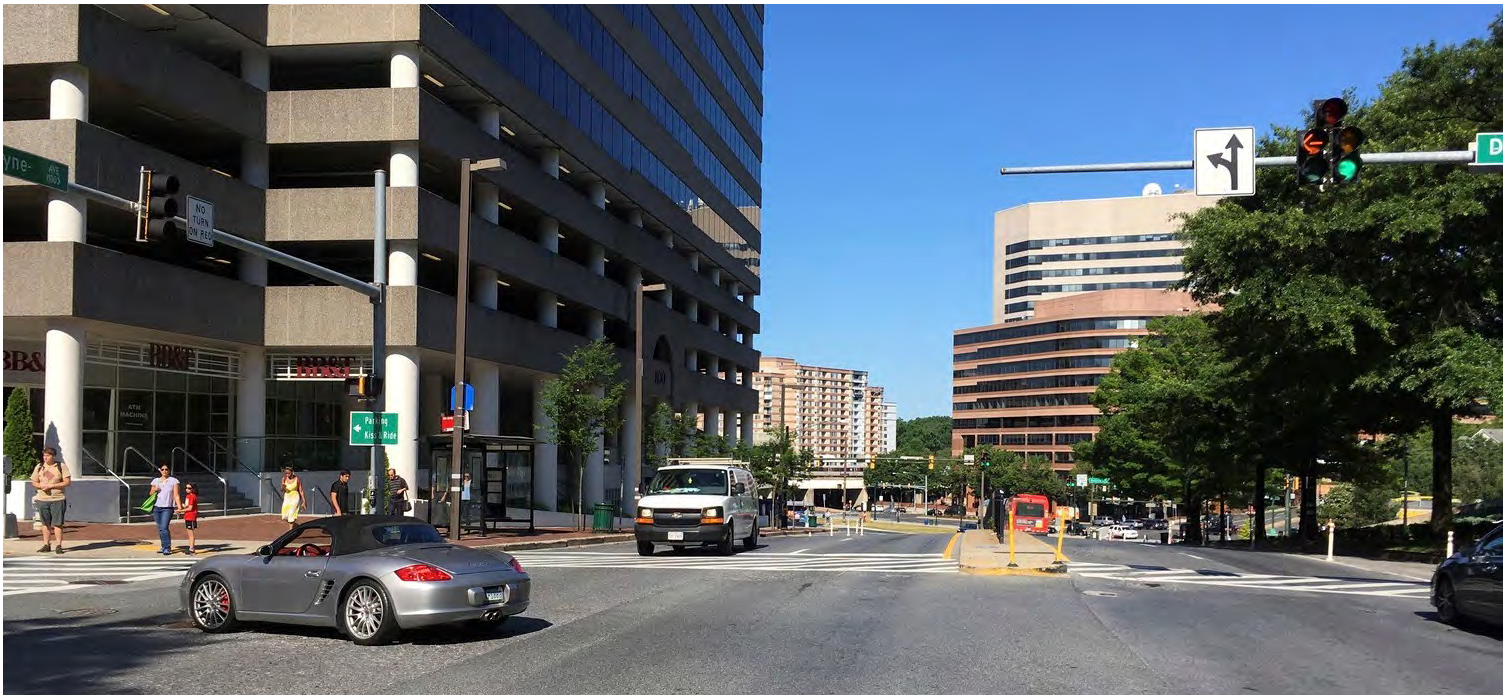
- Eliminate conflicts between turning vehicles and road users crossing parallel to traffic.
- Reduce instances of motorists turning at higher speeds and "sneaking" through intersections during yellow or red signal phases.

Expected Crash Reduction

36 percent for exclusive pedestrian phase for vehicle-pedestrian crashes.[28]

Design Guidance

- Install green- or red-arrow capabilities in traffic signals.
- Can be used for both right turning and left turning vehicles.



- When restricting right turns, install a “No Right Turn on Red” sign (MUTCD R10-11 series).
- Exclusive left turn lanes support protected left turn phasing.

Considerations

- Needs of pedestrians, bicyclists, trucks, buses, and motor vehicles should be considered.
- Consider volume of motorists turning left and right.
- May reduce intersection vehicle capacity and increase vehicle queuing and blocking.

Systemic Safety Potential

Useful as a systemic safety improvement at locations with a history of serious injury or fatal right- or left-turn crashes, or at high-risk locations with the same roadway and land use characteristics.

Additional Information

- PEDSAFE: Pedestrian Safety Guide and Countermeasure Selection System
- FHWA Traffic Signal Timing Manual, Chapter 4

POROUS FLEXIBLE SIDEWALK PAVEMENT

Purpose

Create an accessible sidewalk free of tripping hazards while protecting tree roots.

Description

Made of recycled tire granules, dry aggregate, and urethane binder, porous flexible pavement can be used as a sidewalk material in cases where tree roots have or could cause sidewalk damage and uplifting.

Estimated Cost

$ $$ $$$ $$$$

Applicable Locations

- Sidewalks within a tree root zone

Applicable Street Types

All street types.

Safety Benefits

Porous flexible pavement can make sidewalks safer by eliminating sidewalk tripping hazards caused by uplifting from tree growth, root expansion, and freeze-thaw cycles. Porous flexible pavement may also reduce the risk of pedestrians slipping in icy or wet conditions.

Expected Crash Reduction

Not applicable.

Design Guidance

- As with conventional sidewalk materials, porous flexible pavement requires subgrade preparation and a subbase.
- The subbase should consist of coarse aggregate layered to a minimum depth of 4 inches or as recommended by the manufacturer.
- A fabric barrier should be installed between the subgrade and subbase to prevent tree and plant roots from growing into the pavement.
- Porous flexible pavement used on sidewalks should be at least 1.5 inches thick.
- It is recommended that an arborist be present during construction to address root pruning and other tree-related needs.

Considerations

- Slopes formed by the use of porous flexible pavement must remain within Americans with Disabilities Act (ADA)-accessible thresholds.
- Porous flexible pavement comes in several standard colors. Custom colors can also be developed, making it easier to approximate existing sidewalk colors.
- Depending on the installation location, porous flexible pavement may need periodic cleaning to maintain its porosity and prevent weed growth in the pavement. Cleaning can be accomplished with a broom, a blower,

or water at low pressure. If the pavement becomes heavily silted, a vacuum may be needed.

- Do not use pressure cleaners, abrasive devices, or heavy equipment on porous flexible pavement.

Systemic Safety Potential

The systemic use of porous flexible pavement may reduce pedestrian injuries caused by tripping on uneven or broken sidewalks.

Additional Information

- Montgomery County Permeable Pavements Methods, 2017, www.montgomerycountymd.gov/DPS/Resources/Files/Land_Development/PermeablePavements.pdf
- The District Department of Transportation (DDOT) Green Infrastructure Standards, 2014, ddot.dc.gov/sites/default/files/dc/sites/ddot/publication/attachments/2014-0421-DDOT%20Green%20Infrastructure%20Standards.pdf

RAISED CROSSING

Purpose

Reduce vehicle speeds, increase motorist yielding, and improve bicyclist and pedestrian crossing safety.

Description

Crossings elevated at least three inches above the roadway, up to the sidewalk level.

Estimated Cost

$ **$$** $$$ $$$$

Applicable Locations

- Raised crossings are a treatment option often used at the midblock. However, intersections can also have raised crosswalks or the entire intersection can be raised.
- Roadways with a posted speed of 30 mph or lower.
- Common on school campuses, at shopping centers, and in pick up/drop off zones.

Applicable Street Types

- Downtown Street
- Town Center Street
- Area Connector
- Neighborhood Connector
- Neighborhood Street
- Neighborhood Yield Street

Safety Benefits

- Increases pedestrian prominence in motorist field of vision.
- May reduce vehicle speeds and improve motorist yielding.
- Provides flatter surface for pedestrians with disabilities.

Expected Crash Reduction

45 percent for pedestrian crashes.[29]

51 percent for bicycle-motor vehicle crashes on entrances or exits to streets and driveways.[30]

Design Guidance

- Place ramps on each vehicle approach.
- Raised crossings are often demarcated with different

paving materials and additional paint markings.

- Mark the crossing with high-visibility crosswalk markings.
- Install with applicable warning sign (MUTCD W11-1, W11-2, W11-15, or S1-1).
- Raised crossings do not require curb ramps, though truncated domes should be included at each crossing entrance.

Considerations

- Raised crossings at sidewalk level are preferred for pedestrian accessibility and comfort, and safety.
- Raised crossings should not be used on steep curves or roadways with steep grades.
- May be used for bicyclists along crossings for shared use paths and sidepaths.
- Consider drainage needs.
- Further consideration is needed for roadways heavily used by trucks, buses, and emergency vehicles.

Systemic Safety Potential

Best suited as a spot treatment.

Additional Information

- Field Guide for Selecting Countermeasures at Uncontrolled Pedestrian Crossing Locations
- FHWA Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations

RAISED MEDIANS

Purpose

Restrict motor vehicle turn movements, reduce head-on collisions, and provide refuge for crossing pedestrians.

Description

Continuous raised medians are curbed sections in the center of a roadway that separate opposing directions of motor vehicle travel.

Estimated Cost

$ **$$** $$$ $$$$

Applicable Street Types

All street types.

Safety Benefits

- Reduce potential conflict points by minimizing motor vehicle left turns.
- If six feet or greater, allow pedestrians to cross one direction of vehicle travel at a time.
- Reduce pedestrian crossing distance.
- Reduce vehicular turning speeds.
- Provide space for additional lighting at the crossing.
- Can improve motorist safety where a continuous raised median replaces continuous two-way center turn lanes.

Applicable Locations

- At intersections.
- Along the entire block.
- At midblock crossings.
- Across intersections where it is desirable to restrict motor vehicles turning left due to insufficient yielding or excessive speeds.

Expected Crash Reduction

46 percent of all crashes at raised medians.[31]

Design Guidance

- Medians may be landscaped or paved with a material different to that of the roadway.
- Continuous raised medians require 6 feet width to provide pedestrian refuge or 8 feet width to provide bicyclist refuge.
- Crossings must have ramps or cut-throughs to be accessible.

Considerations

- Landscaping can be added along the median, but vegetation at any crossings should not obstruct visibility for the pedestrian or motorist.
- May increase vehicle through speeds.
- Emergency vehicles may need to travel in lanes of opposing direction of travel.
- Continuous raised medians use space that can be used for bike lanes or wider sidewalks.
- Wide medians increase the pedestrian crossing distance if they do not replace travel lanes.
- Can be installed with an active warning beacon at midblock crossings.
- Pedestrian refuge is needed where motor vehicle speeds are above 30 mph and average motor vehicle volumes are above 9,000 vehicles per day.

Systemic Safety Potential

May be applied as a systemic safety improvement on corridors where motor vehicles do not sufficiently yield to pedestrians or bicyclists.

Additional Information

- Chapter 8 of Designing Sidewalks and Trails for Access: Part II of II: Best Practices Design Guide
- American Disabilities Act Accessibility Guidelines for Buildings and Facilities
- FHWA Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations
- FHWA Proven Safety Countermeasures

RECTANGULAR RAPID FLASHING BEACON (RRFB)

Purpose

Increase driver yielding to pedestrians at mid-block crossings.

Description

Bright, irregularly flashing LEDs, mounted with pedestrian crossing signs, which increase pedestrian visibility to drivers at uncontrolled crossings.

Estimated Cost

$ **$$** $$$ $$$$

Applicable Locations

RRFBs are a treatment option at many types of unsignalized pedestrian crossings, including at standard pedestrian, school, or trail crossings.

- RRFBs are particularly effective at multilane crossings with speed limits under 40 mph.[32]
- Consider a Pedestrian Hybrid Beacon (PHB) for roadways with multiple lanes and higher speeds.

See Complete Street Design Guide for detailed list of acceptable speeds, volumes and lanes that Montgomery County would consider the use of an RRFB.

Applicable Street Types

- Downtown Boulevard
- Downtown Street
- Boulevard
- Town Center Street
- Area Connector
- Neighborhood Connector
- Neighborhood Street
- Neighborhood Yield Street
- Industrial Street
- Country Connector
- Country Road

Safety Benefits

- Increases driver yielding.
- May increase effectiveness of other safety treatments, such as advance yield markings with "YIELD HERE FOR PEDESTRIAN" signs.
- More effective than traditional overhead beacons.[33]
- At multilane crossings, multiple threat crashes still exist.

Expected Crash Reduction

47 percent for vehicle-pedestrian crashes.[34]

Design Guidance

- Place on both sides of an uncontrolled crosswalk.
- If pole-mounted, place below a W11-2 (Pedestrian), S1-1 (School), or W11-15 (Trail) crossing warning sign and above a diagonal downward arrow (W16-7P) plaque.
- May also be used with an overhead-mounted W11-2, S1-1, or W11-15 crossing warning sign, located at or immediately adjacent to an uncontrolled marked crosswalk.
- If sight distance approaching the crosswalk is limited, an additional RRFB may be installed on the approach with a post-mounted W11-2, S1-1, or W11-15 sign with an AHEAD (W16-9P) or distance (W16-2P or W16-2aP) plaque. Consider other treatments in these locations.

Considerations

- RFBs should not be used in conjunction with "Yield," "Stop," or traffic signal control (except at roundabouts).
- If multiple RRFBs are needed in close proximity, consider redesigning the roadway to address systemic safety challenges.
- Other treatments may be more appropriate in locations with sight distance constraints.

Systemic Safety Potential

Spot treatment or targeted systemic locations, such as trail or school crossings are appropriate. Broad application suggests other treatments such as speed reduction or roadway redesign may be necessary.

Additional Information

- Montgomery County Complete Streets Design Guide
- FHWA Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations
- Maryland Manual on Uniform Traffic Control Devices

SHARED STREETS

Purpose

Prioritize pedestrian and bicycle movement by slowing vehicular speeds and communicating clearly through design features that motorists must yield to all other users.

Description

Streets designed such that pedestrians and bicyclists can walk or ride on the street and cross at any location, rather than at designated locations.

Estimated Cost

$ $$ $$$ **$$$$**

Applicable Locations

Urban streets where it is desirable to prioritize walkability and slow traffic speeds to enhance livability and economic development goals.

Applicable Street Types

- Downtown Streets
- Town Center Streets

Safety Benefits

- Slower traffic speeds reduce severity of collisions.
- Slower speeds plus pedestrian/bicycle-centric design disincentivize vehicular traffic.
- Lack of curbs encourage cautious behavior on the part of all users.

Expected Crash Reduction

40 percent reduction in crashes on Dutch streets that had been converted to shared streets.[35]

Design Guidance

- Shared streets should not have vertical curbs, so that pedestrians can use the entire right-of-way. A lack of curbs encourages cautious behavior on the part of all users, which in turn reinforces slower speeds and comfortable walking and bicycling conditions.
- Motor vehicle speeds should not exceed 15 mph at any time.
- Shared street gateway treatments should inform drivers they are entering a shared space. Common ways to do so include:
    - Narrowing entrances to one lane.
    - Elevating the street to the pedestrian level.
    - Using a colored or textured pavement.
- Traffic volumes should not exceed 100 vehicles in the peak hour.

Considerations

- The curbless nature of shared streets enhances universal access.
- Street zones may be delineated with pavement materials, color, bollards or street furniture.
- Sidewalk space in front of buildings should be paved with a surface that is smooth and vibration-free.
- Stormwater on shared streets can be captured using valley gutters, additional inlets and/or bioswales or other green infrastructure.
- A shared street may be closed to motor vehicles to host public events. Care should be taken to maintain access for bicyclists when it is closed to vehicles.

Systemic Safety Potential

Best suited as a spot treatment.

Additional Information

- Minneapolis Shared Street Study

SPEED HUMPS, TABLES, AND CUSHIONS

Purpose

Reduce motor vehicle speeds.

Description

Speed humps are paved ramps measuring 3- to 4-inches high that extend the full width of the street. Speed tables are wider or have a flat top. Speed cushions have wheel cutouts to allow emergency vehicles and bicyclesto pass through unaffected.

Estimated Cost

$ **$$** $$$ $$$$

Applicable Locations

- Vertical traffic control measures such as speed humps, tables, and cushions are best used on streets with lower motor vehicle speeds and volumes.
- Useful in areas where traffic calming is needed, such as near schools.

Applicable Street Types

- Downtown Boulevards
- Downtown Streets
- Town Center Boulevards
- Town Center Streets
- Area Connector
- Neighborhood Connectors
- Neighborhood Streets
- Neighborhood Yield Streets
- Industrial Streets

Safety Benefits

- Reduce motor vehicle speeds.
- May reduce the frequency and severity of crashes for all road users.

Expected Crash Reduction

A definitive crash reduction estimate has not been established. Research suggests speed humps, tables, and cushions reduce crash severity.[36]

Design Guidance

- Install speed humps perpendicular to the flow of traffic.
- Speed humps and tables can be paved or painted to warn motorists and to be visually pleasing.
- Speed humps can be placed periodically along a route to reinforce speed control.
- Well-designed speed humps, tables, and cushions allow vehicles and people riding bikes to proceed over the device at the intended speed with minimal discomfort.
- Do not install on the curve of the roadway.

Considerations

- Consider priority and delay of emergency response vehicles, truck or public transit use of the street, street type, and effectiveness of slowing vehicles versus bicyclist comfort level.

- A pedestrian crossing can be provided on the flat portion of a speed table – also referred to as a "raised crossing." See raised crossing treatment in this toolkit for more details.
- May create drainage problems.
- Many speed humps in a succession may cause problems for buses.
- Investigate feasibility of other traffic calming measures first. Speed humps are typically a last-resort treatment.

Systemic Safety Potential

Best suited as a spot treatment.

Additional Information

- PEDSAFE Countermeasures Guide
- Manual on Uniform Traffic Control Devices
- AASHTO Guide for the design of Bicycle Facilities

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ENGAGEMENT APPENDIX

MONTGOMERY COUNTY'S
PEDESTRIAN PLAN

Montgomery Planning

INTRODUCTION

Montgomery Planning began the Pedestrian Master Plan process in 2019 with a series of meetings across the county and has not stopped engaging with the community since that time. Using innovative engagement tools during a time of unprecedented public health challenges that made face-to-face meetings difficult, the Project Team was adamant about engaging in ways that were respectful of participants' time and provided input that directly influenced Plan recommendations.

Once approved, these Plan recommendations, supported by data, will transform how our entire region thinks about and plans for the pedestrian experience. With each step, Montgomery Planning has worked to incorporate community voices into thinking through how the county can retrofit its auto-oriented infrastructure to make walking and rolling safer and more comfortable for county residents and visitors. This is a summary of Montgomery Planning's county-wide community engagement efforts for the Pedestrian Master Plan from 2019 through 2022.

COMMUNICATIONS APPROACH

The development of the Pedestrian Master Plan started with a community dialogue. The discussions, strategizing, collaboration, and public engagement provided multiple venues for sharing concerns from across the county about pedestrian safety and connectivity with the expectation that the agencies responsible would take appropriate action.

The communications approach intended to bring walking to the forefront of public discourse for a time, highlighting the county's existing walking culture, leading to more public and political support, and making the topic more salient for staff across agencies. Sadly, engagement was also heightened due to media attention around severe and fatal crashes involving pedestrians and cyclists in Montgomery County during the planning period.

"IT ALL STARTS WITH A COMMUNITY DIALOGUE!"

The communications approach was focused on two things:

1. Engaging audiences to inform the plan itself through discussion of barriers to pedestrian travel, dialogue about needed improvements, and appraisal of draft recommendations, as well as
2. Educating audiences about the importance and benefits of walking as a mode of transportation and recreation for individuals and communities.

The approach was implemented through traditional public meeting engagement, and an overarching walking awareness campaign that included community story-capturing/telling mixed with statistics about existing conditions, as well as information on potential improvements to the pedestrian experience.

Equity and inclusivity were core tenets of the communications approach. This included considerations for geographic differences, socioeconomic diversity, and persons with vision, hearing and mobility issues.

GOALS: THE TARGET

The primary goals of the communications plan are to engage and equip residents as potential allies in support of the broader plan goal to enhance Montgomery County's pedestrian culture and improve the experience of walking and rolling countywide.

Project Goals

GOAL 1 | Develop county-wide policy and programmatic recommendations, prioritize infrastructure improvement, and insist on pedestrian forward-design

GOAL 2 | Improve the pedestrian experience in Montgomery County by making it comfortable, convenient, safe, and direct to walk and roll

GOAL 3 | Enhance a walking culture in Montgomery County by encouraging walking as a choice travel mode for all trips within walkable distance and improving accessibility for all walkers

Communications Goals

GOAL 1 | Engage residents and community groups to:

- Inform the plan process by sharing their pedestrian stories, challenges and dreams and assisting in prioritizing infrastructure improvement recommendations.
- Understand the conditions that enhance pedestrian safety and comfort.
- Appreciate the benefits of walkable communities and realize the currently walkable destinations within their communities.
- Feel confident that Montgomery Planning and Montgomery County government are committed to improving pedestrian comfort and safety

GOAL 2 | Equip individuals and citizen groups to advocate for policy, design and infrastructure improvements to the pedestrian realm and become a vocal constituency for these improvements, both in their neighborhoods and countywide

GOAL 3 | Gain support from/cooperation with partner agencies for implementing Pedestrian Master Plan recommendations

GOAL 4 | Seek opportunities for synergy with and efficiencies in communicating when Pedestrian Master Plan topics intersect with Vision Zero and other related plan conversations

COMMUNICATIONS TACTICS

All tactics were designed to be accessible to diverse audiences in Montgomery County. The Communications team developed language-specific and ADA-compliant communications in consultation with the project team.

1 | WALKING HERE CAMPAIGN - Develop and implement an overarching "Walking Here" campaign to:

a. Raise the profile of walking as a transportation mode in the county.

b. Encourage community members to share why they walk (or why they used to walk but stopped), where they're walking, what they love about it, what they experience while walking and/or what improvements would help walking be safer, more efficient, and more enjoyable.

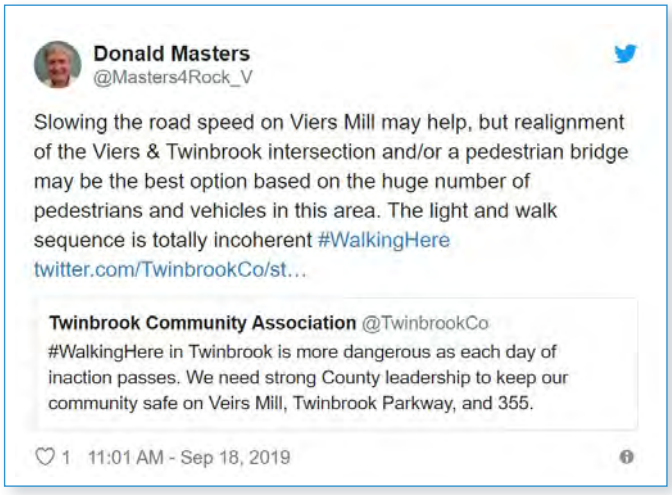
c. Highlight where walking happens to encourage awareness for those using other modes of transportation (e.g., drivers, bicyclists).

d. Show examples of walkable communities within the county, and show where improvement is needed.

e. Share walk stories, best practices, data and information on walking benefits and the walking experience in Montgomery County.

A creative campaign was developed using the cutline "walking here" and hashtag #walkinghere to show people walking and encouraging people to share their walk experiences and stories. This creative concept carried through nearly all Pedestrian Master Plan communications and was applied to a social media campaign, ads, blog posts, video interviews, marketing collateral including giveaways, roadside/sidewalk-side/trailside signage, etc. During the initial phase of engagement, this campaign focused on collecting walk stories. Over time, it evolved to share information on best practices and obstacles to ideal pedestrian environments.

#WALKINGHERE



Rachel Taylor
@rachelvetica

#walkinghere: love too have to step over lumpy clumps of overgrown weeds that are growing in the unkempt cracks between sidewalk panels! (I was initially biking on this sidewalk, but the weed clumps got to be too much to roll over so I switched to walking)

♡ 6 3:53 PM - Sep 28, 2019

Jane Lyons
@janeplyons

Hey, I'm #walkinghere!

♡ 27 9:32 AM - Sep 17, 2019 · Chevy Chase, MD

Darrel Drobnich
@DarrelDrobnich

Replying to @DarrelDrobnich @montgomeryplans

After Rockview Elementary School and across from the Palisades apartments the sidewalk literally ends at a bus stop with no where to go other than across the street without out any pedestrian markings. #Walkinghere

♡ 1 6:07 PM - Sep 15, 2019

Annie Tulkin
@TulkinAnnie

No pedestrian striping and no pedestrian signal to cross at Piney branch and Sligo. When will this fixed? 3 blocks from school and across the street from a park.@VisionZeroMC @MCDOTNow @tomhucker @hansriemer @actfortransit

♡ 4 11:46 AM - Sep 8, 2019 · Silver Spring, MD

2 | GETTING THE WORD OUT

– The Project Team designed and installed signage across the county to increase plan awareness, share information about the plan, and encourage participation at two stages in the planning process.

First, during the initial #WalkingHere engagement effort at the beginning of the COVID-19 pandemic, the Project Team placed signage along each of the county's Open Parkways (Beach Drive, Little Falls Parkway, Sligo Creek Parkway). This signage guided people using these spaces to learn more about the Pedestrian Master Plan and share their pedestrian experiences with the Project Team.

Later in the planning process, the Project Team used signage to inform community members about several draft recommendations and connect people to the complete draft recommendations list so they could weigh in on what they liked, what was missing, and what could be improved.

Signage was developed in English, Spanish, and Mandarin Chinese. Signs were placed in Montgomery Parks located in Equity Focus Areas, as well as on MCDOT RideOn buses and at bus shelters largely within equity communities (shown on the adjacent map).

Bus Service Area

Bus Shelter Locations

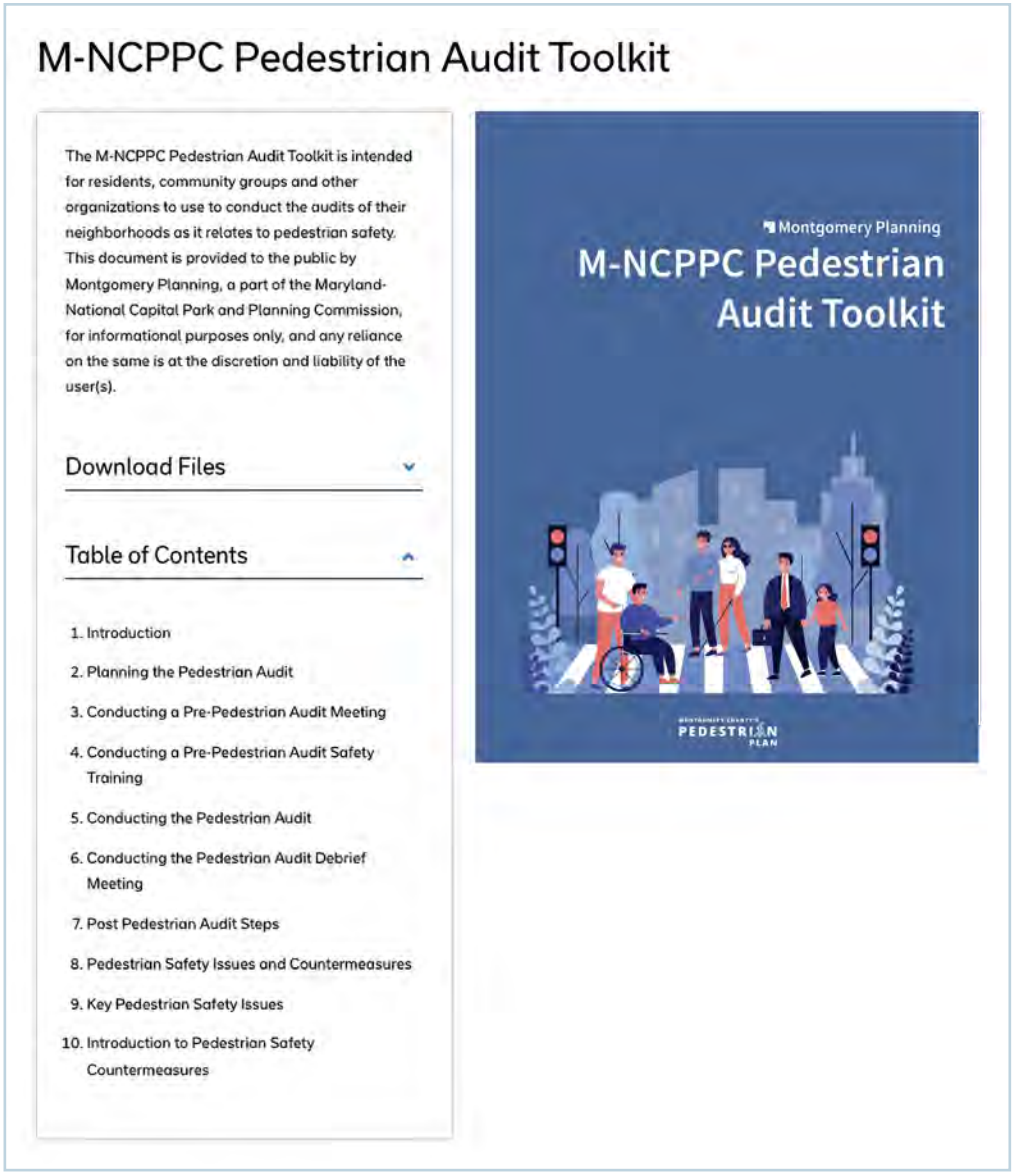
1. Briggs Chaney Rd and Old Columbia Pike
2. University Blvd and Piney Branch Rd
3. Georgia Ave and Ellsworth Dr
4. Colesville Rd and Fenton St
5. Veirs Mill Rd and University Blvd
6. Connecticut Ave and Georgia Ave
7. Randolph Rd and Veirs Mill Rd
8. Frederick Rd and Germantown Rd
9. Rockville Pike and Rose Ave
10. Arlington Rd and Montgomery La

3 | PEDESTRIAN WALK AUDITS – While the Pedestrian Master Plan recommendations are at the countywide level and do not generally address specific locations, it was important to provide a tool to build local capacity for education and advocacy around neighborhood-specific pedestrian issues and provide guidance about how those issues could be addressed.

The Project Team created the Pedestrian Audit Toolkit as a centralized resource for communities interested in planning and carrying out pedestrian audits. These audits are observation and data collection activities with the goal of improving local knowledge of pedestrian and traffic safety best practices. The audit process results in a report to be shared with relevant agencies and elected officials to better allow for potential issues to be addressed.

Published in September 2021, the Toolkit is a one-stop shop for planning the event, reaching out to attendees, identifying a route, reserving a meeting location, creating a map of identified issues, and connecting with the relevant agencies to fix those issues. To support the rollout and use of the Pedestrian Audit Toolkit, the Project Team hosted a virtual training for 61 attendees.

Initially, the Project Team intended to carry out pedestrian audits in communities across the county as a way to raise awareness of specific pedestrian issues and learn about unique pedestrian experiences, but the COVID-19 pandemic made in-person engagement infeasible during the phase of the planning process where this effort would have been most helpful.



4 | **EVENTS** - Planners engaged residents and businesses in large areas of the county through a mix of community meetings and pop-up events/tabling opportunities.

Y Walk along the eastern alignment of the Purple Line Corridor

5 **MEDIA RELATIONS** - The planning team worked with the Communications Division to write and distribute press releases for major plan moments. This included a distribution to local and regional news outlets, community groups and bloggers. In additional to the regular press releases, staff worked to create an initial strategy that focused more generally on walking in Montgomery County. Members of the media saw the #walkinghere social media campaign on Twitter, Instagram and Facebook and covered this in their print and television news stories. As the plan continued, there was more of an effort in educating key media on the technical findings and recommendations. The extra background context and time provided by the team resulted in positive press for the plan.

The Washington Post
Democracy Dies in Darkness

TRANSPORTATION

In auto-centric Montgomery, planners suggest ways to make walking safer

Montgomery County and other suburbs were designed for driving. As traffic worsens, planners are working to make walking safer and less stressful.

By Katherine Shaver

Updated July 14, 2022 at 11:06 a.m. EDT | Published July 14, 2022 at 6:00 a.m. EDT

FOX 5 WASHINGTON DC

Live News Weather More

Montgomery County wants to turn pedestrian shortcuts into actual sidewalks

By Josh Rosenthal | Published June 17, 2020 | Montgomery County | FOX 5 DC

Bethesda Magazine | Bethesda BEAT

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Government

Pedestrian master plan aims to make Montgomery County's streets safer for those walking, rolling around

Recommendations vary from physical infrastructure improvements to changing driver behavior

by Steve Bohnel July 18, 2022 6:08 pm

Other Notable Headlines

Purple Line Stations Need Safer Access for Pedestrians, Planners Say | By Katherine Shaver THE WASHINGTON POST

Montgomery County Mapping Out Neighborhood Cut-throughs to Improve Safety | By Scott Broom WUSA9

Suburbs Try Vision Zero to Protect Walkers and Cyclists On Roads Designed for Vehicles By Katherine Shaver | THE WASHINGTON POST

Montgomery County Is Trying To Make Walking Shortcuts Safer| By Jordan Pascale | DCIST

6 | COMMUNITY ADVISORY GROUP – The Project Team coordinated at major plan milestones with a group of community members. This group provided invaluable perspective in the development of plan goals and objectives, identification of pedestrian issues, and a review of plan recommendations. Specific organizations were invited to participate in this group alongside members who shared interest in pedestrian issues and were selected through an application process. The invited organizations are listed below along with the neighborhoods where the other advisory group members reside. Members represented the county's diversity with regard to race and ethnicity, geography and disability.

Invited Organizations

Action Committee for Transit
African Affairs Advisory Group
African American Affairs Advisory Group
Asian Pacific Advisory Group
Caribbean American Advisory Group
CASA de Maryland
Commission on People with Disabilities
East County Citizens Advisory Board
Latin American Advisory Group
Maryland Building Industry Association
Mid-County Citizens Advisory Board
Middle Eastern American Advisory Group
Montgomery County Coalition of Parent-Teacher Associations
Montgomery County Chamber of Commerce
Montgomery County Civic Federation
Montgomery County Regional Student Government Association
Pedestrian, Bicycle, Traffic Safety Advisory Committee
Silver Spring Citizens Advisory Board
Upcounty Citizens Advisory Board
Western Montgomery County Citizens Advisory Board

Other Member Neighborhoods

North Bethesda
Chevy Chase
Gaithersburg
Woodmoor
Shady Grove
Wheaton
Calverton
Aspen Hill
Forest Glen
Olney
Long Branch

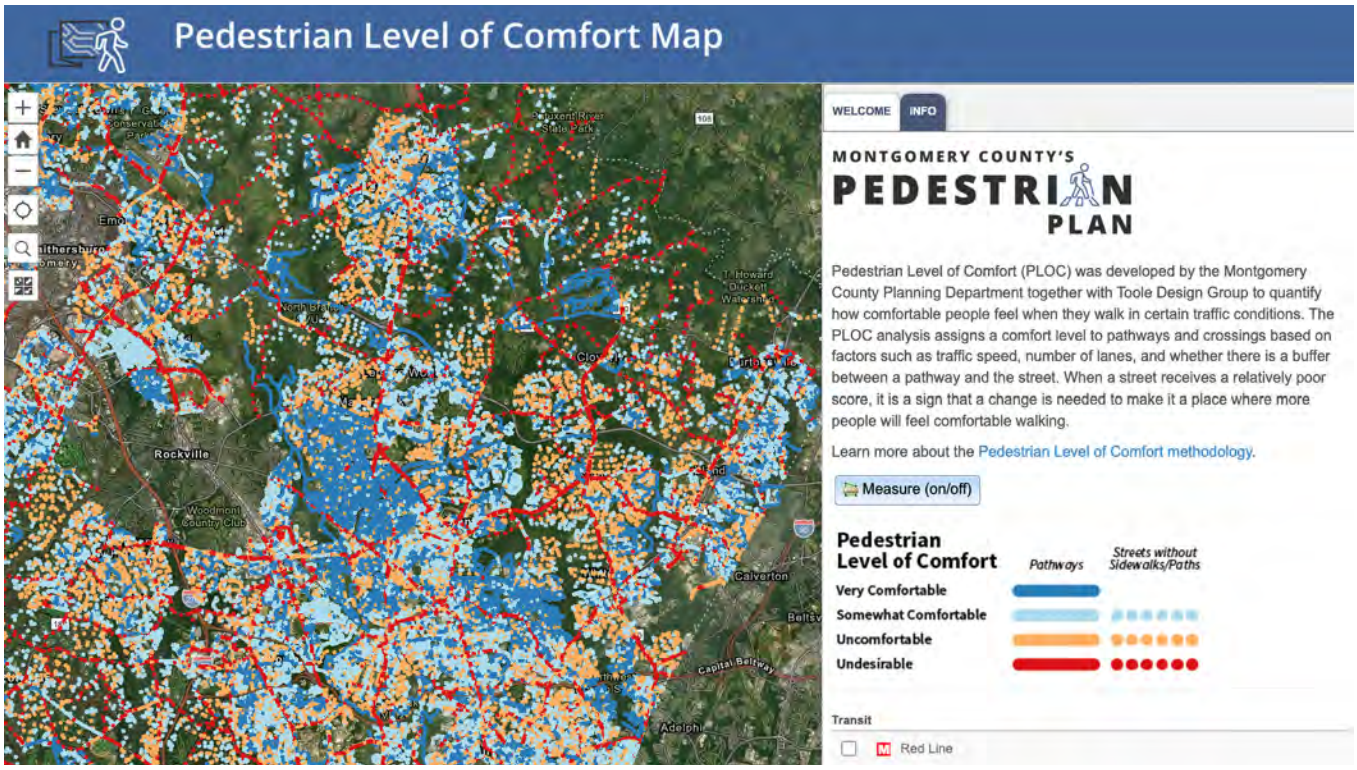
Meeting Topic	Date
Vision and Goals/Pedestrian Issues	February 27, 2020
Complete Streets Design Guide/Purple Line Pedestrian Accessibility Report	June 11, 2020
Countywide Pedestrian Survey	October 28, 2021
Existing Conditions Report	February 10, 2022
Draft Design, Policy, and Programming Recommendations	July 26, 2022

7 COMMUNITY MEETINGS

The Project Team participated in meetings hosted by community organizations and coordinated standalone plan meetings throughout the planning process.The majority of meetings took place early in the project timeline to learn more about residents' pedestrian experiences and toward the end of the project timeline to share draft recommendations and receive feedback.

Meeting	Date
Pedestrian Bicycle Traffic Safety Advisory Committee	3/28/2019
Marybeth Cleveland, Orientation and Mobility Services, LLC	4/5/2019
Juliette Rizzo Accessibility Audit	4/30/2019
Silver Spring Citizens Advisory Board, TREE Committee	6/24/2019
Silver Spring Pedestrian Safety Walk	7/17/2019
Coalition for Smarter Growth	8/7/2019
MCCPTA Arrive Alive Forum	8/24/2019
Commission on People with Disabilities	9/11/2019
Columbia Lighthouse for the Blind	9/18/2019
Montgomery Hills Street Festival	9/21/2019
Cabin John Citizens Association	9/25/2019
Commission on Aging	9/26/2019
YMCA Walk	10/5/2019
Pedestrian Master Plan Olney Kickoff	10/10/2019
Pedestrian Master Plan Fairland Kickoff	10/14/2019
Ashton Village Center Master Plan Walk Audit	10/15/2019
Pedestrian Master Plan Bethesda Kickoff	10/16/2019
Pedestrian Master Plan Silver Spring Kickoff	10/21/2019
Pedestrian Master Plan Germantown Kickoff	11/6/2019
Civic Federation	11/11/2019
Pedestrian Master Plan Wheaton Kickoff	11/13/2019
Capitol View Civic Association	11/21/2019
Getting All Around the County	12/4/2019
Commission on Children and Youth	1/8/2020
National Capital Area Chapter of the American Council of the Blind of Maryland	1/16/2020
Action Committee for Transit	2/11/2020

Meeting	Date
North Bethesda Transportation Management District Advisory Committee	2/19/2020
League of Women Voters	2/24/2020
Montgomery College Career Pathways	8/11/2020
Commission on People with Disabilities	12/9/2020
Association for Safe International Road Travel	2/9/2021
Rockville Pedestrian Advisory Committee	3/11/2021
Ashton Alliance / Sandy Spring Civic Association	6/9/2021
Pedestrian Audit Toolkit Training	9/28/2021
Seven Oaks-Evanswood Citizens Association	10/6/2021
Commercial Real Estate Development Association	4/12/2022
Commission on People with Disabilities	5/11/2022
Pedestrian Bicycle Traffic Safety Advisory Committee	5/26/2022
Greater Olney Civic Association	7/12/2022
Western Montgomery County Citizens Advisory Board	7/18/2022
Wheaton Ad-Hoc Pedestrian Advocates	7/20/2022
Action Committee for Transit	8/9/2022
Getting All Around the County	8/9/2022
Virtual Pedestrian Master Plan Draft Recommendations	9/7/2022
Silver Spring Citizens Advisory Board	9/12/2022
Pedestrian Master Plan Draft Recommendations	9/13/2022
Commission on People with Disabilities	9/14/2022
Mid-County Citizens Advisory Board	9/15/2022
Commission on Veterans Affairs	9/20/2022
Joint Transportation Management District Advisory Committee	9/28/2022
Civic Federation	10/10/2022
Kensington Town Council	10/11/2022
National Capital Area Chapter of the American Council of the Blind of Maryland	10/20/2022
Destination Germantown	10/27/2022
Upcounty Citizens Advisory Board Land Use Committee	11/7/2022
East County Citizens Advisory Board Planning and Economic Development Committee	12/12/2022



The Pedestrian Level of Comfort Map allows community members to visualize the varying comfort of the county's sidewalks, pathways, trails and street crossings for pedestrians. Users can pan and zoom around the county map, clicking on different colored pathways and crossing segments to learn about their scoring based on current conditions

8 **INTERACTIVE ENGAGEMENT** – The COVID-19 pandemic required the Project Team to be more creative about how to effectively engage with the community, collecting essential input while keeping everyone safe.

Pedestrian Level of Comfort,

Before the pandemic, the Project Team developed an interactive map (www.mcatlas.org/pedplan) to share information about the Pedestrian Level of Comfort (PLOC) data collection underway at the time. The map encouraged users to view videos of pedestrians walking in specific locations and share whether the comfort score of those locations met their expectations. Continuing the theme of responsibly using community input in the planning process, planners adjusted the PLOC scoring approach based on this feedback. To date, this map has been viewed 8,700 times.

Pedestrian Shortcuts

Building on the success of the PLOC engagement effort, Planning staff developed a map and survey tool for members of the public to identify the location of pedestrian shortcuts they were familiar with (www.mcatlas.org/pedshortcuts). A Pedestrian Shortcut is an informal pedestrian connection not along a street that provides a more direct pedestrian route than the sidewalk and trail network. Also known as a "people's choice path," a "desire line" or a "goat path," an existing pedestrian shortcut may look like trodden grass, dirt, gravel or pavement that has fallen into disrepair. These connections are not currently sidewalks or trails, but provide important, time-saving benefits for pedestrians interested in making direct trips to local destinations. Many people use these connections daily to

run errands, get to work or school, connect to public transportation, and exercise. This shortcut information would not have been feasible for Planning staff to collect without community participation. 635 shortcuts from across the county were drawn on the map and the Project Team has identified 310 shortcuts to be master-planned and ultimately improved through private development or public capital projects. To date, the interactive map and survey have been visited more than 8,500 times.

Prioritization

Most recently, the Project Team created a prioritization and visualization tool to provide a way for community members to share their perspectives on how different factors should guide where pedestrian projects are prioritized for planning, design, and construction in Montgomery County moving forward. In addition to providing input, the tool was an effort to make data-driven prioritization more transparent and the planning process more accessible.

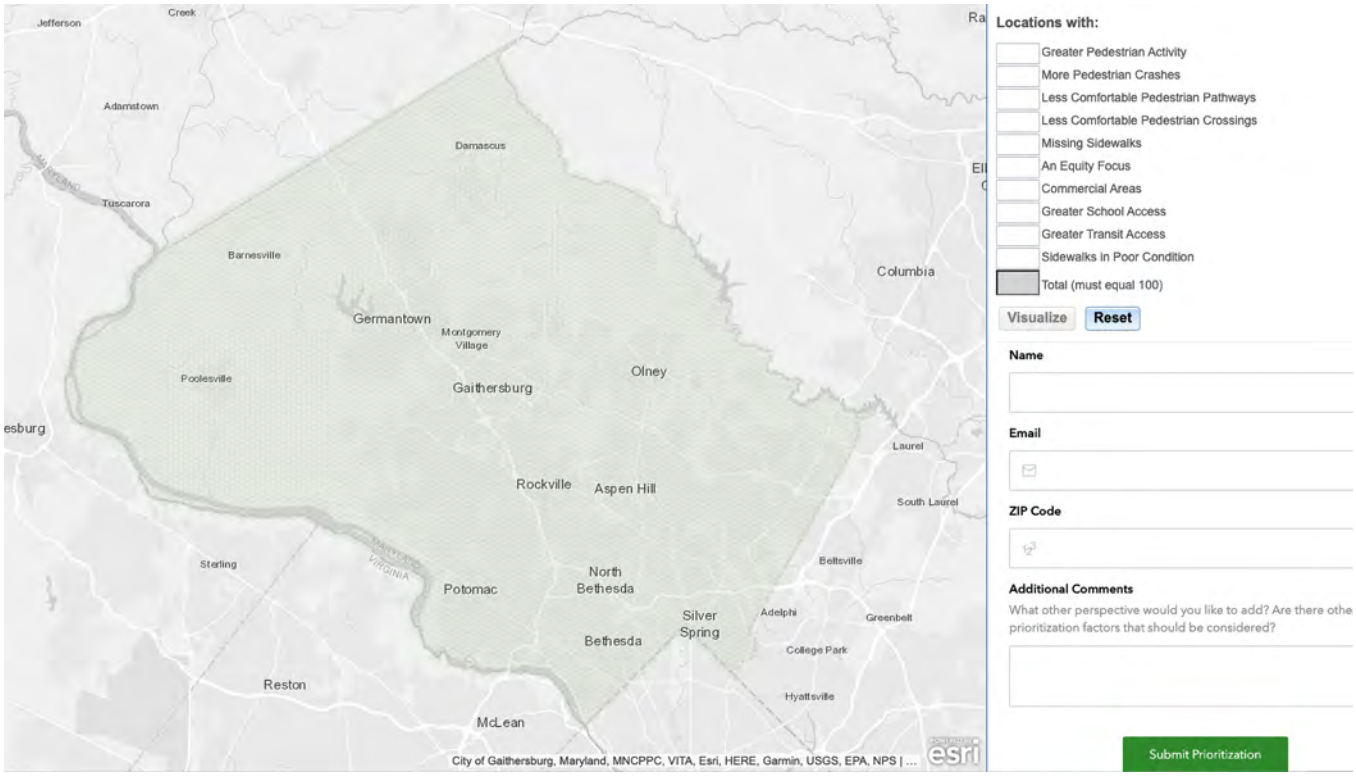
To share feedback, users were asked to allocate 100 points among the following prioritization factors, assigning more points to those factors they think should be given more consideration when setting priorities:

- **Greater pedestrian activity:** Places where more people are walking today, based on a model developed by Montgomery Planning's Predictive Safety Analysis
- **More pedestrian crashes:** Places where the most crashes that harm pedestrians take place based on police crash reports
- **Less comfortable pedestrian pathways:** Places with more pathways (sidewalks, trails, or streets without sidewalks) that score as Undesirable in the Pedestrian Level of Comfort analysis (e.g. narrow/missing sidewalks, sidewalks adjacent to high speed roads with narrow or missing street buffers, etc.)
- **Less comfortable pedestrian crossings:** Places with more street-crossing locations that score as Undesirable in the Pedestrian Level of Comfort analysis (e.g., four to six lanes of high-speed traffic to cross, no traffic signal or stop sign to enable crossing, etc.)
- **Missing sidewalks**: Places with more gaps in sidewalk coverage along non-residential streets
- **An Equity Focus:** Places identified by Montgomery Planning as having high concentrations of lower-income people of color, who may also speak English less than very well
- **Commercial areas:** Places that meet the definition of Downtowns or Town Centers in the county's Complete Streets Design Guide
- **Greater school access:** Places where more people can walk to a Montgomery County Public School
- **Greater transit access:** Places where more people can walk to a WMATA Metrorail station, MARC station, planned Purple Line station, or Bus Rapid Transit station
- **Sidewalks in poor condition:** Places where a county survey found that inaccessible, broken sidewalks are more common

After assigning all 100 points, the user could visualize on a map where their priorities would target pedestrian improvements in the county. Darker green areas of the map are those that are higher priority.

120 community prioritization submissions were received and 918 people viewed the tool. The Project Team used the community perspectives as an input when determining the prioritization factor weights used in the Pedestrian Master Plan.

While the isolation of the COVID-19 pandemic has ebbed, future Montgomery Planning efforts will build on the innovative interactive approaches used by the Pedestrian Master Plan team to facilitate high-quality engagement during this difficult time.



Pedestrian Prioritization Tool that allows viewers to share their priorities for improving the pedestrian experience with the Project Team. The tool identifies 10 factors (characteristics or community conditions) that can help prioritize locations for pedestrian infrastructure improvements.

Countywide Pedestrian Survey

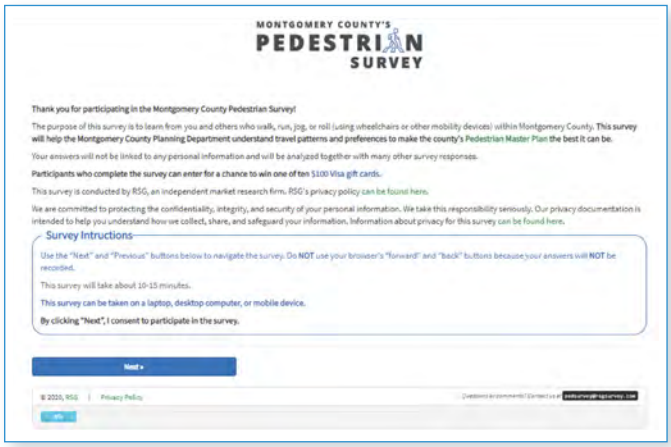
In February 2020, the Pedestrian Master Plan team completed the first ever statistically valid pedestrian survey of Montgomery County households to better understand how often and for what reasons residents are walking and rolling. Survey results were compiled at the countywide level and for three smaller areas:

- Urban (Downtowns and Town Centers) – Red
- Transit Corridors (Within one mile of transit corridors) – Blue
- Exurban/Rural (The remainder of the county) – Yellow

To capture these stories, postcards with a unique link to the online survey were sent to 60,000 randomly selected households throughout the county. In addition to English, the survey was available in Spanish and Simplified Chinese. Households in Rockville and Gaithersburg were not included because they have independent planning authority.

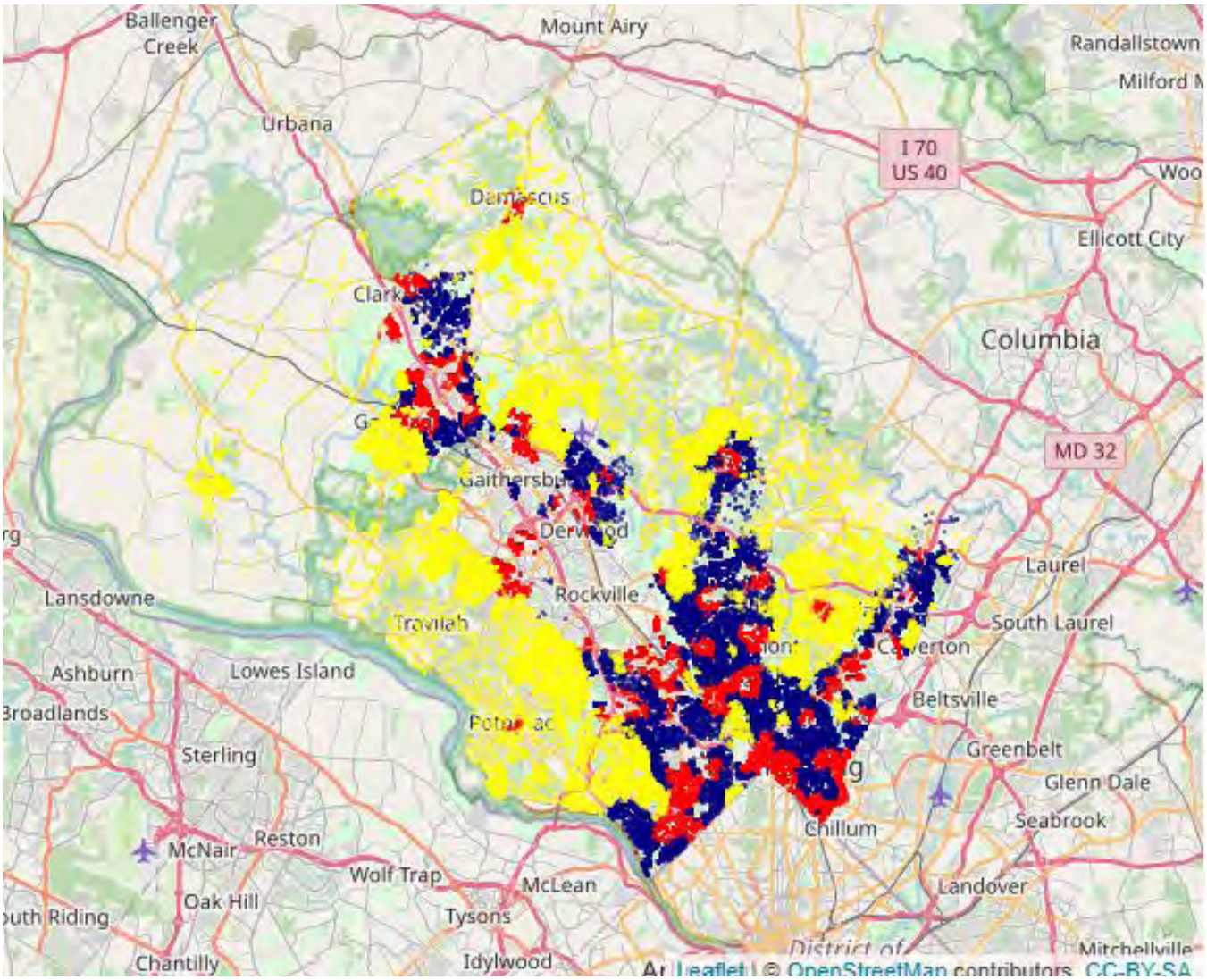
Initially, the team hoped to receive a 2% response rate but was pleasantly surprised by the final response rate of 4.1%. The strong response resulted in a countywide survey margin of error of only 2%. This means that for any given answer, there is a 95% likelihood that the survey response is within 2% of the "true" response for the county. Similarly, each smaller area has a margin of error:

- Urban: 4%
- Transit Corridors: 3%
- Exurban/Rural: 3%



Survey responses were weighted to better represent the actual demographics of Montgomery County using the American Community Survey 2018 5-Year Estimates for income, race, and Hispanic, Spanish, or Latino origin distributions for each geography to ensure the responses are appropriately representative of each area and the county as a whole. For the first time, this survey effort provides detailed insights into the pedestrian travel behavior of Montgomery County residents. The results of the survey were used to develop the Pedestrian Master Plan's Existing Conditions Report and plan recommendations. Survey results were also used to benchmark pedestrian conditions and allow future comparisons.

Full results and other findings can be found on the plan's website.


Ballenger Creek
Mount Airy
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Ellicott City
Columbia
MD 32
Laurel
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Rockville
Travilah
South Laurel
Ashburn
Lowes Island
Beltsville
Sterling
Greenbelt
Glenn Dale
Seabrook
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MONTGOMERY COUNTY'S

PEDESTRIAN PLAN

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PEDESTRIAN LEVEL OF COMFORT METHODOLOGY

MONTGOMERY COUNTY'S PEDESTRIAN PLAN

Montgomery Planning

Pedestrian Level of Comfort Methodology

Version 1.2

Montgomery County Planning Department

December 21, 2020

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.[1] 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 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.[2]

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.[3] 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

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

[1] 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.
[2] 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.
[3] 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/.

pedestrians to "shy" away from travel lanes, thereby reducing the effective width of the pathway.[4] 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.[5] [6] 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

[4] San Francisco Department of Public Health. 2012. "Pedestrian Environmental Quality Index: Street Auditor's Manual." San Francisco, CA.
[5] Ibid.
[6] 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)

Pathway Condition

Research indicates that pathway condition affects pedestrian comfort and this variable is included in other leading pedestrian comfort indices.[7] [8] [9] Montgomery County is currently collecting information about pathway condition throughout the county including cross slope (helps drain water and prevent pooling), tripping hazards, cracks, severe spalling (surface peeling or cracking of concrete), obstructions (to be accounted for in the Accessibility Evaluation), and missing sections. A sample survey is provided below.

HOT BUTTONS							
Ramps		**Pathways**		**Crosswalks**		**Bus pads**	
Detectable Warning Surface (DWS)	Yes/No	**Surface Type**	Concrete, Asphalt or Other	**Slope**		**Minimum Size (5' x 8')**	Yes/No
DWS Type	Cast in Place, Nail Down or Other	**Width**	In Feet	**Marking Type**	Solid, Standard, Continental, Dashed, Zebra, Ladder, None	**Bus Stop Connected to Pathway (100' of pathway or nearest intersection)**	Yes/No
DWS Color	Red, Yellow, Gray or Other	**Cross Slope (2% or less but greater than 0)**	Yes/No	**Centered with Ramp**	Yes/No	**Midblock**	Yes/No
DWS Size	In Feet	**Trip Hazard 1/4" or greater**	Yes/No	**Pedestrian Signal**	Yes/No		
Ramp Width	In Feet	**Multiple Cracks in one section**	Yes/No	**Pushbutton**	Yes/No		
Ramp Slope (8.33% or less)	Yes/No	**Severe Spalling**	Yes/No	**Pushbutton**	Heights, Distance from Pathway, Raised Tactile, Tone, Audible Indication, Actuated Indicator		
Ramp Landing area (2% or less)	Yes/No	**Obstructions (less than 36" opening)**	Yes/No				
Ramp Landing Area (5' x 5')	Yes/No	**Obstruction Type**	Utility, Vegetation, Sign or Other				
		Missing Sections Lengths	In Feet				

Montgomery County Pathway Condition Survey

[7] Clifton, Kelly J., Andrea D. Livi Smith, and Daniel Rodriguez. 2007. "The development and testing of an audit for the pedestrian environment." Landscape and Urban Planning; 95-110.
[8] San Francisco Department of Public Health, 2012.
[9] Oregon DOT. 2018. "Multimodal Analysis." Chap. 14 in Analysis Procedure Manual.

In the PLOC, pathway condition is calculated based on the total number of issues counted on a given segment. For example, a poor pathway section could have obstructions, severe spalling and trip hazards, while a fair segment may have only cracking. A pathway is assumed to be in good condition unless data are available to identify any of the above issues. If the pathway is determined to be in fair condition, 0.5 will be added to its base score from the Pedestrian Pathway Table (table included in the Pathway Evaluation section). If determined to be in poor condition, 1 will be added to the base score (with a maximum score of 4).

The following issues can impact pathway condition:

- Cross slope – <0 or >2%
- Trip hazards – 1/4" or greater
- Cracks – Multiple cracks in one section
- Severe spalling – Surface peeling or flaking of concrete
- Obstructions – As defined above
- Missing sections – Any linear feet of missing pathway in a given segment
    - **Score categories:** Good (no known issues), Fair (1-2 issues), Poor (3+ issues)

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.[10] [11] 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 roadway 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)

[10] 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.
[11] 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.

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.

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.[12] 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

As pedestrians cross more travel lanes to cross the street, exposure to crash risk increases and comfort decreases. [13] [14] [15] [16] 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.[17]

- **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

[12] 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
[13] Oregon DOT. 2018.
[14] Fitzpatrick et al. 2006. "Improving Pedestrian Safety at Unsignalized Crossings." Transit Cooperative Research Program Report 112, National Cooperative Highway Research Program Report 562.
[15] 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.
[16] 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.
[17] 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.

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.[18] 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.[19] A raised refuge island is a median of six feet to accommodate the width of a bicycle, a person using a wheelchair or a person pushing a stroller.[20] In addition, raised medians that are narrower than six feet may have safety benefits for pedestrians compared to no median.[21] 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.[22] [23] 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.[24]

- **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.

[18] 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
[19] Federal Highway Administration, U.S. Department of Transportation. 2019. Proven Safety Countermeasures. https://safety.fhwa.dot.gov/provencountermeasures/.
[20] 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.
[21] 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.
[22] FHWA. 2019. Proven Safety Countermeasures.
[23] 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.
[24] Locations where crossings are legally prohibited are treated as "unmarked" for purposes of PLOC assessment.

IV. Comfort Levels

The comfort level scale allows for a basic four-point ranking system, while 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 or comfort treatment, such as lighting or a "No Turn on Red" sign, is present.[25]

1 = Very Comfortable

1.5 = Comfortable

2 = Somewhat Comfortable

2.5 = Somewhat Uncomfortable

3 = Uncomfortable

3.5 = Very Uncomfortable

4 = Undesirable

[25] Achieving the desired PLOC score may not always be possible in a given location due to limited right-of-way, impractical traffic operations requirements, cost, or other feasibility concerns.

V. Pathway Evaluation

Pedestrian pathways will be scored using the following table. A separate scoring table for roadways with no pedestrian pathway follows.

Pedestrian Pathway Table

This table is categorized along the vertical axis by land use (urban, non-urban) and compares pathway width (broken down into speed categories) to total buffer width, further classified by on-street buffer type. On-street buffers are abbreviated as DPL (designated parking lane), SBL (separated bike lane) and 2SBL (two-way separated bike lane). These variables were considered because a pathway's relative distance from a roadway (i.e. the buffer plus on-street separation), its width, and the speed of that roadway have interrelated effects on pedestrian comfort. *The scores in this table assume the pathway is in good condition. If the pathway is in fair condition, 0.5 will be added to the score. For poor condition, 1 will be added to the score (with a maximum score of 4).*

	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 walkway		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 walkway		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

* If the road category is less than Primary Residential in the Master Plan of Highways and Transitway, it will score as a 2, otherwise it will score a 3.

^If the pathway buffer width is 15' or greater, it will score as a 1, otherwise it will score as a 2.

No Pedestrian Pathway Table

Streets with no pathway receive special consideration because they cannot be scored based on path width or buffer. The most important considerations on these streets are posted speed, amount of vehicle traffic, land use and parking presence. In this table, functional class is used as a substitute for vehicle traffic volumes, since traffic volume data are not available on all roads. No road without a pathway can receive a perfect score of 1 using the available variables.[26] Parking on Less than Primary Residential streets may decrease pedestrian comfort by forcing pedestrians to share a narrower right of way with vehicular traffic, thereby contributing to potential conflicts.

CONTEXT	MASTER PLAN OF HIGHWAYS AND TRANSITWAYS (MPOHT) FUNCTIONAL CLASSIFICATION	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

[26] In the future, M-NCPPC may collect data on traffic calming measures, neighborhood slow zones with traffic calming, neighborhood shared streets or commercial shared streets, all of which would receive a score of 1 with speeds of less than 25 mph. All other scores for these contexts would remain the same.

VI. Crossings Evaluation

Crossings are scored using two main tables and an overlay table for factors that, if evaluated, can affect the base score. The two primary crossing tables are mutually exclusive (controlled or uncontrolled crossings). After crossings are scored, the overlay bonus can be assessed, as described in the crossing overlays section.

Controlled Crossings (Signalized or Stop-Controlled) Table

The following variables are considered for signalized crossings or stop-controlled crossings: number of lanes, median type, crosswalk type and posted speed limit. The highest posted speed limit of the segments that comprise the crossing is the speed limit used for scoring. These variables interact to produce the scores below.

# OF LANES	MEDIAN TYPE	CROSSWALK TYPE	POSTED SPEED LIMIT				
			< 25 mph	25 mph	30 mph	35 mph	>= 40
1 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

Uncontrolled Crossings Table

The same primary variables are considered for uncontrolled crossings as signalized crossings or stop controlled crossings, however, the scoring is specific to uncontrolled crossings.

# OF LANES	MEDIAN TYPE	CROSSWALK TYPE	POSTED SPEED LIMIT				
			< 25 mph	25 mph	30 mph	35 mph	>= 40
1 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

*In locations where a 3-lane road does not include a turn lane, the crossing should be scored as if it has 4 travel lanes.

VII. Crossing Overlays

Overlays are used for crossings that have additional safety and comfort features present as follows:

Lighting

All crossings should be evaluated for lighting where data are available. If lit to MCDOT standards, a crossing's score is improved by a half point.

Protected Pedestrian Phase or Leading Pedestrian Interval (LPI)

Scores for controlled crossings are improved by the presence of either a protected pedestrian phase (fully protected or protected/permissive) or an LPI that allows the pedestrian a head start into an intersection before vehicle traffic signals turn green.

Rectangular Rapid Flashing Beacon (RRFB)

The presence of an RRFB, a traffic control device that improves motorist yielding compliance at uncontrolled crossing locations, improves a crossing's score by a half-point.

No Right Turn on Red Signage (No RTOR)

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

Traffic Calming

At all crossing locations, treatments that slow traffic speeds, improve visibility, and increase yield compliance improve the crossing score by a half point. Such treatments can include raised centerlines, raised intersections, raised crossings, or turn wedges.

Overlay Scoring

The total maximum scoring adjustment for the crossing overlays is 0.5, with the exception of any combination including traffic calming, where the maximum scoring adjustment is 1.0. An overlay category can be ignored if data for that feature are not yet available.

CROSSING TYPE	CROSSING OVERLAY FEATURE	PRESENT	BONUS POINTS	ADDITIVE
Controlled Crossings	Protected Pedestrian Phase or Leading Pedestrian Interval	Yes	0.5	No
		No	0	
	No Right Turn on Red Signage Present (Signalized)	Yes	0.5	No
		No	0	
Uncontrolled Crossings	Rectangular Rapid Flashing Beacon	Yes	0.5	No
		No	0	
All Crossings	Lighting to MCDOT Standards	Yes	0.5	No
		No	0	
	Traffic Calming	Yes	0.5	Yes
		No	0	

VIII. Accessibility Evaluation

In addition to the PLOC evaluation, an accessibility evaluation is recommended for both street blocks and crossings. If a street block or crossing has a score of greater than zero, it may have accessibility issues that need to be addressed.

	ADA CONDITION	YES/NO	SCORE	NOTES
Street Block (Score each segment)	Pathway is under 5' wide	Yes	1	Sum = number of ADA issue categories. Score of 0 = No known accessibility issues from available data.
		No	0	
	Trip hazards of 1/4" or greater	Yes	1	
		No	0	
	Cross slope less than 0% or greater than 2%	Yes	1	
		No	0	
	Obstruction(s) creating a less than 36"* pedestrian access route (PAR)	Yes	1	
		No	0	
	Missing pathway section(s) within segment	Yes	1	
		No	0	
Crossings (Score each crossing direction or crosswalk)	Lacking detectable warning surface (DWS)	Yes	1	Sum = number of ADA issue categories. Score of 0 = No known accessibility issues from available data.
		No	0	
	Ratio of DWS width / Ramp width is less than 1	Yes	1	
		No	0	
	Ramp width is less than 36"**	Yes	1	
		No	0	
	Ramp slope is less than 0% or greater than 8.33%	Yes	1	
		No	0	
	Ramp landing area slope is less than 0% or greater than 2%	Yes	1	
		No	0	
	Ramp landing area is less than 5' x 5'	Yes	1	
		No	0	
	Accessible pushbutton not present (when pedestrian signal is present)	Yes	1	
		No	0	

*Current ADA Standards from the U.S. Department of Justice/Federal Highway Administration (USDOJ)/FHWA) require 36" minimum width for segments (with 60" passing space every 200' minimum for segments). When adopted, Public Right of Way Accessibility Guidelines (PROWAG) will require a 48" minimum and recommend a 60" width for segments. Obstructions include any fixed object, such as signs, planters, utility poles, tree trunks/pits, etc.

**Current ADA Standards (USDOJ/FHWA) recommend a 48" minimum curb ramp with a minimum of 36" required in locations where space is restricted. PROWAG recommends 48" minimum width for curb ramps at all locations.

IX. Conclusion

Montgomery County Planning will use the PLOC evaluation and associated connectivity analyses to identify locations in the county with the greatest pedestrian comfort needs and recommend projects to address these needs in collaboration with MCDOT and other relevant jurisdictions. Used in conjunction with the accessibility overlay table and other pedestrian planning and prioritization tools, such as equity emphasis areas, the PLOC methodology provides a powerful tool for Montgomery County to improve pedestrian comfort and make it easier for the county's residents and visitors to walk.

X. Scoring Examples

The following examples illustrate the PLOC evaluation (including Crossing Overlay score, where applicable) for several pathway and crossing examples in Montgomery County. Examples do not include ADA assessment as the full assessment requires more information than can be gathered using a photo.

Pathway Examples

1220 Noyes Drive, Silver Spring

Non-urban area, no pathway, less than primary residential, no parking allowed, 25 mph.

Score: 3 - Uncomfortable

408 North Horners Lane, Rockville

Left: Non-urban area, primary residential, 4-foot pathway, no buffer, designated parking lane, 25 mph, good condition.

Score: 2 - Somewhat Comfortable

Right: Non-urban area, primary residential, 3.5-foot pathway, 2-foot buffer, no on-street separation, 25 mph, good condition.

Score: 2 - Somewhat Comfortable

Maryland 119 in Gaithersburg

Non-urban area, 8-foot pathway, 5-foot buffer, no parking lane or SBL, 50 mph, good condition.

Score: 3 - Uncomfortable

898 Silver Spring Avenue, Silver Spring

Urban, 8-foot pathway, 5-foot buffer, striped parking lane, good condition, 25 mph.

Score: 1 - Very Comfortable

7431 Arlington Road, Bethesda

Left: Urban, 5.5-foot pathway, no buffer, no parking lane or SBL, 30 mph, good condition.

Score: 4 - Undesirable

Right: Urban, 6-foot pathway, no buffer, no parking lane or SBL, 30 mph, fair condition (utility pole obstructions create <36-inch Pedestrian Access Route).

Score: 4 - Undesirable

Crossing Examples

University Boulevard West and Georgia Avenue, Wheaton

All sides: Signalized, highest posted speed: 35 mph, high-visibility crosswalk, permissive signal phasing, 6+ lanes crossed, raised median.

Score: 3 - Uncomfortable

Edwin Street and Bluhill Road, Wheaton

Stop controlled, highest posted speed: 25 mph.

All sides: Unmarked crosswalk, two lanes crossed, painted/no median.

Score: 2 - Somewhat Comfortable

Washington Street and Martins Lane, Rockville

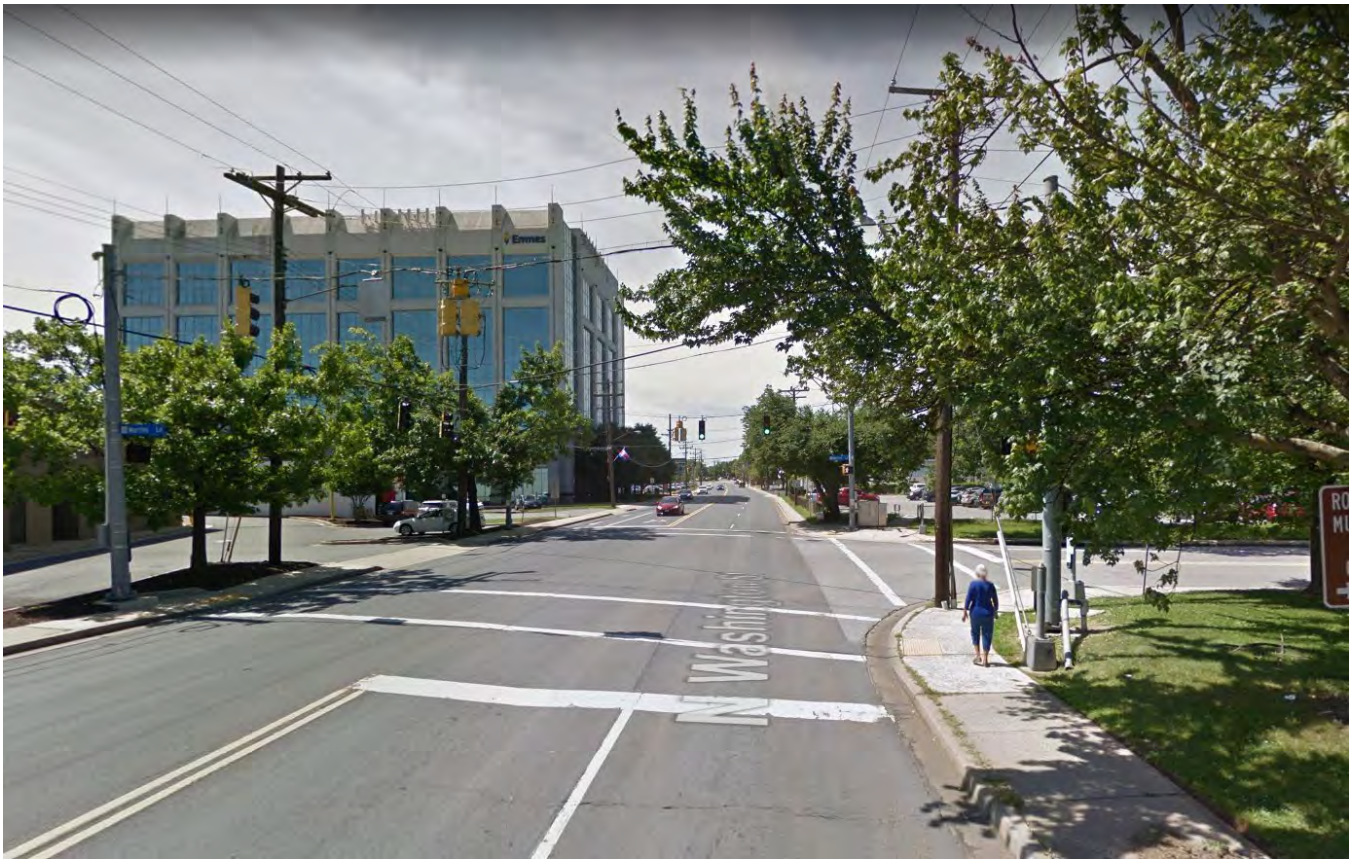
Signalized, highest posted speed: 30 mph.

North and South sides: Standard crosswalk, four lanes crossed, painted/no median.

Score: 3 - Uncomfortable

West side: Standard crosswalk, three lanes crossed, painted/no median.

Score: 1 - Very Comfortable



Hitching Post Lane & Montrose Road, North Bethesda (facing west)

Signalized, highest posted speed: 40 mph.

Note: This intersection has evidence of pedestrian-scale and overhead lighting; hypothetical scores provided if MCDOT standards are confirmed.

North (right) side: Standard crosswalk, three lanes crossed, painted/no median.

Score: 3 - Uncomfortable

Score (with lighting): 2.5 – Somewhat Uncomfortable

South (left) side: Standard crosswalk, four lanes crossed, painted/no median.

Score: 4 - Undesirable

Score (with lighting): 3.5 – Very Uncomfortable

East (foreground) side: High-visibility crosswalk, seven lanes crossed, raised refuge island.

Score: 3 - Uncomfortable

Score (with lighting): 2.5 - Somewhat Uncomfortable

West (background) side: Standard crosswalk, seven lanes crossed, raised refuge island.

Score: 3 - Uncomfortable

Score (with lighting): 2.5 - Somewhat Uncomfortable

Sussex Road and Park Crest Drive, Silver Spring

Highest posted speed: 25 mph

North(background) and south (foreground) sides: Uncontrolled, two lanes crossed, unmarked, painted/no median.

Score: 3 - Uncomfortable

West (left) side: Stop-controlled, two lanes crossed, unmarked, painted/no median.

Score: 2 - Somewhat comfortable

v1.2 Changelog (10/20/2020)

- Clarified low volume designation for “no pathway” and crossing segments.

PEDESTRIAN SHORTCUT METHODOLOGY

MONTGOMERY COUNTY'S PEDESTRIAN PLAN

Montgomery Planning

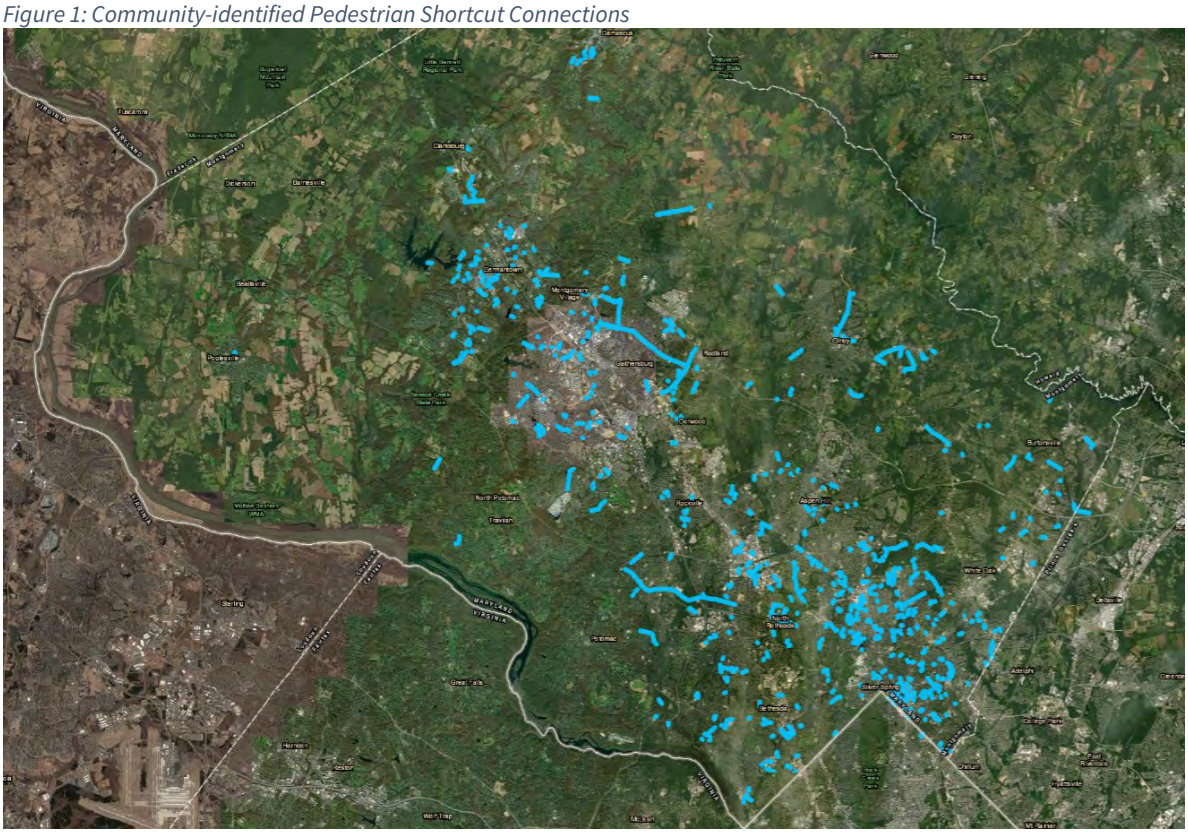
A Pedestrian Shortcut is an informal pedestrian connection not along a street that provides a more direct pedestrian route than the sidewalk and trail network. Also known as a “people’s choice path,” a “desire line” or a “goat path,” an existing pedestrian shortcut may look like trodden grass, dirt, gravel, or pavement that has fallen into disrepair. These connections are not currently sidewalks or trails, but provide important, time-saving benefits for pedestrians interested in making direct trips to local destinations. Many people use these connections daily to run errands, get to work or school, connect to public transportation, and exercise.

Recognizing the importance of pedestrian shortcuts, Montgomery Planning sought to catalogue existing and potential future pedestrian shortcuts in the county and to identify them in the Pedestrian Master Plan so that they are prioritized for construction and maintenance. Montgomery Planning used several approaches to identify where pedestrian shortcuts should be created or improved across the county.

Community Feedback

While the sidewalks, trails, roads, and crossings analyzed as part of the Pedestrian Level of Comfort data collection were straightforward to catalogue systematically, the nature of pedestrian shortcuts made a similar effort much more difficult to accomplish. The main approach to catalogue pedestrian shortcuts involved community members sharing their invaluable knowledge of local walking connections. To collect this information at the countywide level, Montgomery Planning developed an online interactive map where community members could draw shortcut connections. Over 600 pedestrian shortcuts were provided via the interactive Pedestrian Shortcut Map (Figure 1). Community-identified shortcuts ranged from aspirational paths linking destinations that *should* be connected to active connections through private property, parkland, and within the public right-of-way. A high-level analysis of the pedestrian shortcuts submitted through the interactive map was conducted—removing those deemed infeasible or not in keeping with the definition of a pedestrian shortcut. Connections that identified a new street crossing or a missing sidewalk were those most likely to be removed.

Figure 1: Community-identified Pedestrian Shortcut Connections

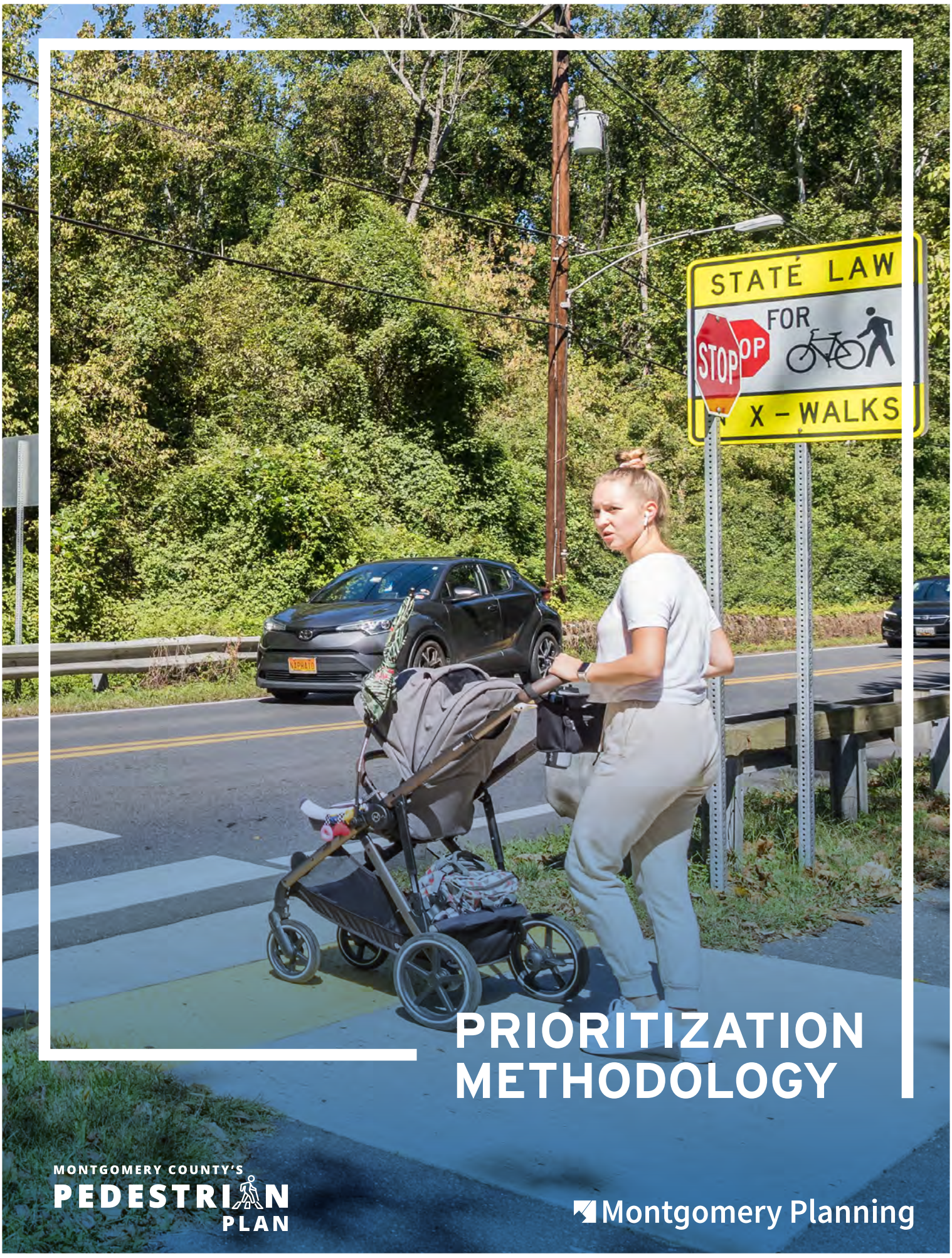


Desktop Review

While community-identified connections span the county, staff reviewed aerial photography, the county's parcel data and existing master plan recommendations to include potential pedestrian shortcuts not shared through the interactive map. The majority of connections included through this process were existing public rights-of-way originally planned as pedestrian connections when neighborhoods were initially subdivided.

Conclusion

At the end of the data collection and review process, the Pedestrian Master Plan recommends master-planning 310 pedestrian shortcuts for improvement through the county's Capital Improvement Program and private development processes.



PRIORITIZATION METHODOLOGY

MONTGOMERY COUNTY'S
PEDESTRIAN PLAN

Montgomery Planning

The Pedestrian Master Plan uses a data-driven approach to prioritize where pedestrian and bicycle improvements should be made by reimagining the county's Bicycle and Pedestrian Priority Area (BiPPA) program framework. This comprehensively evaluates how BiPPAs are created and prioritized. Instead of continuing to identify BiPPAs through specific area master plans, this planning effort separates the county into discreet areas that are then compared to each other based on a priority score and slotted into a priority tier. Projects within higher priority tiers should be designed and constructed before those in lower priority tiers.

Geographies

When the BiPPA program was initially developed, BiPPA areas tended to be nodes of pedestrian and bicycle activity around transit stations. Over time, new BiPPA areas have been created to address the pedestrian and bicycle challenges along some of the county's major roadways, such as Veirs Mill Road and New Hampshire Avenue. The plan's BiPPA prioritization approach takes this evolution to the next step by comprehensively evaluating three different BiPPA types:

1. Downtowns and Town Centers
   These are the traditional BiPPA areas with land use and intensity of use supportive of significant pedestrian and bicycle activity. They match the proposed Complete Streets Design Guide area types identified in the following section.

2. Major Roads
   These are corridors throughout the county that tend to be the most problematic for pedestrians and bicyclists to navigate. The roadways included in this category are all of the non-neighborhood, non-industrial roads defined in the Complete Streets Design Guide.

   Each roadway line was buffered into a polygon. The buffer radius is half of the roadway's master-planned right-of-way. Roadway polygons were clipped at the boundary of Downtowns and Town Centers. Roadway polygons were split where a polygon intersected with a roadway of the same or higher CSDG classification.

3. Neighborhoods
   These are the areas of the county outside of the Downtowns, Town Centers, or major roadways. They tend to be more residential in nature and typically have roadways that are more locally-oriented, slower speed, and carry less motor vehicle traffic.

In total, there are 869 geographies included in the prioritization analysis:

- 55 Downtowns and Town Centers
- 430 major road segments
- 384 neighborhoods

Factors Included

The analysis uses several data sources developed through the plan's existing conditions data collection process as prioritization factors. These factors are then weighted to identify priority BiPPAs for investment.

- **Pedestrian Activity**
  A measure of where people are walking today across the county based on a model developed through Montgomery Planning's Predictive Safety Analysis report.
    - **Metric:** Sum of modeled pedestrians divided by roadway distance in a geography

- **Bicycle Activity**
  A measure of where people are biking today across the county based on a model developed through Montgomery Planning's Predictive Safety Analysis report.
    - **Metric:** Sum of modeled bicyclists divided by roadway distance in a geography

- **Pedestrian Crashes**
  Locations with the highest pedestrian crash risk identified in Montgomery Planning's Predictive Safety Analysis.
    - **Metric:** Sum of modeled pedestrian crash risk divided by geographic area

- **Bicyclist Crashes**
  Locations with the highest bicyclist crash risk identified in Montgomery Planning's Predictive Safety Analysis.
    - **Metric:** Sum of modeled bicyclist crash risk divided by geographic area

- **Pedestrian Pathway Comfort**
  A measure of pedestrian comfort along sidewalks, trails, and roadways without sidewalks from Montgomery Planning's Pedestrian Level of Comfort analysis.
    - **Metric:** Sum of length of undesirable (PLOC 4) pathway segments divided by geographic area

- **Bikeway Comfort**
  A measure of bicyclist comfort along sidewalks, trails, and roadways without sidewalks from Montgomery Planning's Bicycle Level of Traffic Stress analysis.
    - **Metric:** Sum of length of high stress (LTS 4) segments divided by geographic area

- **Pedestrian Crossing Comfort**
  A measure of pedestrian comfort along roadway crossings from Montgomery Planning's Pedestrian Level of Comfort analysis.
    - **Metric:** Sum of length of undesirable (PLOC 4) crossing segments divided by geographic area

- **Bicyclist Crossing Comfort**
  A measure of bicyclist comfort along roadway crossings from Montgomery Planning's Bicycle Level of Traffic Stress analysis.
    - **Metric:** Sum of length of high stress (LTS 4) crossing segments divided by geographic area

- **Equity**
  Locations in Equity Focus Areas (EFAs)—parts of the county with higher concentrations of low-income people of color who may also report speaking English less than "very well."
    - **Metric:** Share of the geographic area located in an EFA

- **School Access**
  A measure of how many households can walk to a Montgomery County Public School (MCPS) within each school's catchment area and the walkable distance identified by MCPS for the given school type.
    - **Metric:** Sum of the residential trips to school divided by geographic area

- **Transit Access**
  A measure of how many households from within one mile can walk to a WMATA Metro Red Line, MARC Brunswick Line, MDOT Purple Line, or Bus Rapid Transit station using the Pedestrian Level of Comfort network.
    - **Metric:** Sum of the residential trips to transit stations divided by geographic area

Recommended Prioritization Approach

The recommended approach takes into account community prioritization preferences, the county's commitment to Vision Zero, and Montgomery Planning's Equity Agenda for Planning.

Step One of the identified approach prioritizes locations based on the factors and weights in the table below.

Recommended Step One Factor Weights

Factor	Weight
Pedestrian Activity	**15**
Bicycle Activity	**9**
Pedestrian Crashes	**15**
Bicycle Crashes	**9**
Pathway Comfort	**9**
Crossing Comfort	**9**
Bikeway Comfort	**5**
Bike Crossing Comfort	**5**
School Access	**12**
Transit Access	**12**

For each of the 869 geographies, the respective factor values are multiplied by the factor weights and then these products are added together to produce a Step One score.

Then, the top 30% of areas after the Step One scoring have an equity score added to their Step One score to produce a Final Score. For each of these areas, the equity weight shown below is multiplied by the percentage of the area that is within an Equity Focus Area.

Recommended Step 2 Factor Weights

Factor	Weight
Equity	**5**

This two-step prioritization approach ensures that those parts of the county with the greatest need are prioritized, and then within that group, equity communities are prioritized further.

Priority Tiers

Rather than creating a ranked list of priority areas, the Pedestrian Master Plan assigns areas into priority tiers. Funded in the Capital Budget is the highest tier, followed by Tier 1, Tier 2, and Tier 3. Those areas not included in a tier are unprioritized. The areas within each tier are identified in tables and maps in the main Pedestrian Master Plan document.

STUDENT TRAVEL TALLY

MONTGOMERY COUNTY'S
PEDESTRIAN
PLAN

Montgomery Planning

Introduction

In late 2019, the Planning Department and Montgomery County Public Schools (MCPS) collaborated to survey MCPS students about how they arrive and depart from school each day. School-aged children are a leading indicator for walking. Those areas where students are walking to school in great numbers are likely areas where there is a lot of walking taking place. This survey was the first time this information had been collected at a countywide level.

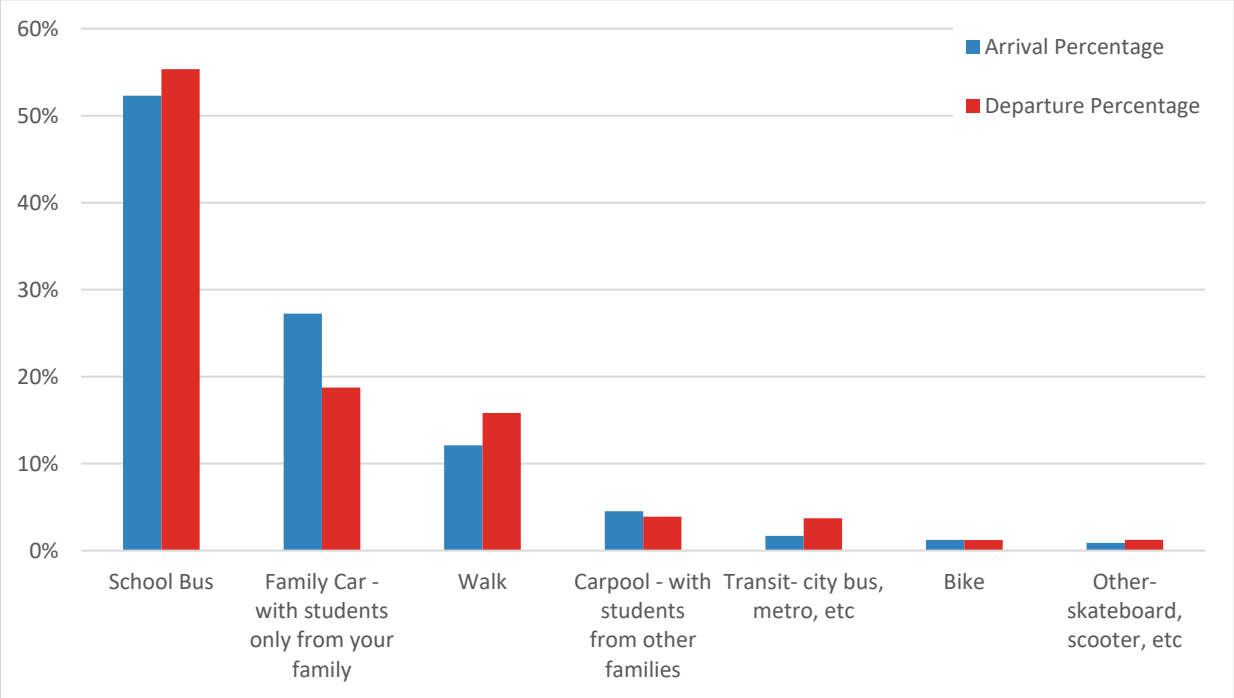
Survey Findings

The majority of students arrive and depart by school bus in Montgomery County (Figure 1). Over 50 percent of students take the bus to school, while more than 55 percent take the bus home from school. Students driving or getting driven to school by family members is the second-most common travel mode, followed by walking.

Student travel mode changes from arrival to departure. Fewer students leave school in a car than arrive in one. This makes sense as many students are dropped off to start the school day by parents or other family members, and school dismissal times are generally not convenient for those same people to leave work to pick up. As a result, at the end of the day, more students take the school bus, walk, take public transit, or leave school by other means. Nearly as many students take public transit at dismissal time as get into a car with non-family members.

At the countywide level, 12 percent of students walk to school and nearly 16 percent walk from school. Students taking public transportation are also pedestrians at the beginning and end of their trips. Adding those students to the mix, there is a 14 percent pedestrian mode share to school and 20 percent pedestrian mode share from school.

Figure 1: Weighted Countywide Mode Share by Arrival/Departure

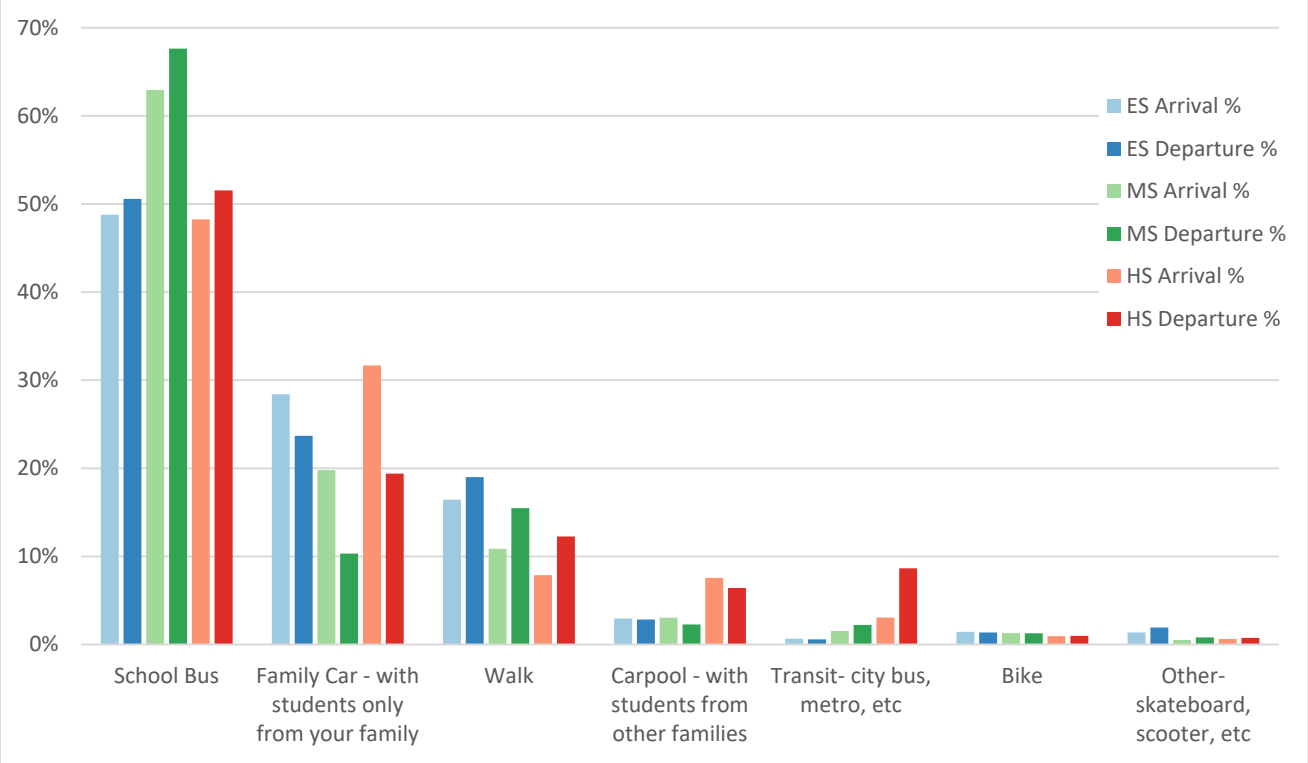


Breaking out the countywide data by elementary, middle, and high schools in Figure 2 illustrate several emerging trends. First, school buses are most heavily utilized by middle school students. This may be because many students live too far away or have to cross too many unsafe roads to walk to school, cannot yet drive themselves and do not have siblings or friends who can drive them to school. With middle schools generally further from home, parents may also be less willing or able to drive students to school or pick them up at the end of the school day.

Second, walk mode share decreases from elementary school to middle school to high school. This is likely a function of two related issues: as students transition to higher schools, they tend to live further away, and in walking further, students would have to cross roads that MCPS has determined are hazardous. School bus service is provided for the affected students, increasing school bus mode share, and decreasing walk mode share.

Third, driving to school is more common for high school students. Both driving with family members and carpooling with non-family members are generally more common in high school than in middle or elementary school. In high school, students may still be picked up and dropped off by parents or other family members, but as they earn driver's licenses, students can also drive themselves, family members, and friends to and from school.

Figure 2: Arrival/Departure Mode Share by School Type

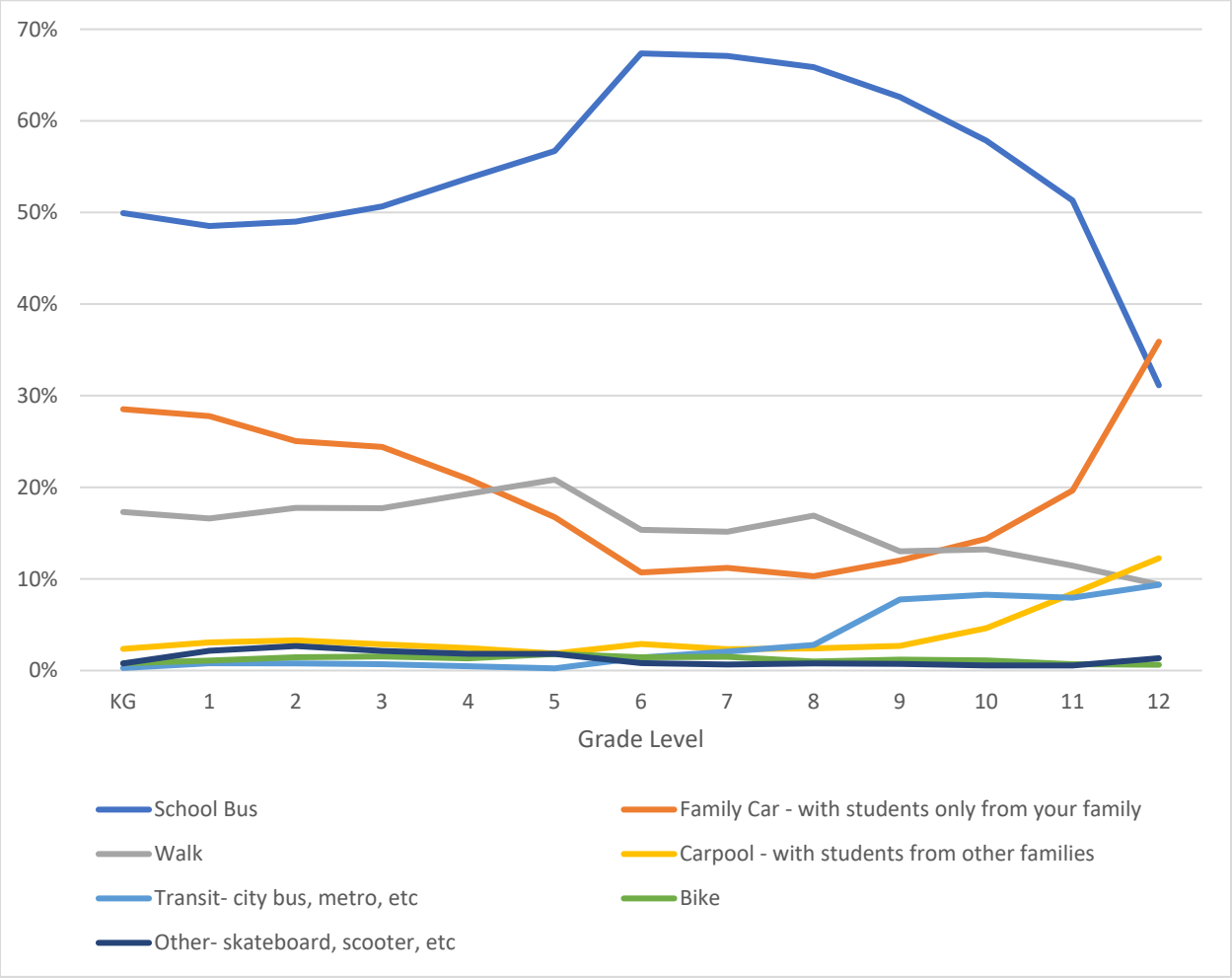


Fourth, public-transit use is also significantly higher for high school students. Three percent of high school students arrive at school by public transit, but nearly nine percent depart school by this mode – more than the percentage who drive home with friends and other non-family members. At Northwood High School, John F. Kennedy High School, and Wheaton High School, the percentage of students

departing by transit is 24 percent, 20 percent, and 20 percent respectively. Bethesda-Chevy Chase High School is not far behind at 15 percent.

The graph below (Figure 3) breaks out mode choice by grade and largely reinforces the dynamics observed at the school level, though there are a few unique findings. School bus ridership increases through elementary school with a concurrent downturn in family car usage. This may be attributable to parents becoming more comfortable allowing children to take the school bus as they age. One can also see the sharp upward inflection of family car usage and carpooling from 10th to 12th grade as students begin driving.

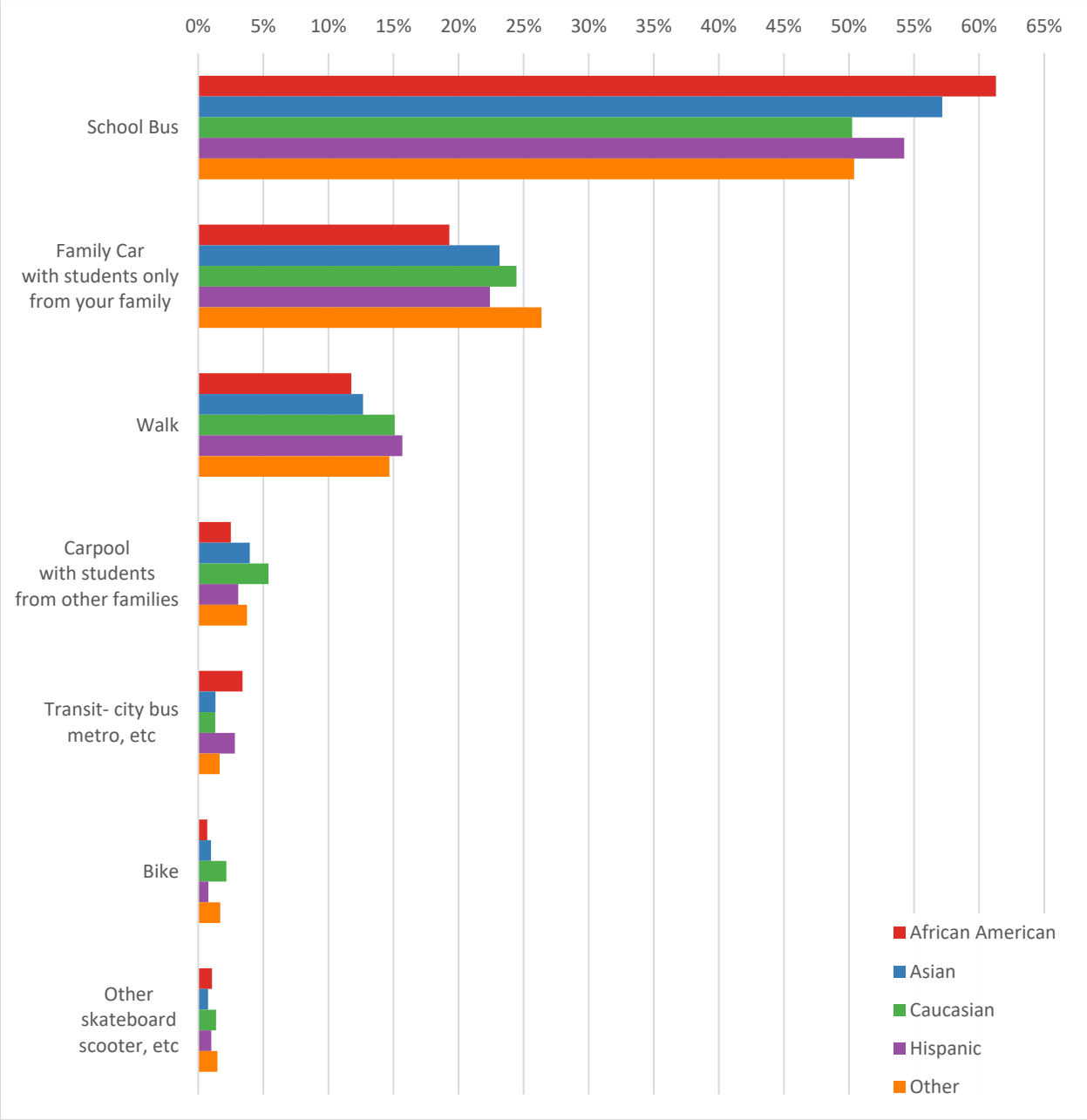
Figure 3: Departure Mode Share by Grade



Looking at student travel patterns through the lens of race and ethnicity (Figure 4) found that African American students were more likely to arrive and depart by school bus and less likely to arrive or depart by family car. Caucasian students were more likely to be driven to and from school than students from other backgrounds. Hispanic students were the most likely to walk, followed by Caucasian students, then Asian students, then African American students. African American and Hispanic students were

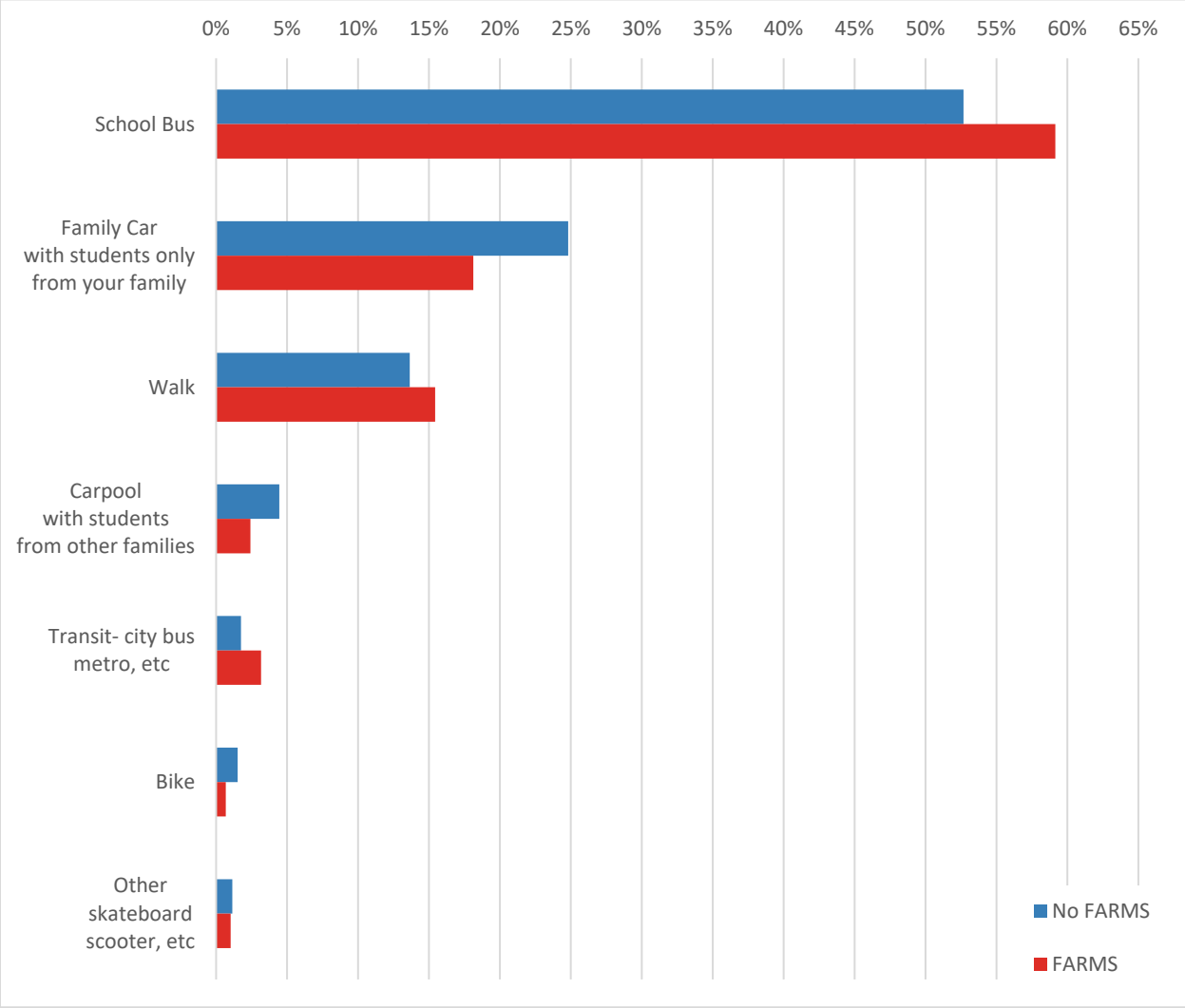
significantly more likely to take public transit to or from school than other groups. Caucasian students are more likely to bike to/from school than other groups.

Figure 4: Average Mode Share by Race/Ethnicity



In addition to race and ethnicity, breaking the data by Free- and Reduced-price Meals System (FARMS) participation provides insight into the relationship between socioeconomic status and mode share (Figure 5). Students eligible for FARMS are less likely to use a car to get to/from school and are also less likely to bike. They are more likely to take a school bus, public transit, or walk.

Figure 5: Average Mode Share by FARMS Status

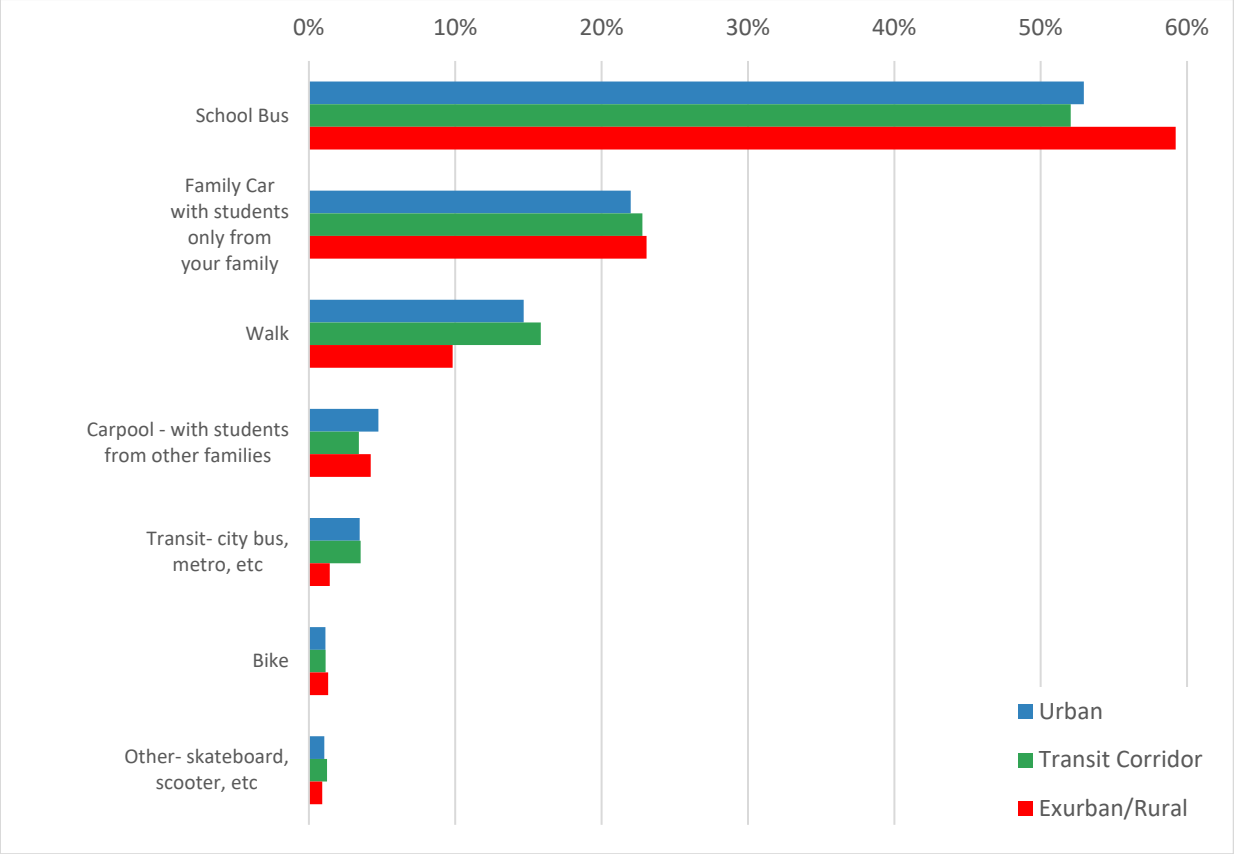


Grouping schools based on whether they are located in urban (downtowns and town centers), transit corridors (within a half mile of higher-frequency public transit) and rural/exurban (the remainder of the county) areas of the county and then reviewing student travel tally findings through that lens provides perspective about the relationship between urban form and mode share (Figure 6)[1]. Students attending schools located in urban areas and along transit corridors walk and take public transit at higher rates than students attending rural/exurban schools. Students at schools in rural/exurban areas are more

[1] In October and November 2020, the Planning Department conducted a countywide survey of pedestrian activity and perception. Postcards with unique survey credentials were sent to 60,000 randomly selected households across the county. The results were provided at the countywide level, but also at smaller geographies. These geographies were urban (downtowns and town centers), transit corridors (within a half mile of higher-frequency public transit) and rural/exurban (the remainder of the county). A map of these geographies is provided in the Existing Conditions Report. Because the cities of Rockville and Gaithersburg do their own planning, the Countywide Pedestrian Survey did not include residents from these communities.

likely to take the school bus than students attending schools in other geographies. Student car usage is generally similar across all geographies.

Figure 6: Weighted Average Mode Share by Pedestrian Plan Survey Area



Methodology

To conduct the survey, MCPS adapted the student travel tally form created by the National Center for Safe Routes to School[2] to be completed by students as part of the login prompt on school computers. The survey asks students what travel mode they used to arrive at school and which mode they would use to depart school. Pictures of each travel mode were included to be more accessible to younger students.

The survey collected responses from November 1, 2019 until December 13, 2019. All told, 73,602 students participated from a broad cross-section of schools. Response rates at more than half of surveyed schools exceeded 50 percent, while response rates were below 20 percent at nearly 28 percent of schools. Response rates for each school can be found in the Supporting Tables section below. Efforts were underway in early 2020 to resurvey those schools with low response rates, but the COVID-19 pandemic and the start of virtual schooling rendered those efforts moot. Survey participation was not required and responses, especially at schools with low response rates, may not be representative of

[2] http://saferoutesdata.org/

the school. Additionally, there does not appear to be a pattern or rationale for why the participation rates at some schools were significantly lower than others.

The survey should be administered biannually to track changes in how students are arriving to and departing from school. Appropriate adjustments should be made to the survey to increase response rates at schools with lower response rates today.

Data Weighting and Interpolation

To control for some of the variance between schools and within schools, each grade-level response was factored up to its appropriate proportion of school-wide enrollment. For example, two ninth graders at Albert Einstein High School reported that they biked to school. Since the response rate for the ninth grade was 50 percent, it was assumed that overall, four ninth graders bike to Albert Einstein. The formula for bike responses is below with a specific Albert Einstein High example for ninth-grade biking.

$$Bike_{weighted} = \frac{School\ Grade\ Enrollment}{School\ Grade\ Survey\ Responses} \times Bike_{responses}$$

$$\sim 4 = \frac{557}{278} \times 2$$

In this way, survey responses are scaled up to better represent the grade within the school and, by extension, the school within the county.

If a grade at a school had zero responses or had a response rate below five percent, staff interpolated survey results for that grade from adjacent grades. For instance, if the second grade at a particular school had zero results, for each mode, the sum of the mode-specific responses for the adjacent grades (first and third) were added and that number was divided by the sum of the total responses for the adjacent grades and then multiplied that figure by the missing grade's enrollment. The formula for biking is below:

$$Bike_{WeightedInterpolated} = \frac{\sum Adjacent\ Bike}{\sum Adjacent\ Total\ Responses} \times School\ Grade\ Enrollment$$

If two consecutive grades within a school had zero responses or had a response rate below five percent, that school was removed from the weighted countywide analyses and those grades were removed from the weighted grade-level analyses.

Additional weighting on the basis of race and ethnicity and the Free- and Reduced-price Meals System (FARMS) status was not conducted as the required grade information was not available.

Limitations

While the student survey was very successful as an initial effort, the data and associated findings have limitations. Though 70,000 students participated, MCPS enrollment in 2020 was 160,564 in fall 2020 when the survey was completed, so response rates overall were around 43 percent. Additionally, missing responses were not necessarily random. Some schools, like Montgomery Blair High School, did not have any responses, while others had response rates near 100 percent. These discrepancies could skew findings, making them less representative of the student population.

Takeaways / Next Steps

The student survey analysis identified several key takeaways:

- **Walking is the third-most popular student travel mode.** Behind the school bus and family car, 12 percent of students walk to school and 16 percent walk home from school.
- **Walking is most common at the elementary schools.** Walk-mode share from school is 19 percent for elementary school students, 15 percent for middle school students, and 12 percent for high school students. There may be several reasons for this, but the increasing distance between home and school is likely a key factor.
- **Hispanic students are the most likely to walk to/from school.** Additionally, Hispanic and African American students are significantly more likely to take public transit (which involves a significant walking component) to/from school than students from other backgrounds.
- **FARMS students are more likely to walk to/from school.** These students are also less likely than non-FARMS students to be driven to/from school, and more likely to take the school bus.
- **Walking is less prevalent in the exurban/rural parts of the county.** Given the distances necessary to travel and the streets along which students would have to walk, it makes sense that schools in rural areas only have about a 10 percent walk-mode share, while transit-corridor schools and urban areas have 16 and 15 percent rates, respectively.

The Pedestrian Master Plan will build on these findings to create pedestrian-mode share goals for different types of MCPS schools and develop recommendations to increase pedestrian-mode share to achieve them. Different types of schools may benefit from different approaches to encourage more walking. Comparing the mode share data from this survey to other data being collected like the Pedestrian Level of Comfort may point to situations where improving the comfort of sidewalks and street crossings is most important. For other schools, a very comfortable pedestrian environment but low walk-mode share may lead to recommendations for robust Safe Routes to School programming and other related activities.

Supporting Tables

Figure 7: Elementary School Student Survey Results

School	Walk to School	Walk from School	School Bus to School	School Bus from School	Family Car to School	Family Car from School	Carpool to School	Carpool from School	Bike to School	Bike from School	Public Transit to School	Public Transit from School	Other to School	Other from School	Response Rate
Arcola Elementary	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Less than 15%
Ashburton Elementary	11.3%	12.0%	63.8%	65.4%	22.4%	19.0%	1.5%	2.2%	0.2%	0.1%	0.1%	0.0%	0.7%	1.2%	71.9%
Bannockburn Elementary	15.4%	16.4%	63.6%	59.6%	17.6%	20.1%	0.0%	0.2%	2.9%	2.3%	0.0%	0.0%	0.5%	1.3%	78.3%
Bayard Rustin Elementary	9.7%	11.9%	52.3%	46.5%	29.7%	30.2%	4.3%	6.7%	1.0%	0.8%	0.7%	0.5%	2.3%	3.4%	42.3%
Beall Elementary	24.5%	25.0%	37.9%	37.1%	32.8%	31.7%	1.4%	1.5%	2.1%	1.8%	0.3%	0.3%	1.0%	2.6%	75.5%
Bel Pre Elementary	0.8%	0.7%	73.6%	79.4%	21.9%	16.1%	2.1%	2.8%	0.5%	0.0%	0.7%	0.5%	0.3%	0.5%	81.1%
Bells Mill Elementary	13.2%	17.1%	37.2%	40.7%	40.1%	31.6%	2.2%	2.7%	4.8%	4.4%	0.7%	0.5%	1.8%	3.0%	89.2%
Belmont Elementary	8.3%	11.7%	51.9%	49.8%	27.7%	26.5%	2.2%	1.9%	7.6%	7.0%	0.0%	0.0%	2.2%	3.1%	92.8%
Bethesda Elementary	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Less than 15%
Beverly Farms Elementary	15.1%	20.4%	39.2%	42.3%	39.8%	31.5%	5.1%	2.3%	0.0%	0.4%	0.0%	1.1%	0.8%	2.1%	45.8%
Bradley Hills Elementary	17.1%	22.3%	42.4%	40.0%	30.0%	27.3%	1.9%	0.6%	5.2%	4.5%	1.3%	0.3%	2.1%	5.0%	58.3%
Brooke Grove Elementary	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Less than 15%
Brookhaven Elementary	14.0%	17.9%	49.0%	49.7%	34.1%	28.1%	2.1%	1.3%	0.4%	1.4%	0.0%	0.4%	0.4%	1.2%	66.7%

School	Walk to School	Walk from School	School Bus to School	School Bus from School	Family Car to School	Family Car from School	Carpool to School	Carpool from School	Bike to School	Bike from School	Public Transit to School	Public Transit from School	Other to School	Other from School	Response Rate
Brown Station Elementary	31.8%	37.9%	17.3%	19.0%	42.3%	34.0%	3.5%	5.6%	3.6%	0.6%	0.8%	1.4%	0.6%	1.6%	38.4%
Burning Tree Elementary	14.8%	15.0%	52.4%	58.0%	29.5%	23.9%	0.0%	0.6%	1.6%	0.3%	0.6%	1.0%	1.0%	1.3%	55.7%
Burnt Mills Elementary	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Less than 15%
Burtonsville Elementary	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Less than 15%
Candlewood Elementary	5.0%	6.6%	66.8%	66.3%	23.1%	23.4%	1.7%	0.6%	1.3%	0.7%	0.3%	0.4%	1.7%	2.1%	82.2%
Cannon Road Elementary	11.5%	11.1%	49.1%	51.3%	34.8%	33.4%	1.2%	1.8%	1.2%	0.0%	1.3%	0.0%	0.9%	2.5%	48.4%
Captain James E. Daly Elementary	23.2%	28.2%	27.8%	35.0%	41.1%	29.2%	3.8%	2.7%	0.7%	1.2%	0.7%	0.6%	2.7%	3.1%	85.3%
Carderock Springs Elementary	2.6%	4.6%	61.8%	71.4%	26.2%	18.4%	4.4%	2.0%	3.2%	2.6%	0.0%	1.0%	1.7%	0.0%	39.3%
Cashell Elementary	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Less than 15%
Cedar Grove Elementary	1.3%	1.0%	81.4%	82.2%	16.0%	14.1%	0.3%	1.1%	0.0%	0.3%	0.0%	0.0%	1.0%	1.3%	74.6%
Chevy Chase Elementary	22.4%	21.9%	50.4%	51.7%	12.6%	12.4%	3.6%	3.6%	4.8%	4.5%	0.0%	0.0%	6.3%	5.9%	95.3%
Clarksburg Elementary	3.7%	3.5%	77.3%	79.3%	15.4%	14.3%	1.3%	1.3%	0.4%	0.2%	0.5%	0.2%	1.4%	1.3%	89.9%
Clearspring Elementary	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Less than 15%
Clopper Mill Elementary	32.9%	35.7%	27.8%	30.5%	31.0%	28.0%	5.1%	4.0%	1.4%	1.2%	1.5%	0.3%	0.2%	0.2%	57.1%

School	Walk to School	Walk from School	School Bus to School	School Bus from School	Family Car to School	Family Car from School	Carpool to School	Carpool from School	Bike to School	Bike from School	Public Transit to School	Public Transit from School	Other to School	Other from School	Response Rate
Cloverly Elementary	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Less than 15%
Cold Spring Elementary	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Less than 15%
College Gardens Elementary	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Less than 15%
Cresthaven Elementary	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Less than 15%
Damascus Elementary	0.3%	0.3%	80.1%	82.9%	18.3%	13.3%	0.3%	0.6%	0.0%	0.3%	0.3%	2.2%	0.6%	0.3%	65.7%
Darnestown Elementary	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Less than 15%
Diamond Elementary	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Less than 15%
Dr. Charles R. Drew Elementary	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Less than 15%
Dr. Sally K. Ride Elementary	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Less than 15%
DuFief Elementary	20.2%	24.4%	28.3%	34.1%	45.5%	36.4%	2.3%	2.3%	3.2%	2.3%	0.0%	0.0%	0.4%	0.5%	44.9%
East Silver Spring Elementary	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Less than 15%
Fairland Elementary	4.2%	5.4%	61.8%	64.2%	25.7%	23.5%	3.7%	3.0%	2.0%	1.1%	2.0%	0.2%	0.6%	2.6%	51.8%
Fallsmead Elementary	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Less than 15%
Farmland Elementary	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Less than 15%

School	Walk to School	Walk from School	School Bus to School	School Bus from School	Family Car to School	Family Car from School	Carpool to School	Carpool from School	Bike to School	Bike from School	Public Transit to School	Public Transit from School	Other to School	Other from School	Response Rate
Fields Road Elementary	25.8%	27.2%	46.4%	46.4%	23.2%	21.0%	1.6%	1.5%	0.7%	0.7%	1.0%	0.5%	1.2%	2.8%	70.1%
Flora M. Singer Elementary	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Less than 15%
Flower Hill Elementary	23.1%	28.4%	38.1%	37.0%	33.7%	28.9%	2.4%	1.6%	1.5%	1.8%	0.3%	0.5%	1.0%	1.8%	91.4%
Flower Valley Elementary	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Less than 15%
Forest Knolls Elementary	14.2%	17.1%	46.3%	45.4%	35.6%	31.6%	1.5%	2.8%	0.6%	1.3%	0.7%	0.4%	1.2%	1.4%	79.9%
Fox Chapel Elementary	24.3%	26.8%	47.4%	56.1%	25.4%	14.0%	2.4%	1.7%	0.2%	0.8%	0.2%	0.4%	0.0%	0.2%	87.2%
Gaithersburg Elementary	45.5%	48.4%	22.6%	23.0%	23.2%	19.5%	7.4%	7.3%	0.5%	0.2%	0.1%	0.5%	0.6%	1.0%	61.5%
Galway Elementary	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Less than 15%
Garrett Park Elementary	15.7%	16.8%	50.8%	51.6%	24.8%	22.4%	2.7%	2.6%	2.6%	1.5%	0.4%	0.5%	3.0%	4.6%	82.1%
Georgian Forest Elementary	2.9%	2.6%	76.2%	80.9%	18.7%	13.7%	0.4%	0.7%	0.4%	0.6%	0.9%	0.5%	0.4%	1.0%	58.7%
Germantown Elementary	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Less than 15%
Glen Haven Elementary	39.2%	49.8%	1.8%	2.0%	48.6%	38.9%	6.4%	3.7%	1.4%	2.3%	1.6%	2.1%	1.1%	1.2%	86.1%
Glenallan Elementary	22.7%	29.1%	36.1%	36.2%	36.0%	31.1%	2.8%	1.8%	1.9%	0.0%	0.0%	0.5%	0.6%	1.3%	32.4%
Goshen Elementary	1.5%	2.0%	66.1%	66.5%	26.6%	24.3%	1.3%	4.1%	0.9%	0.0%	0.8%	0.0%	2.8%	3.1%	38.2%

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Great Seneca Creek Elementary	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Less than 15%
Greencastle Elementary	23.2%	22.9%	34.8%	38.8%	32.5%	25.7%	5.1%	5.7%	1.1%	0.8%	0.6%	2.0%	2.7%	4.2%	49.5%
Greenwood Elementary	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Less than 15%
Harmony Hills Elementary	15.0%	15.0%	64.0%	67.0%	15.6%	12.5%	3.5%	3.2%	0.2%	0.6%	1.3%	0.5%	0.4%	1.2%	59.6%
Highland Elementary	30.5%	40.4%	1.7%	0.7%	57.0%	46.1%	7.4%	9.1%	0.8%	1.8%	1.1%	0.6%	1.5%	1.3%	71.4%
Highland View Elementary	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Less than 15%
Jackson Road Elementary	5.9%	8.7%	60.5%	63.8%	27.1%	21.3%	2.8%	3.0%	1.2%	0.5%	0.5%	0.2%	1.8%	2.5%	90.4%
JoAnn Leleck Elementary at Broad Acres	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Less than 15%
Jones Lane Elementary	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Less than 15%
Judith A. Resnik Elementary	11.9%	18.4%	44.3%	47.3%	33.9%	25.4%	3.1%	1.7%	0.7%	1.3%	1.9%	2.5%	4.2%	3.4%	47.2%
Kemp Mill Elementary	4.1%	4.5%	69.3%	74.7%	23.1%	17.3%	1.3%	1.3%	0.3%	0.0%	0.9%	0.4%	1.0%	1.7%	59.6%
Kensington Parkwood Elementary	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Less than 15%

School	Walk to School	Walk from School	School Bus to School	School Bus from School	Family Car to School	Family Car from School	Carpool to School	Carpool from School	Bike to School	Bike from School	Public Transit to School	Public Transit from School	Other to School	Other from School	Response Rate
Lake Seneca Elementary	26.7%	30.4%	31.3%	33.1%	30.2%	26.6%	4.8%	4.5%	2.6%	1.4%	0.3%	1.0%	4.0%	3.0%	81.1%
Lakewood Elementary	6.0%	9.1%	59.6%	62.6%	29.2%	24.2%	3.1%	1.9%	1.0%	1.0%	0.0%	0.3%	1.1%	0.8%	57.4%
Laytonsville Elementary	1.9%	1.6%	69.7%	74.3%	23.1%	19.9%	2.2%	1.6%	1.2%	0.8%	0.9%	0.9%	1.0%	1.0%	77.3%
Little Bennett Elementary	22.2%	22.5%	40.6%	42.3%	31.1%	26.5%	3.6%	4.7%	0.7%	1.2%	0.8%	0.5%	1.0%	2.3%	71.9%
Lois P. Rockwell Elementary	6.4%	7.6%	58.1%	65.8%	33.2%	25.6%	1.2%	0.0%	0.3%	0.5%	0.4%	0.0%	0.4%	0.5%	73.1%
Lucy V. Barnsley Elementary	12.9%	12.9%	49.2%	54.2%	35.0%	29.5%	1.7%	1.9%	0.8%	0.9%	0.3%	0.2%	0.2%	0.4%	93.5%
Luxmanor Elementary	0.0%	0.4%	79.1%	82.0%	17.2%	13.9%	0.8%	1.1%	1.3%	1.3%	1.3%	1.3%	0.4%	0.0%	31.6%
Maryvale Elementary	0.6%	1.4%	78.8%	77.1%	15.7%	14.3%	1.7%	2.6%	1.2%	0.2%	0.0%	0.8%	2.1%	3.6%	64.7%
Meadow Hall Elementary	33.1%	38.1%	25.0%	25.6%	35.5%	28.4%	3.7%	3.2%	0.8%	0.5%	0.5%	0.5%	1.5%	3.9%	71.5%
Mill Creek Towne Elementary	5.6%	4.8%	56.6%	60.7%	31.2%	28.2%	3.8%	3.7%	0.3%	1.1%	0.0%	0.0%	2.6%	1.5%	75.6%
Monocacy Elementary	0.0%	0.0%	80.7%	87.7%	14.4%	9.4%	2.8%	2.9%	0.7%	0.0%	0.7%	0.0%	0.7%	0.0%	92.1%
Montgomery Knolls Elementary	7.4%	8.1%	66.0%	69.9%	23.1%	18.2%	1.5%	0.9%	1.0%	1.0%	0.3%	0.6%	0.7%	1.3%	86.8%
New Hampshire Estates Elementary	37.9%	42.9%	41.8%	39.9%	13.4%	11.3%	3.4%	1.5%	1.1%	1.9%	0.5%	1.1%	1.8%	1.4%	60.1%

School	Walk to School	Walk from School	School Bus to School	School Bus from School	Family Car to School	Family Car from School	Carpool to School	Carpool from School	Bike to School	Bike from School	Public Transit to School	Public Transit from School	Other to School	Other from School	Response Rate
North Chevy Chase Elementary	18.2%	17.8%	63.2%	66.1%	13.3%	10.9%	0.5%	0.5%	3.1%	2.3%	0.0%	0.0%	1.6%	2.5%	88.4%
Oak View Elementary	17.7%	16.9%	60.0%	66.4%	17.1%	11.1%	1.7%	2.5%	1.1%	0.9%	1.5%	0.6%	0.9%	1.4%	81.3%
Oakland Terrace Elementary	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Less than 15%
Olney Elementary	9.9%	17.7%	63.8%	68.3%	23.2%	10.3%	1.1%	1.3%	0.6%	1.7%	0.9%	0.0%	0.6%	0.7%	55.9%
Pine Crest Elementary	17.5%	17.2%	56.6%	55.2%	20.5%	20.7%	4.1%	5.7%	0.7%	0.7%	0.6%	0.3%	0.0%	0.3%	62.2%
Piney Branch Elementary	35.7%	37.4%	34.7%	32.4%	19.2%	20.1%	3.3%	0.5%	5.5%	5.1%	0.0%	0.8%	1.6%	3.6%	40.3%
Poolesville Elementary	13.1%	14.4%	44.2%	48.7%	33.8%	27.1%	3.3%	4.3%	1.3%	2.1%	1.0%	0.0%	3.5%	3.3%	44.5%
Potomac Elementary	0.0%	0.0%	83.8%	85.3%	13.3%	11.2%	1.7%	1.1%	0.0%	0.7%	1.2%	1.0%	0.0%	0.8%	83.8%
Rachel Carson Elementary	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Less than 15%
Ritchie Park Elementary	7.3%	9.4%	55.4%	56.4%	31.5%	29.7%	0.9%	1.2%	2.5%	1.9%	0.6%	0.0%	1.8%	1.5%	89.3%
Rock Creek Forest Elementary	15.3%	19.0%	50.9%	54.2%	30.5%	22.3%	0.4%	0.6%	0.5%	1.1%	0.3%	0.2%	2.1%	2.5%	71.3%
Rock Creek Valley Elementary	16.0%	27.1%	42.2%	44.4%	37.3%	23.5%	1.6%	2.8%	0.9%	1.3%	0.3%	0.0%	1.7%	0.9%	37.1%
Rock View Elementary	14.8%	16.6%	44.2%	43.9%	34.3%	32.3%	3.7%	3.1%	1.4%	1.7%	0.9%	0.5%	0.6%	1.8%	91.5%

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Rolling Terrace Elementary	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Less than 15%
Ronald McNair Elementary	22.0%	27.5%	27.9%	28.8%	38.5%	33.6%	5.0%	2.0%	3.5%	2.8%	0.3%	0.9%	2.8%	4.4%	56.0%
Roscoe R. Nix Elementary	3.6%	5.4%	67.2%	71.7%	25.6%	19.3%	1.8%	2.1%	1.4%	1.4%	0.3%	0.0%	0.0%	0.0%	49.2%
Rosemary Hills Elementary	19.3%	19.6%	55.6%	53.7%	20.9%	21.8%	2.3%	1.0%	0.5%	0.3%	0.5%	1.1%	0.7%	2.6%	79.4%
Rosemont Elementary	2.5%	3.1%	68.6%	70.3%	24.8%	21.4%	1.9%	2.1%	0.6%	0.8%	0.8%	1.0%	0.8%	1.4%	88.7%
S. Christa McAuliffe Elementary	21.4%	23.3%	48.3%	51.4%	22.5%	17.4%	3.8%	3.4%	0.8%	1.3%	1.0%	1.3%	2.1%	1.9%	88.4%
Sargent Shriver Elementary	22.8%	25.4%	39.7%	41.1%	29.4%	24.6%	4.5%	4.8%	0.7%	1.0%	1.3%	1.4%	1.7%	1.7%	88.7%
Sequoyah Elementary	0.9%	1.8%	79.0%	80.5%	18.4%	15.0%	0.3%	0.6%	0.6%	1.2%	0.6%	0.0%	0.3%	0.9%	89.1%
Seven Locks Elementary	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Less than 15%
Sherwood Elementary	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Less than 15%
Sligo Creek Elementary	20.7%	21.3%	33.7%	36.0%	39.9%	36.9%	1.9%	2.1%	2.7%	2.3%	0.4%	0.6%	0.7%	0.8%	68.2%
Snowden Farm Elementary	48.6%	48.6%	10.9%	18.1%	25.5%	19.4%	12.5%	11.2%	0.7%	1.6%	0.2%	0.2%	1.7%	0.8%	55.1%
Somerset Elementary	28.0%	28.4%	48.5%	40.9%	15.4%	19.7%	1.2%	1.4%	4.4%	4.9%	0.0%	0.4%	2.5%	4.3%	84.3%

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South Lake Elementary	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Less than 15%
Spark M. Matsunaga Elementary	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Less than 15%
Stedwick Elementary	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Less than 15%
Stone Mill Elementary	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Less than 15%
Stonegate Elementary	8.9%	11.1%	50.7%	50.3%	33.9%	30.2%	4.6%	3.9%	0.9%	0.8%	0.8%	0.5%	0.2%	3.3%	69.9%
Strathmore Elementary	2.7%	4.3%	72.7%	78.0%	19.3%	11.2%	2.2%	2.7%	0.9%	0.9%	1.7%	1.5%	0.5%	1.4%	82.0%
Strawberry Knoll Elementary	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Less than 15%
Summit Hall Elementary	25.5%	29.0%	41.3%	43.0%	25.0%	20.9%	4.7%	3.5%	1.4%	1.4%	1.4%	1.2%	0.9%	1.1%	85.3%
Takoma Park Elementary	27.4%	29.6%	45.4%	42.3%	22.3%	24.6%	2.1%	1.0%	0.8%	0.6%	1.0%	0.4%	1.0%	1.5%	78.9%
Thurgood Marshall Elementary	8.1%	10.5%	59.7%	64.0%	29.8%	21.4%	0.6%	1.8%	0.6%	0.8%	0.2%	0.6%	1.0%	0.8%	90.5%
Travilah Elementary	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Less than 15%
Twinbrook Elementary	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Less than 15%
Viers Mill Elementary	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Less than 15%
Washington Grove Elementary	4.9%	4.2%	78.2%	78.9%	14.8%	14.2%	0.6%	1.7%	0.8%	0.6%	0.0%	0.0%	0.7%	0.4%	50.8%

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Waters Landing Elementary	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Less than 15%
Watkins Mill Elementary	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Less than 15%
Wayside Elementary	17.9%	21.8%	54.8%	50.0%	23.0%	21.0%	2.3%	4.9%	0.7%	0.4%	0.2%	0.8%	1.1%	1.1%	90.1%
Weller Road Elementary	30.9%	41.2%	8.9%	10.9%	50.0%	34.4%	6.5%	5.9%	0.2%	2.7%	1.9%	1.9%	1.6%	3.1%	23.9%
Westbrook Elementary	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Less than 15%
Westover Elementary	7.9%	10.5%	35.6%	39.2%	45.3%	39.3%	5.0%	4.0%	3.7%	3.1%	1.3%	1.3%	1.2%	2.4%	78.5%
Wheaton Woods Elementary	30.3%	35.8%	26.0%	27.2%	33.7%	28.9%	5.2%	5.2%	1.4%	1.2%	2.0%	0.7%	1.3%	1.0%	49.1%
Whetstone Elementary	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Less than 15%
William B. Gibbs Jr. Elementary	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Less than 15%
William Tyler Page Elementary	13.9%	23.9%	37.9%	40.7%	38.6%	27.2%	6.1%	5.2%	1.4%	1.4%	0.8%	0.4%	1.4%	1.2%	73.3%
Wilson Wims Elementary	20.4%	24.1%	39.8%	41.8%	31.4%	25.7%	3.5%	3.6%	2.1%	1.9%	0.9%	0.3%	1.8%	2.5%	90.3%
Wood Acres Elementary	15.6%	18.4%	50.0%	52.3%	30.3%	23.4%	1.6%	1.3%	1.4%	1.4%	0.0%	0.0%	1.1%	3.2%	77.7%
Woodfield Elementary	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Less than 15%
Woodlin Elementary	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Less than 15%

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Wyngate Elementary	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Less than 15%

Figure 8: Middle School Student Survey Results

School	Walk to School	Walk from School	School Bus to School	School Bus from School	Family Car to School	Family Car from School	Carpool to School	Carpool from School	Bike to School	Bike from School	Public Transit to School	Public Transit from School	Other to School	Other from School	Response Rate
A. Mario Loiederman Middle	12.8%	18.7%	46.0%	49.5%	28.5%	18.6%	10.2%	10.0%	0.4%	0.5%	1.8%	2.2%	0.4%	0.5%	78.3%
Argyle Middle	6.2%	7.6%	54.9%	58.4%	24.4%	15.3%	6.0%	6.0%	0.2%	0.2%	8.1%	12.1%	0.3%	0.4%	65.5%
Benjamin Banneker Middle	1.7%	3.9%	75.2%	83.3%	19.8%	10.5%	1.3%	1.1%	0.6%	0.3%	1.2%	0.3%	0.2%	0.6%	70.6%
Briggs Chaney Middle	2.8%	3.4%	82.2%	87.2%	13.3%	8.1%	0.6%	0.6%	0.6%	0.3%	0.5%	0.2%	0.0%	0.1%	56.7%
Cabin John Middle	9.2%	16.1%	63.4%	70.5%	24.4%	10.2%	1.8%	1.1%	0.6%	0.4%	0.4%	1.0%	0.2%	0.6%	86.3%
Odessa Shannon Middle	1.4%	4.5%	74.0%	78.4%	17.4%	10.4%	1.9%	0.9%	0.8%	0.0%	3.9%	4.5%	0.6%	1.4%	51.1%
Dr. Martin Luther King Jr. Middle	9.5%	13.1%	65.7%	69.6%	19.4%	9.3%	2.0%	1.7%	0.3%	0.3%	2.4%	5.2%	0.7%	0.8%	80.4%
Earle B. Wood Middle	10.9%	18.3%	62.5%	66.9%	22.3%	10.8%	2.2%	0.9%	0.1%	0.1%	1.3%	1.8%	0.8%	1.1%	78.4%
Eastern Middle	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Less than 15%

School	Walk to School	Walk from School	School Bus to School	School Bus from School	Family Car to School	Family Car from School	Carpool to School	Carpool from School	Bike to School	Bike from School	Public Transit to School	Public Transit from School	Other to School	Other from School	Response Rate
Forest Oak Middle	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Less than 15%
Francis Scott Key Middle	3.2%	7.0%	81.1%	83.9%	13.4%	6.9%	0.6%	0.6%	0.0%	0.0%	1.3%	0.9%	0.3%	0.7%	62.9%
Gaithersburg Middle	26.5%	33.9%	47.2%	47.1%	20.8%	13.4%	2.6%	1.8%	0.3%	0.6%	2.0%	1.8%	0.6%	1.3%	70.2%
Hallie Wells Middle	31.6%	42.9%	21.7%	24.8%	29.2%	15.5%	10.2%	9.9%	4.5%	4.6%	0.8%	0.3%	2.0%	2.0%	90.4%
Herbert Hoover Middle	10.5%	18.6%	55.9%	63.7%	28.8%	13.0%	3.4%	3.0%	0.9%	0.9%	0.2%	0.2%	0.4%	0.6%	81.9%
John Poole Middle	4.7%	7.0%	63.0%	75.4%	24.4%	11.5%	3.1%	1.7%	3.1%	3.1%	0.0%	0.0%	1.7%	1.4%	91.8%
John T. Baker Middle	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Less than 15%
Julius West Middle	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Less than 15%
Kingsview Middle	16.8%	26.2%	42.8%	47.5%	33.6%	16.3%	4.2%	3.7%	1.8%	1.6%	0.9%	4.2%	0.0%	0.4%	82.2%
Lakelands Park Middle	17.3%	25.8%	54.2%	57.7%	21.9%	10.4%	3.1%	1.6%	2.6%	2.7%	0.3%	0.9%	0.6%	0.9%	79.4%
Montgomery Village Middle	28.8%	45.7%	25.7%	26.0%	34.9%	19.4%	5.5%	2.4%	1.4%	1.4%	2.8%	4.6%	0.9%	0.6%	72.8%
Neelsville Middle	0.0%	0.0%	83.0%	89.9%	12.1%	6.3%	0.9%	0.0%	0.0%	0.0%	4.0%	2.8%	0.0%	1.0%	15.0%
Newport Mill Middle	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Less than 15%
North Bethesda Middle	12.3%	15.2%	67.6%	71.3%	14.8%	7.9%	1.3%	0.4%	3.4%	3.1%	0.2%	1.5%	0.5%	0.6%	87.8%

School	Walk to School	Walk from School	School Bus to School	School Bus from School	Family Car to School	Family Car from School	Carpool to School	Carpool from School	Bike to School	Bike from School	Public Transit to School	Public Transit from School	Other to School	Other from School	Response Rate
Parkland Middle	4.2%	5.7%	58.5%	62.9%	27.0%	18.7%	8.4%	8.7%	0.3%	0.2%	1.3%	3.1%	0.4%	0.7%	92.4%
Redland Middle	1.4%	1.7%	89.1%	93.0%	8.6%	4.6%	0.2%	0.0%	0.2%	0.2%	0.4%	0.0%	0.2%	0.6%	78.0%
Ridgeview Middle	7.4%	10.9%	75.8%	76.9%	13.8%	8.0%	1.1%	1.4%	0.3%	0.5%	1.4%	1.9%	0.3%	0.4%	73.2%
Robert Frost Middle	7.1%	11.3%	66.8%	76.4%	20.3%	7.1%	2.0%	1.0%	3.1%	3.1%	0.3%	0.9%	0.3%	0.1%	68.4%
Roberto W. Clemente Middle	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Less than 15%
Rocky Hill Middle	4.8%	5.9%	80.1%	86.6%	13.8%	6.0%	0.7%	0.8%	0.1%	0.1%	0.1%	0.3%	0.4%	0.3%	84.6%
Rosa Parks Middle	7.2%	13.6%	65.4%	68.9%	19.9%	9.3%	5.5%	5.0%	1.7%	2.3%	0.3%	0.1%	0.0%	0.7%	87.1%
Shady Grove Middle	6.7%	9.1%	76.8%	79.7%	14.4%	9.6%	0.6%	0.4%	0.2%	0.2%	1.0%	1.0%	0.2%	0.0%	85.6%
Silver Creek Middle	6.0%	6.6%	83.1%	87.2%	9.0%	3.3%	0.3%	0.4%	1.5%	1.7%	0.1%	0.7%	0.0%	0.1%	83.3%
Silver Spring International Middle	16.1%	19.2%	53.9%	59.1%	19.4%	10.4%	2.0%	0.8%	3.0%	3.1%	4.7%	6.5%	0.8%	0.9%	70.6%
Sligo Middle	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Less than 15%
Takoma Park Middle	29.1%	36.0%	40.6%	45.5%	17.1%	7.5%	5.5%	0.4%	1.5%	1.5%	3.5%	5.2%	2.6%	4.0%	40.2%
Thomas W. Pyle Middle	11.6%	14.9%	70.5%	75.1%	13.4%	5.4%	1.3%	1.1%	2.8%	2.8%	0.1%	0.4%	0.1%	0.1%	33.6%
Tilden Middle	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Less than 15%
Westland Middle	13.9%	18.0%	71.1%	72.4%	11.4%	5.3%	0.6%	0.5%	1.5%	1.3%	0.5%	0.9%	0.9%	1.5%	74.1%

School	Walk to School	Walk from School	School Bus to School	School Bus from School	Family Car to School	Family Car from School	Carpool to School	Carpool from School	Bike to School	Bike from School	Public Transit to School	Public Transit from School	Other to School	Other from School	Response Rate
White Oak Middle	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Less than 15%
William H. Farquhar Middle	0.5%	0.9%	76.0%	86.6%	19.8%	11.5%	3.1%	0.5%	0.3%	0.2%	0.2%	0.4%	0.0%	0.0%	83.0%

Figure 9: High School Student Survey Results

School	Walk to School	Walk from School	School Bus to School	School Bus from School	Family Car to School	Family Car from School	Carpool to School	Carpool from School	Bike to School	Bike from School	Public Transit to School	Public Transit from School	Other to School	Other from School	Response Rate
Albert Einstein High	12.0%	19.0%	44.1%	45.6%	32.4%	19.9%	7.1%	4.0%	0.2%	0.2%	3.7%	10.6%	0.5%	0.6%	54.7%
Bethesda-Chevy Chase High	17.7%	23.8%	42.4%	40.6%	20.8%	9.2%	10.3%	6.2%	4.6%	4.6%	3.8%	15.1%	0.4%	0.6%	40.4%
Clarksburg High	5.9%	10.7%	53.1%	60.1%	31.5%	17.9%	6.7%	6.5%	0.2%	0.3%	1.7%	3.5%	1.0%	1.0%	59.1%
Col. Zadok Magruder High	1.4%	1.8%	67.4%	75.4%	23.5%	14.9%	6.0%	5.4%	0.2%	0.3%	1.0%	1.4%	0.5%	0.7%	58.0%
Damascus High	6.8%	8.8%	46.7%	51.7%	37.0%	28.3%	7.8%	8.6%	0.0%	0.1%	0.6%	1.2%	1.1%	1.2%	76.9%
Gaithersburg High	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Less than 15%
James Hubert Blake High	0.8%	1.8%	69.4%	73.0%	26.5%	20.2%	2.9%	3.0%	0.0%	0.0%	0.2%	1.8%	0.2%	0.2%	31.8%

School	Walk to School	Walk from School	School Bus to School	School Bus from School	Family Car to School	Family Car from School	Carpool to School	Carpool from School	Bike to School	Bike from School	Public Transit to School	Public Transit from School	Other to School	Other from School	Response Rate
John F. Kennedy High	9.2%	11.5%	54.1%	51.4%	26.9%	15.0%	1.6%	1.6%	0.1%	0.1%	7.8%	20.0%	0.3%	0.5%	60.0%
Montgomery Blair High	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Less than 15%
Northwest High	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Less than 15%
Northwood High	11.5%	16.9%	43.4%	41.0%	29.6%	14.9%	3.2%	2.4%	0.7%	0.7%	11.2%	23.6%	0.4%	0.5%	52.4%
Paint Branch High	2.7%	5.0%	61.9%	67.8%	27.6%	18.3%	3.2%	2.6%	0.1%	0.1%	3.7%	4.7%	0.9%	1.5%	49.3%
Poolesville High	7.6%	13.2%	55.5%	56.5%	30.8%	21.3%	4.3%	5.9%	1.2%	1.2%	0.3%	1.3%	0.3%	0.5%	50.8%
Quince Orchard High	8.0%	15.9%	33.0%	35.2%	38.8%	23.8%	15.6%	14.0%	1.4%	1.0%	2.4%	9.1%	0.8%	1.0%	43.5%
Richard Montgomery High	10.9%	15.7%	43.3%	48.5%	34.6%	19.3%	6.4%	4.3%	1.5%	1.4%	3.1%	10.2%	0.3%	0.7%	54.5%
Rockville High	12.7%	17.4%	39.4%	39.4%	33.7%	23.8%	9.3%	10.6%	0.5%	0.5%	3.5%	7.2%	0.7%	1.1%	30.9%
Seneca Valley High	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Less than 15%
Sherwood High	2.5%	3.5%	49.1%	56.8%	36.2%	27.0%	9.9%	9.7%	0.2%	0.3%	0.9%	1.8%	1.1%	0.9%	76.1%
Springbrook High	3.1%	5.6%	60.2%	65.3%	29.3%	19.4%	3.5%	2.3%	0.5%	0.5%	3.0%	6.3%	0.3%	0.5%	31.3%
Thomas S. Wootton High	7.0%	12.0%	41.8%	48.2%	36.2%	24.7%	12.9%	9.9%	1.4%	2.1%	0.1%	3.1%	0.5%	0.1%	29.7%
Walt Whitman High	8.9%	16.0%	34.7%	41.8%	35.5%	19.7%	17.1%	14.9%	2.3%	2.3%	1.1%	4.6%	0.4%	0.6%	77.8%

School	Walk to School	Walk from School	School Bus to School	School Bus from School	Family Car to School	Family Car from School	Carpool to School	Carpool from School	Bike to School	Bike from School	Public Transit to School	Public Transit from School	Other to School	Other from School	Response Rate
Walter Johnson High	6.2%	10.0%	48.8%	49.7%	31.5%	18.9%	8.3%	7.4%	1.1%	1.1%	3.3%	12.1%	0.8%	0.9%	57.6%
Watkins Mill High	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Less than 15%
Wheaton High	12.7%	20.0%	38.2%	39.7%	38.1%	17.1%	3.9%	2.0%	0.4%	0.4%	5.8%	19.6%	1.0%	1.2%	34.4%
Winston Churchill High	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Less than 15%