DRAFT Methodology Report

Montgomery County Bicycle Master Plan

May 2016

1   Abstract: This methodology report outlines the approach to the Bicycle Master Plan, including the
2   plan framework. It defines a vision by articulating goals and objectives, realizes that vision through
3   a network of bikeways and bicycle parking, supported by policies and programs to encourage
4   bicycling, and proposes accountability and transparency of plan implementation through a
5   monitoring program.

Contents

1 Introduction

Bicycling is gaining popularity as a mode of transportation throughout the United States. Driven by changing travel patterns, investments in bicycling infrastructure that separates bicycling from motor vehicle traffic and the increasing popularity of bikeshare programs, the share of trips by bicycle has grown steadily over the past 15 years. Montgomery County continues to make investments in bicycling infrastructure with projects such as the Capital Crescent Trail and the Woodglen Drive separated bike lane and is well-positioned to emerge as a leader in bicycling among suburban jurisdictions. This methodology report outlines how the working draft of the Bicycle Master Plan will be built off of a data driven process.

2 Master Plan Purpose

49

50 The Bicycle Master Plan is intended to set forth a vision for Montgomery County as a world-class
51 bicycling community, where people in all communities are able to get to the places they want to go
52 on a comfortable, safe, and connected bicycle network, and where bicycling is a viable transportation
53 option that improves our quality of life. The plan framework is composed of three interconnected
54 steps.

1 The first step is **Defining the Vision** by imaging and articulating a future state of affairs that meets the goal of enabling all residents to get to their chosen destinations by bike on a comfortable, safe, and connected bicycle network. That vision is refined and clarified through articulation of goals, objectives, metrics and data collection.

2 The second step is **Realizing the Vision** by describing concrete actions that government, property owners, stakeholders and the general public can take to fulfill the vision. These include bicycling-supportive infrastructure, programs and policies.

3 The third step consists of **Monitoring the Vision** by setting up an ongoing monitoring and evaluation program that enables transparency and accountability in plan implementation.

55

56 The Bicycle Master Plan will focus on increasing bicycling among the so-called "Interested but
57 Concerned" population of people who are interested in bicycling more but are concerned for their
58 safety (see Section **Error! Reference source not found.**)[1]. This group of bicyclists are less tolerant
59 of bicycling close to traffic and require separated bikeways to encourage them to bicycle on wider
60 and faster roads. They represent about 50 percent of the population and therefore the greatest
61 opportunity to increase bicycling in Montgomery County.

---

[1] The "Interested but Concerned" population is one of the "Four Types of Transportation Cyclists", an approach coined by Roger Geller, a Bicycle Planner for the City of Portland, Oregon. See
https://www.portlandoregon.gov/transportation/article/158497

DEFINING THE VISION

Goals
∨
Objectives
∨
Metrics
∨
Data Collection

REALIZING THE VISION

Bicycle Infrastructure

Programs

Policies

Priorities

MONITORING THE VISION

Evaluate Objectives
Identify Bikeways & Bike Parking
Summarize Changes To County Policies & Programs

62

3 Defining the Vision

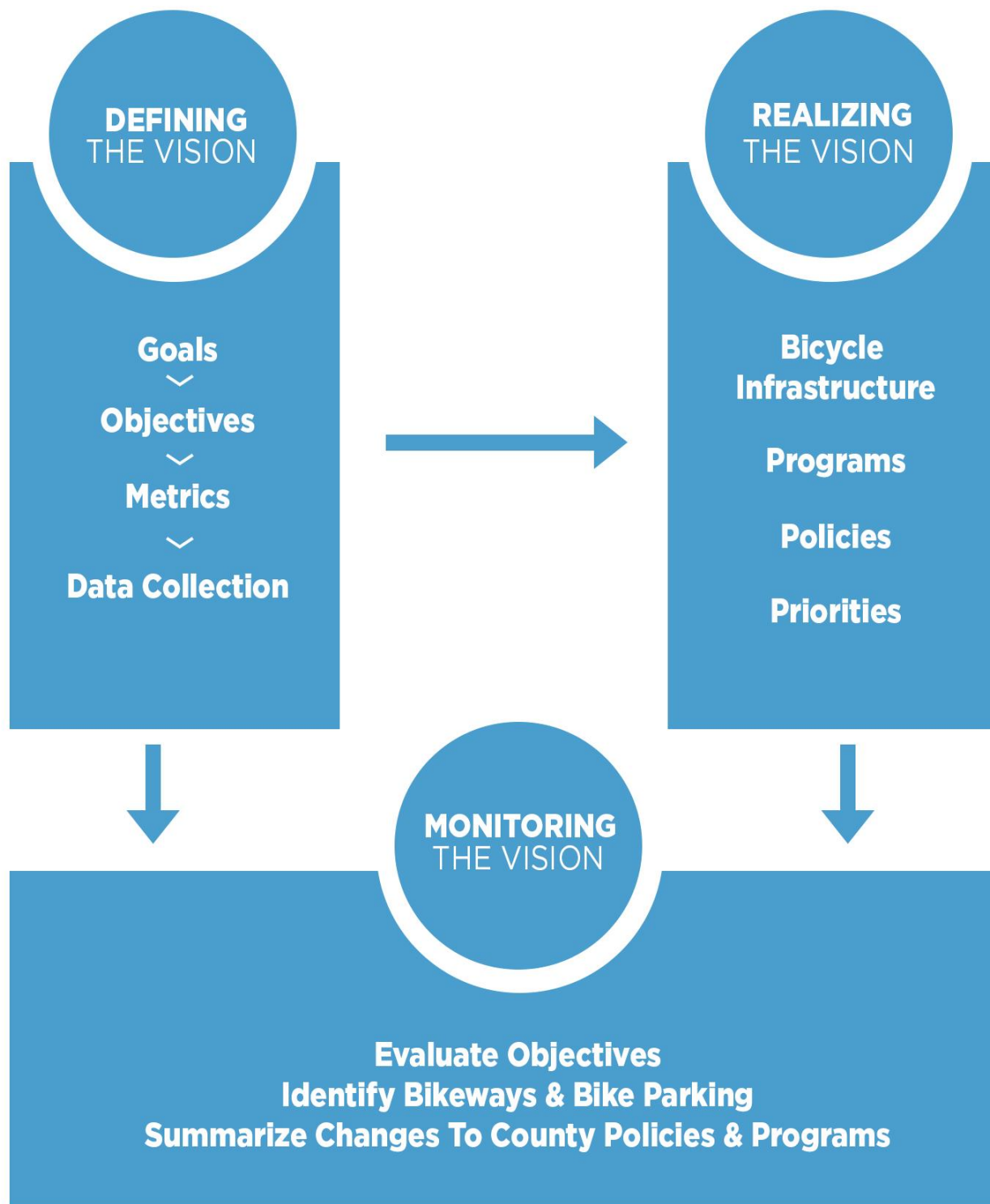An essential first step in preparing the Bicycle Master Plan is to define the plan's vision. This begins by imaging and articulating a future state of affairs that meets the goal of enabling all residents to get to their chosen destinations by bike on a comfortable, safe, and connected bicycle network. That vision is refined and clarified through articulation of goals, objectives, metrics and data collection.

Defining a vision for this plan does not simply put words on paper. It also lays the foundation for a strong monitoring program, which fosters transparency in evaluation and accountability for outcomes. Of course a vision is only as good as its components. One way the Bicycle Master Plan can deliver a world-class bicycle plan is by defining a clear and measurable vision.

```
Vision Statement → Goals → Objectives → Metrics → Data Collection
```
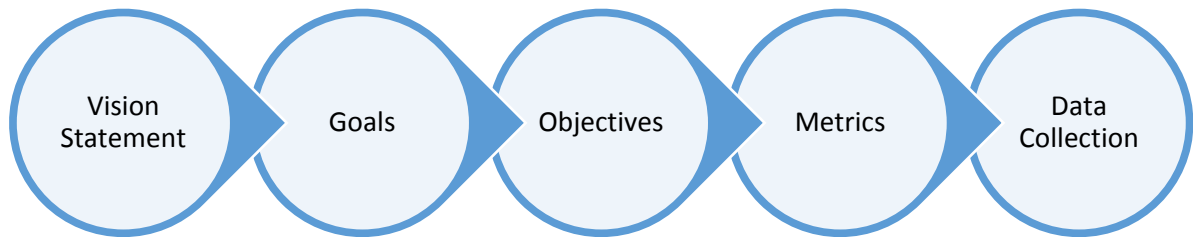
A strong **vision statement** paints a clear picture of what the plan is intended to achieve. It can be further explained through goals that identify the conditions that are needed to achieve the vision statement.

Goals are broad conditions that are needed to achieve the plan's vision statement. They are general and brief and can always be improved. Goals do not prejudge a solution, but rather articulate the conditions that might lead to a particular solution. Each goal is described by one or more objectives that indicate the steps that need to be taken to realize the plan's goals. Goals are as effective as the objectives that describe them.

Objectives are specific conditions that must be met to advance a particular goal. They are achievable, measurable, and time specific. Objectives are effective when they show a meaningful change among different scenarios. They do not prejudge a solution, but rather articulate the conditions that might lead to a particular solution. Objectives are more likely to be evaluated when they are carefully defined, avoid "wiggle room", and do not require substantial new data collection.

Metrics reframe the objectives into measureable statements. They determine the data needed to assess how well the objectives are being met.

Data Collection includes specific information that is required to derive each metric. It indicates the source of the data and whether the data is currently available, could be available with modifications to existing survey instruments, or need to be collected through a new survey.

3.1 Vision Statement

We propose the following vision statement for the Bicycle Master Plan:

Montgomery County will become a world-class bicycling community. Everyone in Montgomery County will be able to travel by bicycle on a comfortable, safe, and connected bicycle network. Bicycling will become a viable transportation option and elevate the quality of life in the County.

3.2 Goals, Objectives, Metrics and Data Requirements

The vision statement will be defined by four goals:

- Goal 1: Increase bicycling trips in Montgomery County
- Goal 2: Create a highly-connected, convenient and low-stress bicycling network
- Goal 3: Provide equal access to low-stress bicycling for all members of the community
- Goal 4: Improve the safety of bicycling

3.2.1 Goal 1: Increase bicycling trips in Montgomery County

The most important measure of success for the bicycle master plan is the extent to which the amount of bicycling increases in Montgomery County. This goal evaluates how bicycling increases over time among different groups of people, destinations, and trip types. Success in advancing this goal is largely driven by success in advancing the other three goals of the plan.

Source: Michael Tercha/Chicago Tribune

110   • Objective 1.1: Increase the percent of Montgomery County residents who commute by
111   bicycling to #% by 20##.
112   o Metric
113   ▪ Percent of residents who commute by bicycle.
114   o Data Requirements and Source
115   ▪ Method of transportation that people use for the longest distance segment of
116   their trip to work. (American Community Survey)

117

118   • Objective 1.2: Increase the percent of people who commute by bicycle to Montgomery
119   County's Transportation Management Districts (TMD) by:
120   o #% in Downtown Silver Spring by 20##
121   o #% in Downtown Bethesda by 20##
122   o #% in North Bethesda by 20##
123   o #% in Friendship Heights by 20##
124   o #% in Greater Shady Grove by 20##
125   o #% in White Oak Science Gateway by 20## (when funded)
126   o Metric
127   ▪ Percent of commuters who bicycle as part of their commute to the Silver
128   Spring TMD.
129   ▪ Percent of commuters who bicycle as part of their commute to the Bethesda
130   TMD.
131   ▪ Percent of commuters who bicycle as part of their commute to the North
132   Bethesda TMD.
133   ▪ Percent of commuters who bicycle as part of their commute to the Friendship
134   Heights TMD.
135   ▪ Percent of commuters who bicycle as part of their commute to the Greater
136   Shady Grove TMD.
137   ▪ Percent of commuters who bicycle as part of their commute to the White Oak
138   TMD.
139   o Data Requirements and Source
140   ▪ Number of respondents who bicycle to work by Transportation Management
141   District (Commuter Surveys currently combine walking and bicycling)
142   ▪ Number of respondents by Transportation Management District (Commuter
143   Surveys)

144

145   • Objective 1.3: Increase the percent of people who access a Montgomery County
146   o Red Line station by bicycle to #% by 20##.
147   o MARC Brunswick Line station by bicycle to #% by 20##.
148   o Purple Line station by bicycle to #% by 20## (future objective when Purple Line
149   opens).
150   o Metrics
151   ▪ Percent of boardings at Red Line stations that access the station by bicycle.
152   ▪ Percent of boardings at MARC Brunswick Line stations that access the station
153   by bicycle.
154   ▪ Percent of boardings at Purple Line stations that access the station by bicycle.
155   o Data Requirements and Source

156	▪ Number of boardings at each Red Line station that are accessed by bike
157	(WMATA)
158	▪ Number of boardings at each Red Line station (WMATA)
159	▪ Number of boardings at each MARC Brunswick station that are accessed by
160	bike (MTA)
161	▪ Number of boardings at each MARC Brunswick station (MTA)
162	▪ Number of boardings at each Purple Line station that are accessed by bike
163	(MTA)
164	▪ Number of boardings at each Purple Line station (MTA)
165	
166	• Objective 1.4: Increase the percent of students who bicycle to school by #% by 20##.
167	○ Metric
168	▪ Percent of elementary school students who travel to school by bicycle.
169	▪ Percent of middle school students who travel to school by bicycle.
170	▪ Percent of high school students who travel to school by bicycle.
171	○ Data Requirements and Source
172	▪ The number of elementary school student who bicycle to school. (requires
173	new survey)
174	▪ Total number of elementary school students. (requires new survey)
175	▪ The number of middle school student who bicycle to school. (requires new
176	survey)
177	▪ Total number of middle school students. (requires new survey)
178	▪ The number of high school student who bicycle to school. (requires new
179	survey)
180	▪ Total number of high school students. (requires new survey)

181   ### 3.2.2   Goal 2: Create a highly-connected, convenient and low-stress bicycling network

182   Bicycling can become a mainstream mode of transportation in Montgomery County if a low-stress
183   bicycling network is put in place that enables most people to travel to the places they want to go by
184   bicycle. The network will be composed of the 70 percent of roads in the County that can already be
185   considered low-stress (mostly residential streets) and roads that require infrastructure to make
186   them appealing to "Interested but Concerned" bicyclists. Simply providing a comfortable bicycling
187   network is insufficient if people do not have a secure place to leave their bicycle when they get to
188   their destination, which is why this goal also considers bicycle parking at major destinations, such as
189   transit stations, commercial areas and public facilities such as schools, libraries and recreation
190   centers.

191
192   **The Montgomery County Planning Department's Bicycle Stress Map**

193   •   Objective 2.1: ##% of potential bicycle trips can be made on a low-stress bicycle network by
194   20##.
195   o   Metric
196   ▪   Percent of potential bicycle trips that can be made on a low-stress bicycle
197   network.
198   o   Data Requirements and Source
199   ▪   Level of Traffic Stress network (M-NCPPC)
200   ▪   Regional Travel Demand Model Trip table (M-NCPPC)
201   ▪   Bicycle trip length decay function (MWCOG Household Travel Survey)
202   ▪   Location of dwelling units (M-NCPPC)

203

204   •   Objective 2.2: #% dwelling units located within 2.0 miles of each Red Line, Brunswick Line
205   and Purple Line station will be able to access the rail station on a low stress bicycling network
206   by 20##.
207   o   Metric
208   ▪   Percent of dwelling units within 2.0 miles of Red Line stations that can access
209   the station on a low-stress bicycling network.
210   ▪   Percent of dwelling units within 2.0 miles of Brunswick Line stations that can
211   access the station on a low-stress bicycling network.
212   ▪   Percent of dwelling units within 2.0 miles of Purple Line stations that can
213   access the station on a low-stress bicycling network.
214   o   Data Requirements and Source
215   ▪   Level of Traffic Stress network (M-NCPPC)
216   ▪   Location of existing and planned Metrorail, MARC, and Purple Line station (M-
217   NCPPC)
218   ▪   Location of dwelling units (M-NCPPC)

219

220   •   Objective 2.3: ##% of dwelling units located within 1.0 mile of each elementary school, 1.5
221   miles of each middle school, and 2.0 miles of each high school will be able to access the school
222   on a low stress bicycling network by 20##.
223   o   Metrics
224   ▪   Percent of dwelling units that are connected to elementary schools on a low-
225   stress bicycle network.
226   ▪   Percent of dwelling units that are connected to middle schools on a low-stress
227   bicycle network.
228   ▪   Percent of dwelling units that are connected to high schools on a low-stress
229   bicycle network.
230   o   Data Requirements and Source
231   ▪   Level of Traffic Stress network (M-NCPPC)
232   ▪   Location of Montgomery County public schools (M-NCPPC)
233   ▪   School boundaries (M-NCPPC)
234   ▪   Location of dwelling units (M-NCPPC)

235

- Objective 2.4: ##% of dwelling units located within 2.0 miles of each public library will be able to access that library on a low stress bicycling network by 20##.

  - Metrics
    - Percent of dwelling units within 2.0 miles of each public library that can access the library on a low-stress bicycling network.
  - Data Requirements and Source
    - Level of Traffic Stress network (M-NCPPC)
    - Locations of public libraries (M-NCPPC)
    - Location of dwelling units (M-NCPPC)

- Objective 2.5: ##% of dwelling units located within 2.0 miles of each recreation center will be able to access that recreation center on a low stress bicycling network by 20##.

  - Metrics
    - Percent of dwelling units within 2.0 miles of each recreation center that can access the recreation center on a low-stress bicycling network.
  - Data Requirements and Source
    - Level of Traffic Stress network (M-NCPPC)
    - Locations of recreation centers (M-NCPPC)
    - Location of dwelling units (M-NCPPC)

- Objective 2.6: By 20##, ## of 12 Red Line stations, ## of Brunswick Line stations and ## of 11 Purple Line stations in Montgomery Co will have a bike station.
  - Metrics
    - Number of Red Line stations in Montgomery County with a bike station.
    - Number of Purple Line stations in Montgomery County with a bike station.
  - Data Requirements and Source
    - Locations of bike stations (M-NCPPC)

- Objective 2.7: ##% of Montgomery County public schools will have bicycle parking by 20##.
  - Metrics
    - Percent of Montgomery County elementary schools with public bicycle parking.
    - Percent of Montgomery County middle schools with public bicycle parking.
    - Percent of Montgomery County high schools with public bicycle parking.
  - Data Requirements and Source
    - School locations
    - Locations of bicycle racks at public schools (RackSpotter, www.rackspotter.com)

- Objective 2.8: ##% of blocks in commercial areas will have either a public bike rack or a bike corral by 20##.
  - Metric
    - Percent of blocks in commercial areas with a public bike rack or a bike corral.

281   ○ Data Requirements and Source
282   ■ Number of commercial blocks in Montgomery County (not yet available)
283   ■ Locations of bike racks and bike corrals in Montgomery County (RackSpotter,
284   www.rackspotter.com)

285

286   • Objective 2.9: ##% of Montgomery County libraries will have bicycle parking by 20##.
287   ○ Metric
288   ■ Percent of Montgomery County libraries with public bicycle parking.
289   ○ Data Requirements and Source
290   ■ Library locations (M-NCPPC)
291   ■ Locations of bicycle racks at public libraries (M-NCPPC)

292

293   • Objective 2.10: ##% of Montgomery County recreation centers will have bicycle parking by
294   20##.
295   ○ Metric
296   ■ Percent of Montgomery County recreation centers with public bicycle
297   parking.
298   ○ Data Requirements and Source
299   ■ Recreation center locations (M-NCPPC)
300   ■ Locations of bicycle racks at recreation centers (M-NCPPC)

3.2.3 Goal 3: Provide equal access to low-stress bicycling for all members of the community

Montgomery County can only become a world-class bicycling community if there is equal access to a low-stress bicycling for all members of the community, including minorities and people with lower incomes. Since many minority and lower income areas are far from a Red Line, Brunswick Line or future Purple Line station, this goal also considers the ability of lower-income and majority-minority areas to access bus stops on a low-stress bicycling network.

307	• Objective 3.1: The percent of bicycle trips that can be made on a low stress bicycling network
308	in low-income and majority-minority areas will be the same as or greater than the County
309	overall.
310	○ Metric
311	▪ Percent of potential bicycle trips that can be made on a low-stress bicycle
312	network in low-income and majority-minority areas.
313	○ Data Requirements and Source
314	▪ Level of Traffic Stress network (M-NCPPC)
315	▪ Regional Travel Demand Model Trip table (M-NCPPC)
316	▪ Bicycle trip length decay function (MWCOG Household Travel Survey)
317	▪ Location of dwelling units (M-NCPPC)
318	▪ Low income and majority-minority areas (US Census)
319	
320	• Objective 3.2: The #% of dwelling units within 0.5 miles of the nearest Metrobus or RideOn
321	bus stop that will be able to access the bus stop on a low-stress bicycling network in low-
322	income and majority-minority areas will be the same as or greater than the County overall.
323	○ Metric
324	▪ Percent of dwelling units within 0.5 miles of the nearest Metrobus or RideOn
325	bus stop that will be able to access the bus stop on a low-stress bicycling
326	network in low-income and majority-minority areas.
327	○ Data Requirements and Source
328	▪ Level of Traffic Stress network (M-NCPPC)
329	▪ Location of bus stops (Montgomery County)
330	▪ Location of dwelling units (M-NCPPC)
331	▪ Low income and majority-minority areas (US Census)

332 ### 3.2.4   Goal 4: Improve the safety of bicycling

333 The intent of this goal is to make bicycling safe by reducing the rate of crashes at dangerous
334 intersections and by eliminating fatalities. While safety can be improved by taking active measures
335 to reduce travel speeds and by providing separation from traffic, this goal will be evaluated by
336 reactive metrics based on crash reports.

337

338

339 • Objective 4.1: Reduce the ratio of bicycle crashes to bicycle trips at the ## highest crash
340 locations in the County by ##% by 20##.
341   o Metric
342   ▪ The ratio of bicycle crashes to bicycle trips at the ## highest crash locations
343   in the County
344   o Data Requirements and Source
345   ▪ Bicycle crash reports (Montgomery County CountyStat)
346   ▪ Bicycle counts at major crash locations (requires new data collection)

347

348 • Objective 4.2: Eliminate bicycle deaths by 20##
349   (based on adoption of Vision Zero by the Montgomery County Council in October 2016)
350   o Metric
351   ▪ The number of bicyclists killed per year.
352   o Data Requirements and Source
353   ▪ Bicycle crash reports (Montgomery County CountyStat)

3.3   Goals and Objectives Considered but Not Recommended

Numerous bicycle master plans from communities as diverse as Fairfax County, Virginia and Portland, Oregon were reviewed for their goals and objectives and were considered for inclusion in the Bicycle Master Plan. Most of the goals in these plans fit into eight categories:

1. Increased bicycling
2. Connectivity
3. Equity
4. Safety
5. Economic development
6. Environmental quality
7. Health
8. Livability

Category #1 is an <u>outcome</u> rather than a condition needed to achieve the plan's vision, it is measurable and time specific, can show a meaningful change, and relies on existing data sources.

Of these eight categories, only # 2, #3 and #4 express <u>conditions</u> that are needed to achieve the plan's vision. Furthermore, each goal can be continuously improved upon and critically, can be described by one or more objectives that are measurable based on readily available data.

Categories #5, #6, and #7 are all relevant to Montgomery County, and are stated reasons that decision makers, planners, and designers frequently site for supporting bicycling. However, we do not believe they should be included as goals because developing effective objectives for them would:

- Require an extensive data collection program.
- Be unlikely to have policy implications, since different scenarios would not likely show a meaningful change.

For these reasons, we strongly recommend against including # 5, 6, and 7. They do not strengthen the vision definition at this time, and may weaken the monitoring program by creating a set of objectives that cannot be easily measured. If the means to collect the data to evaluate these goals becomes easier to collect, inclusion of these goals should be reconsidered. These categories can be discussed as other benefits and outcomes of bicycling in a working draft of the Bicycle Master Plan.

Category #8 is also relevant to Montgomery County, but is exceedingly difficult to define. In fact, is it likely that all of the preceding goals are a component of livability. So rather than include a separate livability goal, we have included livability in the vision statement.

While there are many conditions that a bicycle plan should measure, the proposed objectives for each goal reflect what we believe the plan can realistically measure at this time. If too many objectives are included that require new data collection or that are overly cumbersome, the assessment of the objectives would likely be ignored. Therefore, we propose to focus the initial master plan assessment on the objectives above. Once we prove that we can successfully institutionalize assessment of these objectives, we would propose to consider the following "aspirational" objectives, which would make the evaluation more comprehensive:

Prospective Goal 1

- Increase the percent of people who access a Montgomery County BRT station by bicycle to #% by 20##.
- Increase the percent of people who bicycle for non-work and non-school trips by #% by 20##.
- Increase the percent of people who bicycle to work in:

398   o   Clarksburg Town Center to ##% by 20##.
399   o   Germantown Town Center to ##% by 20##.
400   o   Olney Town Center to ##% by 20##.

401   Prospective Goal 2

402   •   #% dwelling units located within 1.0 mile of each BRT station will be able to access the rail
403   station on a low stress bicycling network by 20##.
404   •   #% dwelling units located within 0.5 miles of each Metrobus and RideOn bus stop will be able
405   to access the bus stop on a low stress bicycling network by 20##.
406   •   By 20##, ## of ## BRT stations in Montgomery Co will have a bike station.
407   •   ##% of existing apartment and condo buildings will have secure, enclosed bicycle parking by
408   20##.

409   Prospective Goal 3

410   •   By 20##, the percent of dwelling units and work places in low-income and majority-minority
411   areas connected with each Red Line, Brunswick Line, Purple Line and BRT station within 2.0
412   miles by the low stress bicycle network will be the same as or greater than the County overall.

4 Realizing the Vision

An essential second step in preparing the Bicycle Master Plan is to make recommendations on how to realize the plan's vision. This includes concrete actions that government, property owners, stakeholders and the general public can take to fulfill the vision and includes identifying a network of bicycle parking and bikeways and recommending bicycling-supportive programs and policies.

Infrastructure Programs Policies Priorities
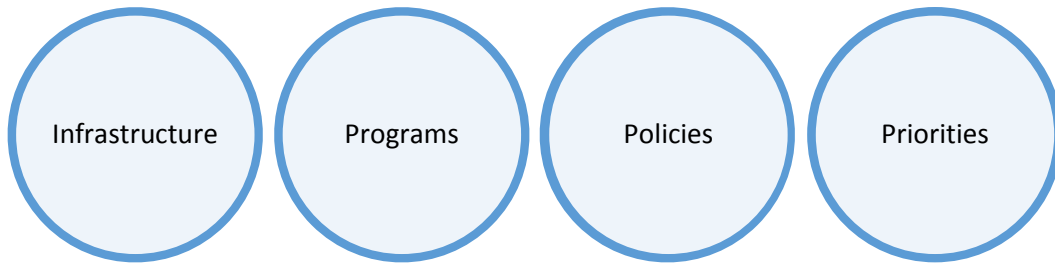
Bicycle supportive **Infrastructure** includes a highly-connected and low-stress bikeway network, where physical improvements on higher stress roads knit together the vast majority of roads and trails in Montgomery County that are already appropriate for people of all ages and bicycling abilities. Bicycle supportive infrastructure also includes adequate and secure bicycle parking, since many people will not ride a bicycle as part of their work, school or shopping trip if they are concerned that their bicycle will be damaged or stolen. This includes privately maintained bicycle parking spaces at residential and commercial buildings and publicly maintained parking spaces at activity centers such as transit stations, employment centers, and commercial areas. **Bicycle Programs** encourage bicycling by identifying bicycle-supportive events, services, opportunities and projects. Similarly, **Bicycle Policies** are actions that guide government decisions that affect bicycling. These may include laws, policies, standards and guidelines. Since bikeway and parking projects, and bicycle-supportive programs and policies take time to implement, the plan will **Prioritize** those that contribute most to the vision of the plan as measured by the goals and objectives.

4.1 Infrastructure

The Bicycle Master Plan will recommend two types of bicycle infrastructure: bikeways and bicycling parking.

4.1.1 Low Stress Bicycling

Bicycle planning has become increasingly sophisticated since Montgomery County last comprehensively updated its bicycle plans in 2005. New methodologies are available that allows planners to evaluate their existing bicycling network based on a standardized approach.

4.1.1.1 Target User Group

In 2006, Peter Geller, a bicycle planner for Portland, Oregon, proposed an approach to classifying bicyclists that he called the "four types of transportation cyclists". These included the "Strong and Fearless" group who are comfortable bicycling regardless of road conditions, the "Enthused and Confident" group who are comfortable sharing the roadway with traffic, but prefer their own space, the "Interested but Concerned" group who would bicycle more if they felt safer, and the "No Way No How" group who are not currently interested in bicycling. While Portland had spent many years

446 working to improve bicycling, he argued that the efforts were largely focused on improving bicycling
447 for the "Enthused and Confident" group and that new approaches were needed to attracted the
448 "Interested but Concerned" population to bicycle for transportation.

449 Recent research by Portland State University indicates that while the "Strong and Fearless" and
450 "Enthused and Confident" bicyclists account for about 12 percent of the population, "Interested but
451 Concerned" bicyclists account for about 50 percent of the population and therefore represent the
452 greatest opportunity to increase bicycling[2].

Strong and Fearless (~7%)
Very comfortable on non-residential streets without bike lanes

Enthused and Confident (~5%)
Very comfortable on non-residential streets with bike lanes

Interested but Concerned (~51%)
Less than very comfortable on non-residential street with or without bike lanes

No Way, No How (~37%)
Everyone else

453

454 The Bicycle Master Plan will focus on increasing bicycling among the "Interested but Concerned"
455 population by identifying a network of bikeways composed of neighborhood streets, trails and
456 infrastructure improvements on streets where bicycling is stressful for most people.

457 *4.1.1.2   Level of Traffic Stress*

458 To identify those streets that are excessively stressful for the "Interested but Concerned" population,
459 the Bicycle Master Plan team is using a modified version of the Level of Traffic Stress, a methodology
460 development by the Mineta Institute in 2012 to evaluate the amount of traffic stress that bicyclists
461 experience on road segments, intersection approaches, and unsignalized crossings. Using this
462 approach, a street network can be classified into four stress levels, ranging from low stress to high
463 stress. For a bicycle network to attract the broadest segment of the population, it must provide low-

---

[2] Jennifer Dill and Nathan McNeil, "Revisiting the Four Types of Cyclists: Findings from a National Survey,"
Transportation Research Record: Journal of the Transportation Research Board, forthcoming

464 stress connectivity, defined as "providing routes between people's origins and destinations that do
465 not require cyclists to use links that exceed their tolerance for traffic stress, and that do not involve
466 an undue level of detour."

467 There are several strengths to this approach. First, the data is generally available through publicly
468 available mapping tools, such as Google Streetview. Second, it provides a consistent approach to
469 evaluating traffic stress. Third, it can be tied to the "four types of transportation cyclists"
470 classification, so planners can determine how well our existing a planned bicycle networks are
471 connected for different user groups.

472 The Level of Traffic Stress (LTS) methodology focuses on the following criteria for evaluating traffic
473 stress on bicyclists:

474 Segments

475 • Number of lanes
476 • Speed limit or prevailing speed
477 • Presence or absence of bike lane
478 • Presence or absence of parking
479 • Frequency of vehicles parked in bike lanes
480 • Width of bike lane and parking lane

481 Intersection Approaches

482 • Presence of right turn lane(s)
483 • Length of right turn lane
484 • Turn lane configuration (bike lane shifts vs. bike lane continues straight)

485 Unsignalized Crossings

486 • Width of cross street
487 • Speed limit of cross street
488 • Presence or absence of median refuge

489 The analysis applies a "weakest link" logic, wherein the stress level is assigned based on the lowest-
490 performing attribute of the street. For example, even if a segment has mostly low stress
491 characteristics, the occurrence of one higher-stress attribute (for example, frequent bike lane
492 blockage) dictates the stress level for the link.

493 The Level of Traffic Stress methodology identifies four stress levels:

494 • LTS 4 – High stress, only suitable for experienced bicyclists
495 • LTS 3 – Moderate traffic stress for all bicyclists
496 • LTS 2 – Low traffic stress, and suitable for most adults
497 • LTS 1 – Requires little attention to surroundings; suitable for most children

498 Generally, "Strong and Fearless" cyclists will be comfortable bicycling on roads of all stress levels.
499 "Enthused and Confident" cyclists will be comfortable bicycling on roads with a LTS of 3 or lower.
500 "Interested but concerned" bicyclists will be comfortable on facilities with an LTS of 1 or 2.

501 The Bicycle Master Plan team evaluated over 3,500 miles of roads and trails in the County using a
502 modified version of the original Level of Traffic Stress methodology to determine the amount of
503 traffic stress that people experience when bicycling on roads and trails in Montgomery County. Our
504 analysis found that 78 percent of roads and trails in Montgomery can be considered lower stress
505 while 22 percent of roads and trails can be considered higher stress:

506   •   High Stress (LTS 4) = 13 percent
507   •   Moderate Stress (LTS 3) = 9 percent
508   •   Low Stress (LTS 2) = 10 percent
509   •   Very Low Stress (LTS 1) = 68 percent

510 When considering this evaluation, it is important to note that around half of all road miles in
511 Montgomery County are residential streets.

512 To achieve a bicycling network that appeals to the "Interested but Concerned" population, the Bicycle
513 Master Plan will focus on reducing traffic stress levels to a low stress (LTS 2) or better Countywide
514 and to a very low stress (LTS 1) around places that children visit, including schools, libraries, parks
515 and recreation centers.

516   4.1.2   Bikeways

517 Classifying bikeways helps decision makers, planners, designers and the public understand the
518 proposed bikeway network. Many jurisdictions assign both a **bikeway network classification** and
519 a **bikeway facility classification** to each master-planned bikeway.

520   *4.1.2.1   Bikeway Network Classification*

521 Bikeway network classification refers to a bikeways importance to the network.

522 **Existing Approach**

523 Since 2005, Montgomery County has classified each master-planned bikeway as either a Countywide
524 Bikeway or Local Bikeway. Countywide Bikeways are often located on arterial streets and provide
525 longer distance connections, linking major destinations such as municipalities, central business
526 districts, town centers, employment centers, major transit stations, and regional parks and trails.
527 Local Bikeways provide important connections from Countywide Bikeways to community facilities
528 such as schools, libraries, community and recreation centers and local retail centers. While this
529 network classification system gives greater importance to Countywide Bikeways, that importance is
530 diluted in practice because Countywide Bikeways comprise about two-thirds of all master-planned
531 bikeways providing no way to distinguish the most important bikeways.

532 **Proposed Approach**

533 A new bikeway network classification system is proposed for Montgomery County that designates
534 each road as either a High Priority Bikeway (HPB), Priority Bikeway (PB), or Bikeway (B). Unlike the
535 Countywide Bikeway / Local Bikeway approach, this <u>classification system will have policy</u>
536 <u>implications by assigning each bikeway a level of priority in the bicycling network that is tied to</u>
537 <u>higher quality design, greater weight in trade-offs for space among other transportation modes, and</u>
538 <u>potentially greater levels of funding</u>.

539 **High Priority Bikeways** are the most important master-planned bikeways in the network. They are
540 likely to experience the greatest amount of bicycling because they connect to major commercial
541 areas, rail stations or bridges, include a long corridor that serves many neighborhoods, or collect
542 traffic from other routes. To achieve a high quality design, they may require greater funding than
543 other bikeway projects and should be prioritized in discussions related to limited space and trade-
544 offs between transportation modes. High Priority Bikeways are master-planned bikeways that are
545 designated with a bikeway facility type (see below), such as a bicycle boulevard, bike lane, or
546 separated bike lane. They are intended to consist of approximately 10 – 20 percent of all master-
547 planned bikeways.

548 **Priority Bikeways** are master-planned bikeways that provide direct and convenient access but are
549 not as important to the overall bikeway network as High Priority Bikeways. They are designated with
550 a bikeway facility type, such as a bicycle boulevard, bike lane, or separated bike lane, and are likely
551 to consist of approximately 80 – 90 percent of all master-planned bikeways.

552 **Bikeways** are not master-planned bikeways, but include all other roads where it is legal to bicycle in
553 Montgomery County, reflecting that just like motorists and pedestrians, people bicycle on all roads
554 available to them to access their homes, jobs, shopping, other local destinations. While they are not
555 designated with a bikeway facility type and will not appear on the bikeway map, they should be
556 designed with the understanding that people of all ages and abilities will bicycle on them. As such,
557 they are candidates for traffic calming measures on residential and business district streets to reduce
558 the speed of automobiles.

559 *4.1.2.2   Bikeway Facility Classification*
560 Bikeway facility classification refers to the type of bikeway, including shared use paths, bike lanes,
561 and separated bike lanes.

562 **Existing Approach**

563 Montgomery County currently classifies each master-planned bikeway as one of five facility types:

564 • **Shared use paths** are paved two-way paths that are typically 10 feet wide, but can vary
565   between 8 feet and 14 feet wide, and are designated for walking, bicycling, jogging, and
566   skating. They are separated from motorized traffic by a curb, barrier, or landscape panel.
567   Shared use paths are sidepaths when they are located within a street right-of-way, and trails
568   when they are located within a separated right-of-way.
569 • **Separated bike lanes** are an exclusive bikeway facility that combines the user experience of
570   a separated path with the on-street infrastructure of a conventional bike lane. They are
571   physically separated from motor traffic by curbs, landscape panels and /or parking and
572   distinct from the sidewalk.
573 • **Bike lanes** are a portion of a street designated for the exclusive use of bicycles by striping,
574   signing, and pavement markings.
575 • **Signed shared roadways** are streets that are shared by both bicycle and motor vehicle travel
576   and are signed as such. This may be a street with wide curb lanes, streets with paved
577   shoulders, or a low volume and low speed street with no additional accommodation for
578   bicycles.
579 • **Dual bikeways** are bikeways that feature two types of bikeways: 1) shared use path and bike
580   lanes, or 2) shared use path and signed shared roadway. The dual bikeway accommodates
581   both on-road and off-road bicycling along the same roadway.

582 **Proposed Approach**

583 A new bikeway facility classification system is proposed for Montgomery County. This classification
584 system organizes bikeway facility types into five bikeway facility classifications, based on their level
585 of separation from traffic. It includes bikeway facility types that were not available or commonly used
586 when the County last comprehensively amended its bikeway plan in 2005 and removes obsolete
587 bikeway facilities. The proposed bikeway facility classifications and bikeway facility types are:

Facility Classification	Facility Type
Trails	**Trails**
Trails	Trails
Separated Bikeways	Sidepaths Separated Bike Lanes
Striped Bikeways	Buffered Bike Lanes Bike Lanes Advisory Bike Lanes Climbing Lanes
Shoulders	Shoulders
Shared Roads	Bike Boulevards Shared Streets

Most ↑

Separation from Traffic

Least ↓

588

4.1.2.2.1   Trails

590   **Trails** are paths that are located outside of the road right-of-way. They provide two-way travel
591   designated for walking, bicycling, jogging, and skating. Trails are typically 10 feet wide, but can vary
592   between 8 feet (in constrained locations) and 14 feet wide (where usage is likely to be higher), On
593   trails with very high levels of walking and bicycling they can include separated space for pedestrians
594   and bicyclists.

595

596   Benefits

597   • Provide a bicycling environment suitable for all ages and abilities as they are completely
598   separated from traffic, except at street crossings.

599   Typical Application

600   • Often located along existing or unused railroad rights-of-way, utility rights-of-way, or along
601   linear environmental features such as streams and rivers.

602 ### 4.1.2.2.2   Separated Bikeways

603 Separated bikeways provide physical separation from traffic and include **sidepaths** and **separated**
604 **bike lanes**. They will be considered on any roads with one or more of the following characteristics:

605 - Traffic Lanes: ≥ 4 lanes.
606 - Posted speed limit: ≥ 35 mph.
607 - Traffic volumes: ≥ 6,000 vehicles per day.
608 - On-Street Parking Turnover: frequent.
609 - Bike Lane Obstruction: likely to be frequent.

610 **Sidepaths** are shared use paths that are located within the road right-of-way. They provide two-way
611 travel designated for walking, bicycling, jogging, and skating. Sidepaths are typically 10 feet wide, but
612 can vary between 8 feet (in constrained locations) and 14 feet wide (where usage is likely to be
613 higher), Sidepaths are separated from motorized traffic by a curb, barrier, or landscape panel. When
614 designed well, they can provide a comfortable bicycling environment.

MacArthur Blvd Sidepath

615

616 <u>Benefits</u>

617 • More attractive to a wider range of bicyclists than striped bikeways (see the Strip Bikeways
618   section below) on higher volume and higher speed roads.

619 <u>Typical Application</u>

620 • See Separated Bikeway section overview.
621 • Adjacent to the roadway.
622 • Recommended on higher volume and higher speed roads where pedestrian volumes are low,
623   including suburban streets.

624 **Separated Bike Lanes** are an exclusive bikeway facility type that combines the user experience of a
625 sidepath with the on-street infrastructure of a conventional bike lane. They are physically separated
626 from motor vehicle traffic and distinct from the sidewalk.

627 While separated bike lanes are attractive to a wider range of bicyclists than striped bikeways, they
628 can provide different levels of separation:

629 • Separated bike lanes with flexible delineator posts ("flex posts") alone offer the least
630 separation from traffic and are appropriate as interim solution in retrofit situations (see
631 Section 6.1).
632 • Separated bike lanes that are raised with a wider buffer from traffic provide the greatest level
633 of separation from traffic, but will often require road reconstruction.
634 • Separated bike lanes that are protected from traffic by a row of on-street parking, such as
635 shown in the image of Woodglen Avenue, offer a high-degree of separation, but would benefit
636 from more aesthetically pleasing design features.

637 Other forms of separation from traffic include bollards, curbs, and planters.

Two-Way Separated Bike Lanes on Woodglen Drive, White Flint

638

639 Benefits

640 • More attractive to a wider range of bicyclists than striped bikeways (see the Strip Bikeways
641 section below) on higher volume and higher speed roads.
642 • Eliminate the risk of a bicyclist being hit by an opening car door.
643 • Prevent motor vehicles from driving, stopping or waiting in the bikeway.
644 • Provide greater comfort to pedestrians.

645 Typical Application

646 • See Separated Bikeway section overview.
647 • Adjacent to the roadway.

648 • Recommended on higher volume and higher speed roads where pedestrian volumes are high,
649   including higher density areas, commercial and mixed-use development, and near major
650   transit stations.

651 ### 4.1.2.2.3   Striped Bikeways

652 Until a few years ago, striped bikeways (including **buffered bike lanes**, **conventional bike lanes**,
653 **advisory bike lanes**, and **climbing bike lanes**), were the gold standard of bicycle planning in urban
654 areas. While bike lanes have been included in Montgomery County's bike plans since 1978, it has only
655 been the past few years that the County has embraced them. Currently, 150 miles of conventional
656 bike lanes are recommended in Montgomery County's master plans and about 30 miles have been
657 fully implemented.

658 While striped bikeways remain a useful tool to reduce traffic stress, they are insufficient to attract
659 "Interested but Concerned" bicyclists in many environments because they do not provide sufficient
660 separation from traffic and because they are often obstructed by motorized vehicles.

661 Communities around the country are beginning to recognize that bike lanes do not provide sufficient
662 separation for bicyclists on most arterial roads and have instead begun to implement separated bike
663 lanes. In fact, in January 2016, Portland became the first community to make separated bike lanes the
664 default form of bike lane. Every time Portland road designers recommended a bike lane, they need to
665 make it a separated bike lane or else explain why not.

666 Striped bikeways will be considered on any roads with one or more of the following characteristics:

667 - Traffic Lanes: ≤ 3 lanes.
668 - Posted speed limit: ≤ 30 mph.
669 - Traffic volumes: ≤ 9,000 vehicles per day.
670 - On-Street Parking Turnover: infrequent.
671 - Bike Lane Obstruction: likely to be infrequent.
672 - Where a separated bikeway is not feasible or desirable.

673 **Buffered Bike Lanes** are conventional bicycle lanes paired with a designated buffer space separating
674 the bicycle lane from the adjacent motor vehicle travel lane and/or parking lane.

675
676 <p align="center" style="color:blue">**Buffered Bike Lanes on Clyburn Avenue, Chicago**</p>

677 The NACTO Urban Bikeway Design Guide identifies these benefits and typical applications of buffered
678 bike lanes:

679 <u>Benefits</u>

680 • Provides greater shy distance between motor vehicles and bicyclists.
681 • Provides space for bicyclists to pass another bicyclist without encroaching into the adjacent
682   motor vehicle travel lane.
683 • Encourages bicyclists to ride outside of the door zone when the buffer is between parked
684   cars and bike lane.
685 • Provides a greater space for bicycling without making the bike lane appear so wide that it
686   might be mistaken for a travel lane or a parking lane.
687 • Appeals to a wider cross-section of bicycle users.

688 <u>Typical Application</u>

689 • See Striped Bikeway section overview.

690 **Conventional Bike Lanes** (or just bike lanes) are a portion of the roadway that has been designated
691 by striping, signage, and pavement markings for the preferential or exclusive use of bicyclists.

693 **Bike Lanes on Tilden Lane**

694 The NACTO Urban Bikeway Design Guide identifies these benefits and typical applications of
695 conventional bike lanes:

696 Benefits

697 • Increases bicyclist comfort and confidence on busy streets.
698 • Creates separation between bicyclists and automobiles.
699 • Increases predictability of bicyclist and motorist positioning and interaction.
700 • Increases total capacities of streets carrying mixed bicycle and motor vehicle traffic.
701 • Visually reminds motorists of bicyclists' right to the street.

702 Typical Application

703 • See Striped Bikeway section overview.

704 **Advisory Bike Lanes** are a way to reduce the stress of bicycling on lower volume and lower speed
705 residential streets where there is insufficient space to provide two bike lanes and two travel lanes.
706 Space is provided for bike lanes by removing the center line from the road and narrowing the
707 automobile space. Unlike a conventional bike lane where motorists are discouraged from entering
708 the bike lane with a solid lane line, the advisory bike lane is continuously dashed to allow motorists
709 to temporarily enter the bike lane to provide oncoming traffic sufficient space to safely pass, as long
710 as a bicyclist is not approach. This behavior is similar to the passing behavior on many narrow
711 residential, un-laned, two-way "yield" streets where traffic lanes are not designated with striping and
712 so motorists must pull to the side (into parking gaps or driveways) to let oncoming vehicular traffic
713 pass.

714

715 <u>Benefits</u>

716 • Provides space for bicycling.
717 • Removing the center line reduces the speed of motor vehicles.

718 <u>Typical Application</u>

719 • Where there is insufficient space for conventional bike lanes and two lanes of traffic
720 • Land Use: Residential.
721 • Number of Travel Lanes: An un-laned, bi-directional street.
722 • Street Width: The un-laned two-way travel space should be 12 to 18 feet.
723 • Posted Speed: ≤30 mph.
724 • Automobile Volumes: 2,000 to 4,000 vehicles per day.
725 • Parking: May be used on streets with or without on-street parking.

726   **Climbing Lanes** include a bicycle lane in the uphill direction and a shared lane in the downhill
727   direction and are used to improve safety on hills where there is a higher speed differential between
728   bicyclists and motor vehicles.

729
730

Arizona Avenue, Santa Monica (source: Streetsblog LA)

731   Benefits

732   • Provide space for bicycling in the uphill direction when the speed differential between
733   bicyclists and motor vehicles is high.

734   Typical Application

735   • See Striped Bikeway section overview.
736   • The uphill direction of a steep road.

737

738 **Shoulders** are a portion of the roadway that accommodates stopped vehicles, emergency use and
739 bicycles and motor scooters. Bikeable shoulders of at least three feet in width can improve comfort
740 on some roadways for some bicyclists. They are more likely to be present in suburban and rural
741 locations in the county, often where posted speed limits are 40 mph and higher.

742 Bicyclists often encounter potentially hazardous conditions while using roadway shoulders, which
743 are often inconsistent in their width and pavement quality and which sometimes end unexpectedly
744 or are otherwise unusable because of parked vehicles, forcing bicyclists to move into the travel
745 lane.

746 It is unlikely that the working draft of the Bicycle Master Plan will recommend new bikeable
747 shoulders where they would not otherwise be implemented for pavement stability, emergency use
748 and stopped vehicles because on most roads they do not create a low-stress bicycling environment.
749 However, where bikeable shoulders are provided, roadway shoulders should be upgraded to
750 provide a consistent width and pavement quality. Consideration may also be given to restricting
751 parking where any significant bike use is expected and where movement into the travel lanes
752 would be considered potentially hazardous.

753
754

Source: http://bikewalklee.blogspot.com

755 Benefits

756 • Provide separation from traffic

757 Typical Application

758 • Land Use Context: suburban or rural
759 • Posted Speed Limit: ≥ 40 mph

4.1.2.2.5   Shared Roads

761 **Shared Roads** are bikeways that share space with automobiles, including bicycle boulevards in
762 suburban areas and shared streets in urban areas. Of course all roadways where bicycles shared
763 space with automobiles are shared roads, but only some are master-planned shared roads.

764 **Bicycle Boulevards** are streets with low motorized traffic volumes and speeds, designated and
765 designed to give walking and bicycling priority. They use signs, pavement markings, and speed and
766 volume management measures to discourage through trips by motor vehicles and create safe,
767 convenient crossings of busy arterial streets. The working draft of the Bicycle Master Plan will
768 include a concept plan for a bicycle boulevard between Downtown Silver Spring and Wheaton.

769 The bicycle boulevard in the image below from Portland, Oregon uses diverters to prevent motorized
770 traffic from traveling across the intersection, but allows bicyclists and pedestrians to continue to
771 travel through the intersection.

772
773

A bicycle boulevard on Cesar E Chavez Boulevard in Portland, Oregon Source: Toole Design Group

774 As outlined in the 2012 AASHTO Guide for the Development of Bicycle Facilities, bicycle boulevards
775 incorporate several design elements:

776 • Traffic diverters at key intersections to reduce through motor vehicle traffic while permitting
777   passage for through bicyclists.
778 • At two-way, stop-controlled intersections, priority assignment that favors the bicycle
779   boulevard, so bicyclists can ride with few interruptions.
780 • Neighborhood traffic circles and mini-roundabouts at minor intersections that slow motor
781   vehicle traffic but allow bicyclists to maintain momentum.
782 • Other traffic-calming features to lower motor vehicle speeds where deemed appropriate.
783 • Wayfinding signs to guide bicyclists along the way and to key destinations.

784   •   Shared-lane markings (sharrows) where appropriate to alert drivers to the path bicyclists
785   need to take on a shared roadway.
786   •   Crossing improvements where the boulevard crosses major streets (including traffic signals,
787   median refuges, and curb extensions).

788 The term "bicycle boulevard" is misleading since bicycle boulevards convey benefits to both bicyclists
789 and pedestrians. In fact, many communities use different terminology to define bicycle boulevards,
790 including neighborhood greenways and slow streets. The Bicycle Master Plan team has not yet
791 identified a name for this bikeway facility type that is appealing, and so for the time being will
792 continue to refer to them as bicycle boulevards.

793 <u>Benefits</u>

794   •   Attractive to a wide range of bicyclists.
795   •   Reduce the speed and volume of traffic.
796   •   Prioritize walking and bicycling at minor street crossings.
797   •   Improve safety and reduce delay for walking and bicycling at major street crossings.

798 <u>Typical Application</u>

799   •   Posted Speed Limit: ≤ 25 mph.
800   •   Context: areas where through traffic can be diverted to parallel streets.
801   •   Street pattern: where a continuous route for bicycling is possible.

802

803   **Shared Streets** are an urban design approach where pedestrians, bicycles and motor vehicles can
804   comfortably coexist. They are typically located on low traffic volume, low traffic speed and high
805   pedestrian volume streets and often eliminate design features such as curbs, road surface markings,
806   traffic signs, and traffic lights.

807

808   Shared streets will be included in the working draft of the Bicycle Master Plan as a bikeway facility
809   type. However, this facility type is dependent on the roadway and land use context, which is
810   typically addressed in area master plans, so only existing shared streets will be reflected in the
811   working draft of the Bicycle Master Plan.

812 *4.1.2.3   Separated Bikeway Planning Considerations*

813 4.1.2.3.1   When Separated Bikeways Should Be Separated from Traffic

814 Once the decision to provide a separated bikeway from traffic is made, planners must determine
815 whether the bikeway should also be separated from pedestrians.

Separated Bike Lanes on Woodglen Drive   **Sidepath on MacArthur Blvd**

816 **Pedestrian demand will be the primary consideration for determining whether a separated**
817 **bikeway should be implemented as a sidepath or a separated bike lane.** All other things being
818 equal, sidepaths will be recommended where observed or anticipated pedestrian demand is lower,
819 since conflicts between people walking and bicycling will be infrequent. Separated bike lanes will be
820 recommended where pedestrian volumes are observed or anticipated to be higher.

821 **Another closely related factor is the land use type and density of the surrounding**
822 **environment.** Sidepaths tend to be more appropriate in suburban areas where pedestrian travel is
823 less and where pedestrian movements tend to be more predictable. In urban areas pedestrian travel
824 is characterized by meandering and stop-and-go movements as people socialize, enter and exit
825 stores, dine outdoors, access transit or walk to and from on-street parking. Pedestrians movements
826 are less predictable so providing separated bike lanes and sidewalks is recommended in the vicinity
827 of commercial and higher-density mixed use areas and major transit facilities.

Factor	Sidepaths	Separated Bike Lanes
Pedestrian Volumes (observed or anticipated)	Lower	Higher
Land Use Character	Lower density development, especially suburban / rural areas	Higher density development, especially commercial / mixed-use areas

828

829 There are many areas in Montgomery County with higher pedestrian volumes and higher density
830 development where sidepaths either exist or are recommended in a master plan. These include Silver
831 Spring, White Flint, Glenmont, Germantown, Olney and White Oak. One prominent example of an
832 existing urban sidepath is the Silver Spring Green Trail, which exists in segments along Second
833 Avenue and Wayne Avenue between Spring Street and Whole Foods in Downtown Silver Spring. As
834 shown in the image below, the Silver Spring Green Trail is indistinguishable from a wide sidewalk in
835 places. This is a common feature of many urban sidepaths.

836
837   **The Silver Spring Green Trail in front of Fenwick Station Apartments**

838   Even where the Silver Spring Green Trail provides both a sidewalk and a sidepath, many bicyclists
839   are reluctant to bicycle on the sidepath because it is heavily used by pedestrians.

840   **The working draft of the Bicycle Master Plan will reclassify existing and master-planned**
841   **sidepaths as wide sidewalks in areas with high pedestrian volumes and with higher density**
842   **land use (such as commercial areas) and will not carry them forward as bikeways. An**
843   **alternate bikeway recommendation will be considered in these locations.**

844   Sidepaths are still appropriate as an interim bikeway in urban areas where the master-plan
845   recommended separated bike lane is not yet implemented due to right-of-way, funding or other
846   constraints. This will be discussed more in the working draft of the Bicycle Master Plan.
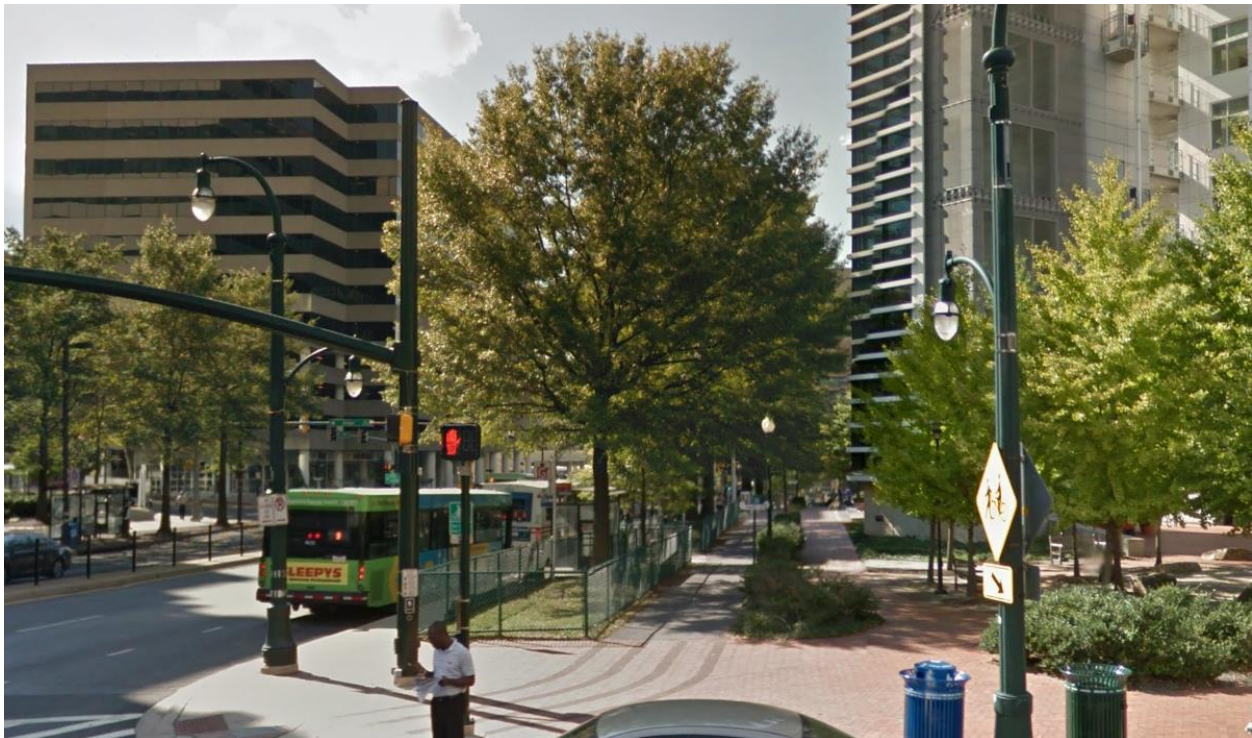
847
848 **The Silver Spring Green Trail in front of the Wayne Avenue parking garage.**

849 4.1.2.3.2 When Two-Way Separated Bikeways Should Be Considered on Both Sides of the Street

850 Montgomery County has many multilane, high-speed, high-volume roads with limited crossings and
851 multiple destinations on both side of the streets. This creates a barrier for bicycling, especially when
852 the bikeway is split by the direction of travel (as in conventional bike lanes) or when there is a two-
853 way bikeway on one side of the road (such as a sidepath or separated bike lanes), requiring bicyclists
854 to cross the same street twice to reach their destination. Where the barrier is excessive, bicyclists
855 may either be deterred from bicycling, ride in the bikeway in the wrong direction, or ride on the
856 sidewalk. Two-way bikeways on both sides of the street will encourage short bicycle trips by
857 minimizing the need to 1) cross wide roadways, and 2) travel excessive distances to cross at a safe
858 location.

859 Since constructing a two-way bikeway on both sides of the road requires a substantial investment, it
860 will only be applied where the following conditions are met:

861 • Long distances between safe, comfortable crossings (typically 800 to 1,000 feet)
862 • Wide automobile travel way cross section (four or more lanes)
863 • Presence of destinations/active land uses on both sides of the street

864 Before settling on the choice to recommend a two-way bikeway on both sides of the street, other
865 network and roadway reconfiguration options will be investigated. Parallel routes on lower-volume,
866 lower-speed streets may be available that require minimal detour and a lower level of investment.
867 The Bicycle Master Plan team will also consider whether changes are feasible to the street in regard
868 to:

869 • Adding or improve crossings to be safe and comfortable
870 • Reducing the width of the road (lane diet and / or road diet)
871 • Changing the posted speed

872   These types of changes may not be feasible in retrofit projects, but the design process of a street in a
873   newly developing or redeveloping area should take these questions into consideration.

874   Rockville Pike in the White Flint area is perhaps the quintessential example of a street that is well-
875   suited to a two-way bikeway on both sides of the street due to the excessive distance between safe,
876   comfortable crossings (approximately 850 feet), wide street cross section (a six-lane road with
877   multiple turn lanes) and presence of active commercial destinations on both sides of the street. A
878   two-way bikeway on both sides of the street will be considered between Flanders Avenue and the
879   City of Rockville[3]. Implementing a two-way bikeway on both sides of the street will result in tradeoffs,
880   but is critical to making White Flint a bikeable community.

881
882   **Rockville Pike at Edson Lane**

883   *4.1.2.4   Elimination and Replacement of Two Bikeway Facility Classifications*

884   The working draft of the Bicycle Master Plan will recommend eliminating and replacing of two types
885   of bikeways: signed shared roadways and dual bikeways.

886   4.1.2.4.1   Signed Shared Roadways

887   Signed shared roadways have been a bicycle facility classification in Montgomery County since the
888   1978 Master Plan of Bikeways. Currently, there are over 400 miles of roads recommended as signed

---

[3] The March 2016 Draft Rockville Pike Plan recommends two-way separated bike lanes from the City line to Viers Mill Road.

889 shared roadways in the County. The working draft of the Bicycle Master Plan will make the following
890 recommendations for signed shared roadways.

891 • Eliminate signed shared roadways, including those with wide outside lanes, as a bikeway
892   facility classification.
893 • Include bikeable shoulders, bicycle boulevards, and shared streets as bikeway facility types.
894 • Continue use of wayfinding signs, regulatory signs (such as bikes may use full lane) and
895   pavement markings (such as sharrows) as implementation tools for MCDOT and SHA, but
896   not master-planning tools.
897 • Encourage MCDOT to develop a comprehensive wayfinding plan.
898 • Encourage MCDOT to develop a sharrow policy.

899 **While signed shared roadways provide value to bicyclists, they should be eliminated as a**
900 **bicycle classification.** Even though they can be implemented in ways that make bicycling more
901 comfortable, a signed shared roadway by itself – shared space between bicycling and driving that is
902 identified with a sign – does not improve the comfort of bicycling. In fact, the three main functions of
903 designating signed shared roadways (wayfinding, public bicycle maps, and identification of locations
904 where pavement markings, such as sharrows, and signs, such as Bikes May Use Full Lane, could be
905 added to supplement existing shared lanes) are operational and regulatory approaches that are the
906 responsibility of the Montgomery County Department of Transportation and the Maryland State
907 Highway Administration, not a master plan. Furthermore, it is unclear when a signed shared roadway
908 has been implemented.

909 **While we recommend eliminating signed shared roadways as a bikeway facility classification,**
910 **the working draft of the Bicycle Master Plan will add shared roads as a bikeway facility**
911 **classification and consider the use of another bikeway facility type in locations where signed**
912 **shared roadways are currently recommended, including buffered bike lanes, bike lanes,**
913 **advisory bike lanes, bikeable shoulders, and bicycle boulevards.**

914 Two types of signed shared roadways include wide outside lanes and bikeable shoulders.

915 **Wide outside lanes should be discontinued as a bikeway facility type.** While wide outside travel
916 lanes provide space for both bicyclists and drivers to operate within the same lane, there is a general
917 consensus that while wide outside lanes provide more space for a driver to pass a bicyclist, this
918 additional width does not increase a bicyclist's comfort, especially on roadways with high speeds.
919 Additionally, wide lanes tend to increase automobile travel speeds, and may actually make bicyclists
920 less comfortable next to higher speed traffic than on a similar roadway with standard width lanes.

921
922   **Wide outside lanes provide more space for drivers to pass bicyclists. but do not change the level of comfort**
923   **experienced by most riders.**

924   **Bikeable shoulders will be identified as a new bikeway facility classification.** See Section
925   4.1.2.2.4.

926   **A wayfinding plan should be developed by the Montgomery County Department of**
927   **Transportation as a separate planning process from the master plan.** Implementation of
928   wayfinding routes is already underway by MCDOT and has been based, in part, on previously
929   recommended signed shared roadways. However, in developing the detailed sign plans for routes,
930   planners have found a need to deviate from the identified routes to take advantage of more
931   comfortable crossing locations. A wayfinding plan would identify the most suitable routes for
932   bicycling based on existing conditions and should be updated every few years as new bikeways are
933   constructed and new destinations emerge.

<p align="center">**Montgomery County DOT has implemented some wayfinding routes**</p>

934
935

936 **The Montgomery County Department of Transportation should develop a sharrow policy.**
937 Sharrows serve three primary purposes: 1) to indicate where it is recommended that bicyclists ride
938 in the road, 2) to provide a visual cue to remind drivers that bicyclists may be present, and 3) for
939 wayfinding. While none of these are master planning functions, they are considerations for
940 implementation.

941 It should be noted, however, that implementation has varied among different jurisdictions. For
942 instance, Portland, Oregon uses sharrows primarily as a wayfinding marking and only on low-
943 volume, low-speed streets. This usage includes bicycle boulevards where additional traffic calming
944 and/or diversion is present. Most other jurisdictions use sharrows to fill gaps in the network,
945 regardless of traffic volume, where other dedicated facilities do not exist. In many cases these are
946 located on higher volume collectors or arterials.

947 A sharrow use policy in Montgomery County could designate the use of sharrows in these instances:

948 • Bicycle Boulevards: Sharrows may be a treatment option on low-volume, low-speed streets
949 designated as bicycle boulevards. In this context, sharrows can serve a wayfinding function
950 and also reinforce bicyclists' right to bicycle in the center of the lane.
951 • Interim Use: In limited or special cases, sharrows may be used as an interim marking on
952 streets master-planned for other facilities. For instance, a street may be designated for a
953 separated bike lane and serve a critical network function in connecting major destinations,
954 but implementation of the separated bike lane may take years, and a sharrow can help a
955 segment of the bicycling population navigate high-speed, high-volume roads in the
956 intervening period. The sharrow would indicate to drivers that they should expect bicyclists.

957
958 **Sharrows indicate an appropriate path of travel to bicyclists and encourage drivers to move over to pass.**

959 4.1.2.4.2   Dual Bikeways

960 The dual bikeway facility classification was developed in the 2005 Countywide Bikeways Functional
961 Master Plan to "meet the needs of the total range of bicyclists." A dual bikeway consists of both an
962 off-road sidepath and an on-street bikeway facility type on the same street. In locations where space
963 is available, the on-road facility is typically recommended to be a bike lane; where space is not
964 available, the on-street facility it is typically recommended to be a signed shared roadway. The dual
965 bikeway facility classification is unique to Montgomery County and was recommended in locations
966 where the County wanted to provide separation from high-speed, high-volume traffic for what today
967 the industry refers to as "Interested but Concerned" riders. Currently there are about 48 miles of road
968 in Montgomery County that are recommended to be a dual bikeway with both a sidepath and bike
969 lanes, of which 9 miles have been implemented.

970 The dual bikeway facility classification was recommended to accommodate more confident cyclists
971 who are comfortable riding near or sharing the road with higher-speed, higher-volume traffic, would
972 prefer to travel at a higher speed, and do not want to be impeded by slower moving bicyclists and
973 pedestrians on a sidepath. In addition, a segment of the bicycling population believe they create
974 safety problems for faster traveling cyclists at intersections and because they require bicyclists to
975 slow down, yield or stop when crossing side streets and driveways.

976 While these concerns are valid, they have more to do with the poor design of sidepaths than an
977 inherent weakness. Sidepaths in Montgomery County are often constructed with a thin layer of
978 asphalt, leading to a bumpy surface over time. Driveway crossings and intersections are almost an
979 afterthought. In fact, sidepaths are a common feature in suburban settings in the Netherlands, which
980 has higher levels of bicycling and much lower injury and fatality rates, compared to the United States.
981 **The working draft of the Bicycle Master Plan will recommend higher design standards for**
982 **sidepaths**.

983 Additionally, bike lanes on high volume and high speed roads are likely to be used by only a small
984 segment of the population (most people would prefer to bicycle in a separated bikeway and a small
985 percent would prefer to bicycle in the road). In an environment where tradeoffs with cost, right-of-
986 way, pedestrian safety, and stormwater management are key factors in design, it is hard to justify
987 providing 11 – 12 feet in the roadway for bike lanes, when additional space is already needed for
988 sidepaths that have a wide setback from the road.

989 **The working draft of the Bicycle Master Plan will discontinue use of dual bikeways as a facility**
990 **classification and instead refer to their individual components, such as separated bike lanes,**
991 **bike lanes, sidepaths and shoulders, to better communicate the actual bikeway facility type**
992 **recommendation.**

993 As noted previously, signed shared roadways will not be continued as a master-planning bikeway
994 facility type. However, MCDOT and SHA should consider use of regulatory signs, such as Bikes May
995 Use Full Lane, sharrows, and wayfinding signs.

996 **In suburban locations, bike lanes should remain an interim treatment on higher volume and**
997 **higher speed roads where:**

998 - **a sidepath is either recommended (but not existing), OR**
999 - **the existing sidepath is substandard, AND**
1000 - **where there is sufficient space in the existing roadway to quickly and cheaply install**
1001 **bike lanes through restriping.**

1002 **However, over time the bike lanes should be eliminated in favor of separated bikeways with**
1003 **wide separation from the road.** For instance, Darnestown Road is an existing dual bikeway with an
1004 8-foot-wide side path, about 3-foot-wide separation from the road in places, and a 5.5-foot-wide bike
1005 lane on the north side of the road. A 3-foot-wide buffer is not wide enough for many children to
1006 bicycle safely along a 40 mph road with 3 lanes of traffic in each direction. Overtime, the bike lanes
1007 should be repurposed to create a wider buffer between the sidepath and the curb.

1008
1009
A dual bikeway on Darnestown Road

4.1.3   Bicycle Parking

1010

1011 As the number of bicyclists continues to grow in Montgomery County, the need for safe, secure and
1012 accessible bicycle parking is becoming more apparent. Bicycle parking is needed at all destinations,
1013 including residences, commercial and office locations, and major transit stations.

4.1.3.1   *Bicycle Parking at Major Transit Stations*

1014

1015 Bicycling is one of the least used modes of access to Metrorail stations, but it is growing at a fast rate.
1016 In 2012 1.0% of all trips to Metrorail were by bicycle, up from 0.4% in 2002. WMATA has adopted a
1017 bicycle access mode share goal of 2.1% by 2020 and 3.5% by 2030.

1018 People in Montgomery County have a few options when they arrive at a metro station by bicycle.
1019 They can bring their bicycle on Metrorail outside of peak periods, they can leave their bicycle at
1020 existing bike lockers and bike racks, or if arriving by bikeshare, they can leave their bike at a dock.

1021

1022   **Bicycle Parking at the Kramer Station in Austin, Texas**

1023 Bicycle parking stations – not to be confused with bikeshare stations – offer another means to store
1024 bicycles in an enclosed or covered facilities that offer high volume and high security bicycle parking
1025 for use by bicyclists who are traveling for transportation. These facilities make bicycle transportation
1026 a convenient and more attractive choice for regular commuting, for accessing transit by bicycle, and
1027 for a variety of other utilitarian bicycle trips, especially when the travel distance is between one and
1028 three miles from the station.

1029 Bicycle parking stations can offer services such as bicycle repair, bicycle rental, bicycle retail, food
1030 service, showers and changing rooms, lockers for personal belongings, bicycling information, etc.
1031 Bicycle parking stations are often located at multi-modal transit hubs, but can be also be located in
1032 dense urban neighborhoods, central business districts (CBDs).

1033 Bike stations can expand the use of bicycling to transit by attracting people who:

1034   • Are uncomfortable locking their bicycle to a rack for an extended period.
1035   • Live beyond areas that bikeshare can serve.

1036 In addition to being more secure than bike racks, they are a more efficient use of space than bike
1037 lockers, which require more space and are typically rented to one person for an extended time period.

1038 Bicycle parking stations in the United States vary widely with regard to parking capacity and services
1039 provided. Smaller bicycle stations have the capacity to park 20 - 25 bicycles, while the largest bicycle
1040 stations can accommodate over 300 bicycles. Some stations, like the Tri-Met Bike Link facilities in
1041 Portland, Oregon, and the Washington Metropolitan Area Transit Authority (WMATA) Bike & Ride
1042 Center in College Park, Maryland, offer only secure bicycle parking; while others, like Chicago's
1043 Millennium Park Cycle Center, offer secure parking, showers, changing rooms, restrooms, bicycle and
1044 bicycle accessory retail, bicycle rentals, bike tours, and lockers for belongings.
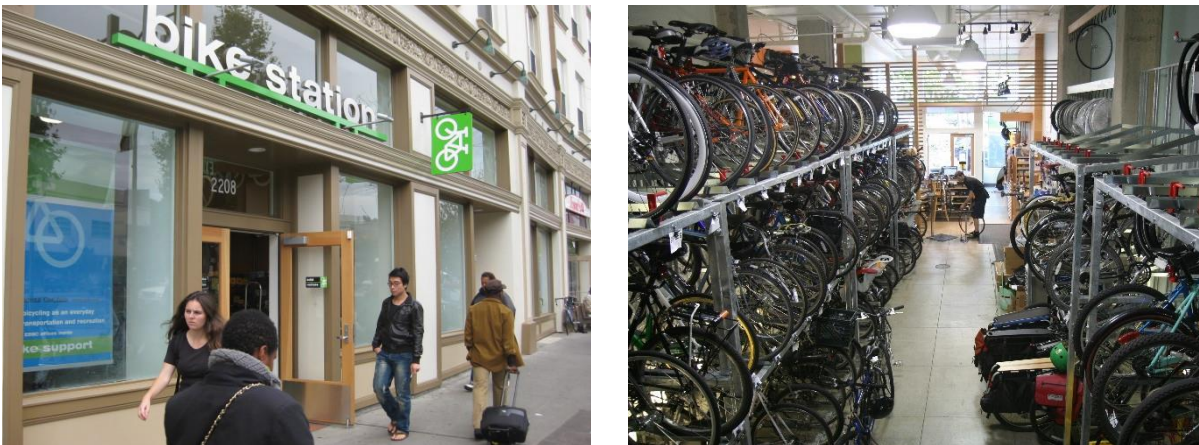
1045

A bike station at the Berkeley BART Station

1046 Within the metropolitan Washington region, bicycle parking stations exist at the Union Station,
1047 College Park and Reston-Wiehle Metrorail stations and are under construction at the East Falls
1048 Church and Vienna Metrorail stations. WMATA operates the College Park bike station and will
1049 operate the East Falls Church and Vienna Metrorail stations.

1050 The working draft of the Bicycle Master Plan will consider recommendations for bike stations at all
1051 major existing and planned transit lines, including the Red Line, Brunswick Line, Purple Line, and
1052 future bus rapid transit stations. Specific locations may be identified for transit stations that are
1053 existing (Red Line and Brunswick Line) or in an advanced stage of design (Purple Line and Corridor
1054 Cities Transitway), but general locations are more likely for Montgomery County's bus rapid transit
1055 stations. Sizing of the stations will be goal based, such as WMATA has developed for each Red Line
1056 station. For smaller transit stations such as those on the Corridor Cities Transitway, bike stations are
1057 likely to serve multiple transit stations.

1058 *4.1.3.2   Bicycle Parking at Residential, Commercial and Office Developments*

1059 In 2014, Montgomery County completed a major overhaul to the bicycle parking required of new
1060 developments in its zoning ordinance. Whereas the previous ordinance calculated bicycle parking
1061 requirements as a percentage of automobile parking with a maximum of 20 bicycle parking spaces,

1062 the new ordinance calculates bicycle parking requirements based on land use category with a
1063 maximum of 100 bicycle parking spaces. While the revisions to the zoning code made a big
1064 improvement in the quantity of long-term bicycle parking, the improvements to the quality of long-
1065 term bicycle parking were limited. The working draft of the Bicycle Master Plan will include
1066 recommendations about how to improve the quality of bicycle parking in the zoning code.

4.2   Programs

1068 The working draft of the Bicycle Master Plan will identify a number of events, services, opportunities
1069 and projects that encourage bicycling in Montgomery County.

1070 For example, to encourage bicycling among children, programs could target the public school system:

1071 • Bicycle education in the public school curriculum. (MCPS)
1072 • Provide bike racks at all public schools. (MCPS)
1073 • Bike to School Day. (MCPS)

1074 Other programs include:

1075 • Prepare a monitoring report for the Bicycle Master Plan (M-NCPPC)

1076 A more detailed list of programs will be recommended in the working draft of the Bicycle Master Plan
1077 to advance the goals of the plan.

4.3   Policies

1079 Policies are actions that are intended to guide decisions that affect bicycling. A few examples include:

1080 • Making separated bike lanes the default form of bike lane in urban areas. (MCDOT)
1081 • Making protected intersections the default form of intersection to improve the safety of
1082 crossings for bicycles[4]. (MCDOT)
1083 • Updating the County's road design standards to include all of the bikeway facility types
1084 included in the Bicycle Master Plan and remove or replace road design standards with wide
1085 outside lanes. (MCDOT)

1086 A more detailed list of policies will be recommended in the working draft of the Bicycle Master Plan
1087 to advance the goals of the plan.

4.4   Prioritization

1089 Since bicycle network and parking projects, and bicycle-supportive programs and policies take time
1090 to implement, the plan will Prioritize those that contribute most to the vision of the plan as measured
1091 by the goals and objectives. The prioritization approach is under development.

---

[4] Protected intersections are a way to extend the protection of separated bike lanes to the intersection. They will be described in greater detailed in the working draft of the Bicycle Master Plan. For more information on protected bike lanes, see http://www.protectedintersection.com.

5 Monitoring the Vision

An essential third step for the Bicycle Master Plan is to establish a monitoring program that enables transparency and accountability in plan implementation. While regular monitoring would occur every one or two years after the Bicycle Master Plan is adopted, target values and a baseline evaluation will be conducted as part of the plan. The monitoring template below reflects each of the plan's objectives and includes target values for the plan to achieve in 2022 and 2027, 5 and 10 years after the plan is adopted.

5.1 Potential Monitoring Report Template

Objective	Metric	Target 2022 (5-year target)	Target 2027 (10-year target)	Actual 2017 (baseline)	Actual 2019
Goal 1: Increase bicycling trips in Montgomery County					
1.1	Percent of residents who commute by bicycle.				
1.2	Percent of commuters who bicycle as part of their commute to the Silver Spring TMD.				
	Percent of commuters who bicycle as part of their commute to the Bethesda TMD.				
	Percent of commuters who bicycle as part of their commute to the North Bethesda TMD.				
	Percent of commuters who bicycle as part of their commute to the Friendship Heights TMD.				
	Percent of commuters who bicycle as part of their commute to the Greater Shady Grove TMD.				
	Percent of commuters who bicycle as part of their commute to the White Oak TMD.				
1.3*	Percent of boardings at Red Line stations that access the station by bicycle.				
	Percent of boardings at MARC Brunswick Line stations that access the station by bicycle.				
	Percent of boardings at Purple Line stations that access the station by bicycle.				
1.4*	Percent of elementary school students who travel to school by bicycle.				
	Percent of middle school students who travel to school by bicycle.				
	Percent of high school students who travel to school by bicycle.				

* Travel to individual schools and transit stations is detailed below.

Objective	Metric	Target		Actual	
		2022 (5-year target)	2027 (10-year target)	2017 (baseline)	2019
Goal 2: Create a highly-connected, convenient and low-stress bicycling network					
2.1	Percent of potential bicycle trips that can be made on a low-stress bicycle network.				
2.2**	Percent of dwelling units within 2.0 miles of Red Line stations that can access the station on a low-stress bicycling network.				
	Percent of dwelling units within 2.0 miles of MARC Brunswick Line stations that can access the station on a low-stress bicycling network.				
	Percent of dwelling units within 2.0 miles of Purple Line stations that can access the station on a low-stress bicycling network.				
2.3**	Percent of dwelling units that are connected to elementary schools on a low-stress bicycle network.				
	Percent of dwelling units that are connected to middle schools on a low-stress bicycle network.				
	Percent of dwelling units that are connected to high schools on a low-stress bicycle network.				
2.4**	Percent of dwelling units within 2.0 miles of a public library that can access the library on a low-stress bicycling network.				
2.5**	Percent of dwelling units within 2.0 miles of a recreation center that can access the recreation center on a low-stress bicycling network.				
2.6	Number of Red Line stations in Montgomery County with a bike station.				
	Number of Purple Line stations in Montgomery County with a bike station.				
2.7	Percent of Montgomery County elementary schools with public bicycle parking.				
	Percent of Montgomery County middle schools with public bicycle parking.				
	Percent of Montgomery County high schools with public bicycle parking.				
2.8	Percent of blocks in commercial areas with a public bike rack or a bike corral.				
2.9	Percent of Montgomery County libraries with public bicycle parking.				
2.10	Percent of Montgomery County recreation centers with public bicycle parking.				

1101   ** Access to individual transit stations, schools, libraries and recreation centers is detailed below.

Objective	Metric	Target		Actual	
		2022 (5-year target)	**2027** (10-year target)	**2017** (baseline)	**2019**
Goal 3: Provide equal access to low-stress bicycling for all members of the community					
3.1***	Percent of potential bicycle trips that can be made on a low-stress bicycle network in low-income and majority-minority areas.				
3.2***	Percent of dwelling units that can access a bus stop on a low-stress bicycling network in low-income and majority-minority areas.	See detail			
Goal 4: Improve the safety of bicycling					
4.1****	The ratio of bicycle crashes to bicycle trips at the ## highest crash locations in the County	See detail			
4.2	The number of bicyclists killed per year.				

1102   *** Access to individual low-income / majority-minority areas is detailed below.

1103   ****Crashes at specific locations is detailed below.

5.2 Monitoring Report Detail for Goal 1

1104

1105   Percent of boardings at <u>Red Line</u> stations that access the station by bicycle.

Red Line Stations	Target		Actual	
	2022 (5-year target)	**2027** (10-year target)	**2017** (baseline)	**2019**
Glenmont				
Wheaton				
Forest Glen				
Silver Spring				
Takoma				
Friendship Heights				
Bethesda				
Medical Center				
White Flint				
Twinbrook				
Rockville				
Shady Grove				

1106   Percent of boardings at MARC <u>Brunswick Line</u> stations that access the station by bicycle.

Brunswick Line Stations	Target		Actual	
	2022 (5-year target)	**2027** (10-year target)	**2017** (baseline)	**2022** (5-year target)
Dickerson				
Barnesville				
Boyds				
Germantown				
Metropolitan Grove				
Gaithersburg				
Washington Grove				
Rockville				
Garrett Park				
Kensington				
Silver Spring				

1107   Percent of boardings at <u>Purple Line</u> stations that access the station by bicycle.

Purple Line Stations	Target		Actual	
	2022 (5-year target)	**2027** (10-year target)	**2017** (baseline)	**2022** (5-year target)
Bethesda				
Chevy Chase Lake				
Lyttonsville				
16th Street				
Silver Spring Transit Center				
Silver Spring Library				
Dale Drive				

Manchester Place				
Long Branch				
Piney Branch Road				
Takoma / Langley				

1108

1109   Percent of <u>elementary</u> school students who travel to school by bicycle.

Elementary School	Target		Actual	
	2022 (5-year target)	2027 (10-year target)	2017 (baseline)	2022 (5-year target)
Arcola				
Ashburton				
Bannockburn				
Barnsley				
Beall				
Bel Pre				
Bells Mill				
Belmont				
Bethesda				
Beverly Farms				
Bradley Hills				
Brooke Grove				
Brookhaven				
Brown Station				
Burning Tree				
Burnt Mills				
Burtonsville				
Candlewood				
Cannon Road				
Carderock Springs				
Carson				
Cashell				
Cedar Grove				
Chevy Chase				
Clarksburg				
Clearspring				
Clopper Mill				
Cloverly				
Cold Spring				
College Gardens				
Cresthaven				
Daly				
Damascus				
Darnestown				
Diamond				
Drew				
DuFief				
East Silver Spring				
Fairland				
Fallsmead				
Farmland				

Elementary School	Target		Actual	
	2022 (5-year target)	2027 (10-year target)	2017 (baseline)	2022 (5-year target)
Fields Road				
Flower Hill				
Flower Valley				
Forest Knolls				
Fox Chapel				
Gaithersburg				
Galway				
Garrett Park				
Georgian Forest				
Germantown				
Glen Haven				
Glenallan				
Goshen				
Great Seneca Creek				
Greencastle				
Greenwood				
Harmony Hills				
Highland				
Highland View				
Jackson Road				
JoAnn Leleck				
Jones Lane				
Kemp Mill				
Kensington Parkwood				
Lake Seneca				
Lakewood				
Laytonsville				
Little Bennett				
Luxmanor				
Marshall				
Maryvale				
Matsunaga				
McAuliffe				
McNair				
Meadow Hall				
Mill Creek Towne				
Monocacy				
Montgomery Knolls				
New Hampshiretates				
North Chevy Chase				
Oak View				
Oakland Terrace				
Olney				

Elementary School	Target		Actual	
	2022 (5-year target)	2027 (10-year target)	2017 (baseline)	2022 (5-year target)
Page				
Pine Crest				
Piney Branch				
Poolesville				
Potomac				
Resnik				
Ride				
Ritchie Park				
Rock Creek Forest				
Rock Creek Valley				
Rock View				
Rockwell				
Rolling Terrace				
Roscoe Nix				
Rosemary Hills				
Rosemont				
Sargent Shriver				
Sequoyah				
Seven Locks				
Sherwood				
Singer				
Sligo Creek				
Somerset				
South Lake				
Stedwick				
Stone Mill				
Stonegate				
Strathmore				
Strawberry Knoll				
Summit Hall				
Takoma Park				
Travilah				
Twinbrook				
Viers Mill				
Washington Grove				
Waters Landing				
Watkins Mill				
Wayside				
Weller Road				
Westbrook				
Westover				
Wheaton Woods				
Whetstone				

Elementary School	Target		Actual	
	2022 (5-year target)	2027 (10-year target)	2017 (baseline)	2022 (5-year target)
William B. Gibbs Jr.				
Wilson Wims				
Wood Acres				
Woodfield				
Woodlin				
Wyngate				

1110

1111

1112   Percent of <u>middle</u> school students who travel to school by bicycle.

Middle School	Target		Actual	
	2022 (5-year target)	2027 (10-year target)	2017 (baseline)	2022 (5-year target)
Argyle				
John T. Baker				
Benjamin Banneker				
Cabin John				
Roberto W. Clemente				
Eastern				
William H. Farquhar				
Forest Oak				
Robert Frost				
Gaithersburg				
Herbert Hoover				
Francis Scott Key				
Dr. Martin Luther King, Jr				
Kingsview				
Lakelands Park				
Col. E. Brooke Lee				
A. Mario Loiederman				
Montgomery Village				
Neelsville				
Newport Mill				
North Bethesda				
Parkland				
Rosa M. Parks				
John Poole				
Thomas W. Pyle				
Redland				
Ridgeview				
Rocky Hill				
Shady Grove				
Silver Spring International				
Sligo				
Takoma Park				
Tilden				
Julius West				
Westland				
White Oak				
Earle B. Wood				

1113

1114

1115 Percent of <u>high</u> school students who travel to school by bicycle.

High School	Target		Actual	
	2022 (5-year target)	2027 (10-year target)	2017 (baseline)	2022 (5-year target)
Bethesda-Chevy Chase				
Montgomery Blair				
James Hubert Blake				
Winston Churchill				
Clarksburg				
Damascus				
Albert Einstein				
Gaithersburg				
Walter Johnson				
John F. Kennedy				
Col. Zadok Magruder				
Richard Montgomery				
Northwest				
Northwood				
Paint Branch				
Poolesville				
Quince Orchard				
Rockville				
Seneca Valley				
Sherwood				
Springbrook				
Watkins Mill				
Wheaton				
Walt Whitman				
Thomas S. Wootton				

1116

1117

1118

1119 ## 5.3   Monitoring Report Detail for Goal 2

1120 Percent of dwelling units within 2.0 miles of each <u>Red Line</u> stations that can access the station on a
1121 low-stress bicycling network:

Red Line Station	Target		Actual	
	2022 (5-year target)	**2027** (10-year target)	**2017** (baseline)	**2022** (5-year target)
Glenmont				
Wheaton				
Forest Glen				
Silver Spring				
Takoma				
Friendship Heights				
Bethesda				
Medical Center				
White Flint				
Twinbrook				
Rockville				
Shady Grove				

1122 Percent of dwelling units within 2.0 miles of each MARC <u>Brunswick Line</u> stations that can access the
1123 station on a low-stress bicycling network:

Brunswick Line Station	Target		Actual	
	2022 (5-year target)	**2027** (10-year target)	**2017** (baseline)	**2022** (5-year target)
Dickerson				
Barnesville				
Boyds				
Germantown				
Metropolitan Grove				
Gaithersburg				
Washington Grove				
Rockville				
Garrett Park				
Kensington				
Silver Spring				

1124 Percent of dwelling units within 2.0 miles of each <u>Purple Line</u> stations that can access the station on
1125 a low-stress bicycling network:

Purple Line Station	Target		Actual	
	2022 (5-year target)	**2027** (10-year target)	**2017** (baseline)	**2022** (5-year target)
Bethesda				
Chevy Chase Lake				
Lyttonsville				

16th Street				
Silver Spring Transit Center				
Silver Spring Library				
Dale Drive				
Manchester Place				
Long Branch				
Piney Branch Road				
Takoma / Langley				

1126

1127

1128 Percent of dwelling units within 1.0 miles of <u>elementary schools</u> that can access the school on a low-
1129 stress bicycling network

Elementary School	Target		Actual	
	2022 (5-year target)	2027 (10-year target)	2017 (baseline)	2022 (5-year target)
Arcola				
Ashburton				
Bannockburn				
Barnsley				
Beall				
Bel Pre				
Bells Mill				
Belmont				
Bethesda				
Beverly Farms				
Bradley Hills				
Brooke Grove				
Brookhaven				
Brown Station				
Burning Tree				
Burnt Mills				
Burtonsville				
Candlewood				
Cannon Road				
Carderock Springs				
Carson				
Cashell				
Cedar Grove				
Chevy Chase				
Clarksburg				
Clearspring				
Clopper Mill				
Cloverly				
Cold Spring				
College Gardens				
Cresthaven				
Daly				
Damascus				
Darnestown				
Diamond				
Drew				
DuFief				
East Silver Spring				
Fairland				
Fallsmead				

Elementary School	Target		Actual	
	2022 (5-year target)	2027 (10-year target)	2017 (baseline)	2022 (5-year target)
Farmland				
Fields Road				
Flower Hill				
Flower Valley				
Forest Knolls				
Fox Chapel				
Gaithersburg				
Galway				
Garrett Park				
Georgian Forest				
Germantown				
Glen Haven				
Glenallan				
Goshen				
Great Seneca Creek				
Greencastle				
Greenwood				
Harmony Hills				
Highland				
Highland View				
Jackson Road				
JoAnn Leleck				
Jones Lane				
Kemp Mill				
Kensington Parkwood				
Lake Seneca				
Lakewood				
Laytonsville				
Little Bennett				
Luxmanor				
Marshall				
Maryvale				
Matsunaga				
McAuliffe				
McNair				
Meadow Hall				
Mill Creek Towne				
Monocacy				
Montgomery Knolls				
New Hampshiretates				
North Chevy Chase				
Oak View				
Oakland Terrace				

Elementary School	Target		Actual	
	2022 (5-year target)	2027 (10-year target)	2017 (baseline)	2022 (5-year target)
Olney				
Page				
Pine Crest				
Piney Branch				
Poolesville				
Potomac				
Resnik				
Ride				
Ritchie Park				
Rock Creek Forest				
Rock Creek Valley				
Rock View				
Rockwell				
Rolling Terrace				
Roscoe Nix				
Rosemary Hills				
Rosemont				
Sargent Shriver				
Sequoyah				
Seven Locks				
Sherwood				
Singer				
Sligo Creek				
Somerset				
South Lake				
Stedwick				
Stone Mill				
Stonegate				
Strathmore				
Strawberry Knoll				
Summit Hall				
Takoma Park				
Travilah				
Twinbrook				
Viers Mill				
Washington Grove				
Waters Landing				
Watkins Mill				
Wayside				
Weller Road				
Westbrook				
Westover				
Wheaton Woods				

Elementary School	Target		Actual	
	2022 (5-year target)	2027 (10-year target)	2017 (baseline)	2022 (5-year target)
Whetstone				
William B. Gibbs Jr.				
Wilson Wims				
Wood Acres				
Woodfield				
Woodlin				
Wyngate				

1130

1131

1132   Percent of dwelling units within 1.5 miles of <u>middle schools</u> that can access the school on a low-
1133   stress bicycling network

Middle School	Target		Actual	
	2022 (5-year target)	2027 (10-year target)	2017 (baseline)	2022 (5-year target)
Argyle				
John T. Baker				
Benjamin Banneker				
Cabin John				
Roberto W. Clemente				
Eastern				
William H. Farquhar				
Forest Oak				
Robert Frost				
Gaithersburg				
Herbert Hoover				
Francis Scott Key				
Dr. Martin Luther King, Jr				
Kingsview				
Lakelands Park				
Col. E. Brooke Lee				
A. Mario Loiederman				
Montgomery Village				
Neelsville				
Newport Mill				
North Bethesda				
Parkland				
Rosa M. Parks				
John Poole				
Thomas W. Pyle				
Redland				
Ridgeview				
Rocky Hill				
Shady Grove				
Silver Spring International				
Sligo				
Takoma Park				
Tilden				
Julius West				
Westland				
White Oak				
Earle B. Wood				

1134

1135

1136 Percent of dwelling units within 1.0 miles of <u>high schools</u> that can access the school on a low-stress
1137 bicycling network

High School	Target		Actual	
	2022 (5-year target)	2027 (10-year target)	2017 (baseline)	2022 (5-year target)
Bethesda-Chevy Chase				
Montgomery Blair				
James Hubert Blake				
Winston Churchill				
Clarksburg				
Damascus				
Albert Einstein				
Gaithersburg				
Walter Johnson				
John F. Kennedy				
Col. Zadok Magruder				
Richard Montgomery				
Northwest				
Northwood				
Paint Branch				
Poolesville				
Quince Orchard				
Rockville				
Seneca Valley				
Sherwood				
Springbrook				
Watkins Mill				
Wheaton				
Walt Whitman				
Thomas S. Wootton				

1138

1139

1140   Percent of dwelling units within 2.0 miles of each <u>public library</u> that can access the station on a low-
1141   stress bicycling network:

Public Library	Target		Actual	
	2022 (5-year target)	2027 (10-year target)	2017 (baseline)	2022 (5-year target)

1142   Percent of dwelling units within 2.0 miles of each <u>recreation center</u> that can access the station on a
1143   low-stress bicycling network:

Recreation Center	Target		Actual	
	2022 (5-year target)	2027 (10-year target)	2017 (baseline)	2022 (5-year target)

1144

5.4 Monitoring Report Detail for Goal 3

1145

1146 Percent of potential bicycle trips that can be made on a low-stress bicycle network in low-income
1147 and majority-minority areas.

Area	Target		Actual	
	2022 (5-year target)	2027 (10-year target)	2017 (baseline)	2022 (5-year target)

1148 Percent of dwelling units within 0.5 miles of the nearest Metrobus or RideOn bus stop that will be
1149 able to access the bus stop on a low-stress bicycling network in low-income and majority-minority
1150 areas.

Area	Target		Actual	
	2022 (5-year target)	2027 (10-year target)	2017 (baseline)	2022 (5-year target)

1151

1152

1153 ## 5.5 Monitoring Report Detail for Goal 4

1154 The ratio of bicycle crashes to bicycle trips at the ## highest crash locations in the County.

Crash Location	Target		Actual	
	2022 (5-year target)	**2027** (10-year target)	**2017** (baseline)	**2022** (5-year target)

1155

1156

1157

6 Implementation

1158

The working draft of the Bicycle Master Plan will include an implementation section that includes the following items:

6.1 Approach to Phasing Separated Bike Lane Implementation

In a desire to implement a low-stress bicycling network quickly, many jurisdictions are installing separated bike lanes through lower cost improvements such as flexible delineator posts. While "flex posts" discourage automobiles from stopping or waiting in the bike lane, they do not create a bikeway that is comfortable for all users, require frequent maintenance and are not aesthetically pleasing. The Bicycle Master Plan will investigate how these lower-cost bikeways can transition to more permanent separation, such as raised separated bike lanes, with aesthetics treatments and stormwater management facilities.

Cesar Chavez Street, San Francisco, CA (source: PeopleForBikes.org)

6.2 Approach to Implementing On-Road Bicycle Facilities Incrementally

Like many jurisdictions, Montgomery County implements bicycle facilities as part of facility planning projects and through the development approval process. There is a long history of constructing discontinuous sections of sidepaths along the frontage of development projects, with the idea that over time continuous facilities are completed at a lower cost and with less impact to the community. While this is a reasonable approach for off-road bikeways, it creates challenges when using the

1177 approach for on-road facilities. The working draft of the Bicycle Master Plan will develop an
1178 incremental approach to implementing on-road facilities, such as separated bike lanes, buffered bike
1179 lanes, and conventional bike lanes, as part of the development review process.

6.3   Higher Quality Sidepaths

1181 Sidepath surfaces in Montgomery County tend to become a rough bicycling surface over time as they
1182 develop cracks at the edges from use by maintenance vehicles and bumps due to the growth of tree
1183 roots.

1184 Sidepaths need to be designed to withstand vehicle loading since maintenance trucks will use them.
1185 That may result in different designs for subgrade and pavement thicknesses based on soil
1186 conditions. Per the AASHTO Guide for the Development of Bicycle Facilities, at a minimum, a 6-inch
1187 minimum total pavement depth including the surface course (asphalt or Portland cement concrete)
1188 and the base course (typically an aggregate rock base). This needs to be placed over a compacted
1189 subgrade.

1190 As discussed previously, the working draft of the Bicycle Master Plan will recommend higher design
1191 standards for sidepaths.

6.4   Typical Sections for New Bikeway Facility Types

1193 The working draft of the Bicycle Master Plan will prepare typical sections for:

1194 Separated bike lanes:

1195 - One-way and two-way separated bike lanes at sidewalk level
1196 - One-way and two-way separated bike lanes at a vertical level between the street and
1197   sidewalk
1198 - One-way and two-way separated bike lanes at sidewalk level at street level without on-street
1199   parking
1200 - One-way and two-way separated bike lanes at sidewalk level at street level with on-street
1201   parking

1202 Buffered bike lanes:

1203 - With and without on-street parking
1204 - Others as recommended by the consultant

1205 Advisory bike lanes:

1206 - With and without on-street parking
1207 - Others as recommended by the consultant

6.5   Intersection Templates

1209 The working draft of the Bicycle Master Plan will prepare typical sections for:

1210 - Protected intersections with and without on-street parking.
1211 - Bike boulevard treatments (such as diverters and refuges).
1212 - Transition from one-way to two-way bikeways.
1213 - Facilitating left turns, such as with two-stage bike boxes and left turn pockets, etc.