

Bicycle Master Plan

Department of Planning – March 2006

City of Baltimore

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SECTION I. EXECUTIVE SUMMARY

The Bicycle Master Plan was initiated by the Mayor's Bicycle Advisory Committee on behalf of the bicycling community to promote and facilitate bicycling as a safe, convenient and comfortable form of transportation and recreation in Baltimore. A plan to coordinate the formal integration of bicycles in our existing infrastructure is necessary to improve safety and create a multi-modal transportation system friendly to the citizens of Baltimore.

Baltimore has a great potential to be a city where thousands of people ride bicycles everyday: there is a high level of residential development within two to three miles of the central business district; shared use paths along the Gwynns Falls and Jones Falls bisect the city from east to west and north to south; Baltimore has a large population of residents that do not own cars; and the city's system of parks and connecting parkways developed by the Olmsted Brothers is highly conducive to bicycle riding.

The design and implementation of this plan supports broad city-wide goals including enhanced safety for city residents, opportunities for youth, healthy neighborhoods, and strengthening Baltimore's economy. The increased presence of bicyclists contributes to public safety with more eyes on the street. Bicycling is a great way for urban residents with busy lives to combine healthy exercise with daily travel. Accommodating future population growth typically means more automobiles, congestion and increased pollution. Providing a safe and convenient bicycle transportation system can help reduce the number of motor vehicles on city streets and the need for additional parking.

This plan also complies with the strategic plan of Baltimore's Department of Transportation that calls for a "comprehensive and modern transportation system that integrates all modes of travel and provides mobility and accessibility in a convenient, safe and cost-effective manner."¹

The current Bicycle Master Plan (BMP) is the third major effort undertaken by the City to make bicycling safer and more enjoyable. Formal bicycle planning in Baltimore dates back to 1978 when the Baltimore Department of Planning prepared the Baltimore Bikeways development plan. That plan used existing bicycling counts and did not assume increased bicycling upon provision of facilities. As a result, a conservative plan with three bicycle routes was proposed and adopted. In 1993, the Planning Department staff created an update to the plan, but it was never formally adopted.

The BMP is distinct from the previous efforts. The BMP seeks to make Baltimore bicycle friendly and increase bicycling by constructing a comprehensive network and making policy and procedure adjustments within city government. It assumes low bicycling rates are due to poor infrastructure and a lack of accommodations. The BMP identifies gaps in the system and recommends needed capital and operating investments to address these gaps. This plan also emphasizes safety, education and encouragement programs as key components for successful implementation.

This plan will guide Baltimore City in creating a lasting bicycle transportation program, by:

- mapping out an integrated on-street and off-street bikeway network,
- addressing bicycle parking and inter-modal bike/transit integration,
- stressing safety education for motorists, bicyclists and youths,

- providing an action plan for encouragement and enforcement,
- recommending transportation and development policy and program changes,
- describing new bicycle facilities designs,
- and detailing new roadway and trail maintenance management practices.

Over the next three years, an aggressive program of on-street bicycle transportation improvements will create a network an Introductory Network of bicycle facilities setting Baltimore on the right course for the 21st Century (see page x, Map A). Baltimore's bicycle network will connect all of our neighborhoods to recreation, employment and activity centers within the city and to existing and planned bicycle facilities throughout the Baltimore region and along the proposed East Coast Greenway. Implementation of this program has already started incorporating new bike routes in Baltimore's capital improvements program and integrating bike lanes for road and bridge projects currently under design.

BENEFITS OF BICYCLING

Encouraging greater bicycle travel in Baltimore will bring many benefits to residents and visitors alike. These benefits are summarized below.

Traffic Relief

Increased bicycle travel will reduce the number of motor vehicles on Baltimore roadways, easing congestion and on-street parking demand.

Environmental Benefits

A primary source of air pollution in the Baltimore metropolitan region is auto emissions.¹ Motor vehicles are also a source of pollution for the Chesapeake Bay and Baltimore's tributaries. For short- and medium-distance trips, substituting the bicycle for the auto will reduce the amount of air pollutants washing into our waterways.

Baltimore and its surrounding metropolitan region are classified as a severe non-attainment area for ground level ozone by the U.S. Environmental Protection Agency. Cycling 8 miles prevents 15 lbs. of air pollutants from contaminating the air. Bike travel already reduces automotive pollution by 1 percent nationally and saves an estimated 700 million gallons of fuel annually.

Economic Benefits

In the region, thirty-five percent of household income is spent on housing. After housing, motor vehicles are the second-highest household expense for Baltimore families. Regular bicycling, complemented by the existing transportation options in Baltimore, can allow a single person to live without a car or a two-car family to give up a second car (typically a \$6,000 to \$7,000 annual expense).² The recent and continued appreciation of housing values makes these numbers very conservative. Bicycling for transportation can improve the mobility of some of the 326,000 Baltimore residents who do not have access to a car.

Approximately 50% of Baltimore residents live in a household where they do not have access to a motor vehicle.

¹ Maryland Department on the Environment reports that 30-40 percent of the pollution that causes ground level ozone comes from motor vehicle use, http://www.mde.state.md.us/air/air_quality/index.asp.

² Based on calculations from *Making Housing Affordable by Reducing Second-Car Ownership*, Patrick H. Hare, 1995. Adjusted for inflation and today's gas prices.

Bicycling can help bring tourist dollars into the city. Active vacations are one of the fastest growing sectors of the tourist industry. Bicycling also allows tourists to travel more quickly between sites and enables neighborhoods around downtown to attract visitors and tap into the spending power of the 45 million tourists who come to Baltimore.

Health Benefits

Increased levels of bicycling will improve the health of Baltimore residents. Biking to the store, school or work provides a time-efficient, low-cost way of attaining the U.S. Surgeon General's recommended daily allowance of physical activity. Bicycle exercise can help reduce heart disease, diabetes, obesity and other chronic illnesses, which are not uncommon in Baltimore.

HISTORY OF BICYCLING IN BALTIMORE

Bicycling has long been a part of the culture of Baltimore. In the late 19th Century and early 20th Century, Baltimore was at the forefront of the *Great American Bicycling Craze* that spread through the East Coast and the nation. In the early 1900's, *Mrs. William H. Row* reflected on her husband's life of bicycling through the turn of the century, "...back in the [18]90's Baltimore was bike crazy. There were hundreds of 'wheels' on the streets. There were a score of cycling clubs and every Sunday there were outings and races and endurance tests. There were even elaborate tracks for professional racing, and the top riders made headlines on the sports pages."³

Another report estimated that by 1916 Baltimore had 80 or 90 bicycle shops, many started by enthusiasts who gave up other professions to live and breathe their favorite sport.

1930's & '40s

In the late 1930's Baltimore experienced its first bicycling revival. In July 1938, the *Evening Sun* reported, "Cycle riding comes back with a bang, bang here. Thousands taking up sport as city ropes off spaces in parks—rental agents report business is booming."

The automobile had taken over the roads in the 1920's and 30's, so this revival saw crash rates soar, especially among the thousands of kids that were riding bikes to school. To address this issue the Police Department, Safety Council, teachers, school officials and students partnered to undertake an education and enforcement campaign. Largely a student initiative, Hamilton Junior High initiated a program that was spread to schools throughout the city. Program activities included bicycle inspections, formulation of safe riding rules, a safety pledge campaign, and organization of a Cycle Safety Club with a membership card and license tag for student bicycles. A student safety scout force patrolled the schools and neighborhoods and issue tickets to rule violators, and a student court meted out justice.

The 1970's and the Oil Crisis

After another decline, cycling came back again in the 1970's. At this time, city promoters started an annual 12-mile historic bicycle tour along the inner harbor and bike commuters started clamoring for a plan to improve conditions on roadways and promote the clean and energy-efficient mode of travel. Three new bike routes were established: 1) Roland Avenue, 2) the Herring Run Trail, and 3) Rogers/Ken Oak/Cross Country Blvd./Kelly Ave. and a bicycle lane was created on the ring road around Lake Montebello. But for a variety of reasons, only a portion of previous plans were carried out and the few bikeways created had little impact on changing overall bicycling conditions.

³ *I Remember When Cyclists Were Headliners*, Mrs. William H. Rowe, Enoch Pratt Free Library, Maryland Room

BICYCLING TODAY

Who Bicycles in Baltimore?

Information gathered in the survey and based on observation suggests that bicyclists using the streets today might be categorized in the following groups:

- Hearty bicycle commuters.
- Regular fitness and recreational riders.
- Inner city dwellers who, for social, political or economic reasons, live without a car and use a bicycle as one among multiple transportation alternatives.
- People who occasionally use a bicycle for utilitarian transportation, typically on short, bicycle-friendly routes. Trip purposes might include visiting a park, going to the library, running errands, shopping, visiting friends, etc.

Why Baltimoreans Bicycle

Baltimore is experiencing resurgent interest in bicycling. The increasing sense of safety, influx of new residents with new attitudes about transportation, the enticement to bicycle provided by the trail system, and swiftly increasing gas prices are primary forces behind this resurgence. Ongoing factors include low car ownership rates, the need for close to home recreation and fitness, residents' devotion to Baltimore's great parks, which have retained their popularity for recreational biking, and the number and variety of bicycle events held annually.

Bicycle events staged in Baltimore draw large numbers of people. The 8th annual JFX Celebration which hosts a ride on a section of the Jones Falls Expressway, closed to motor vehicle traffic for the event, attracted 4,000 riders in 2005. No less than seven major bicycle rides take place on city streets and trails annually

This interest is translating into increased demands upon City Government to improve bicycling conditions. In 1997, the Mayor's Bicycle Advisory Committee was formed through citizen request. To kick off this plan, more than 100 bicyclists and advocates attended the first public meeting, on a cold winter evening in January 2005.

Why Baltimoreans Don't Bicycle

Bicycling on Baltimore's arterial streets and roadways is largely for the brave at heart. Many cyclists are not comfortable in Baltimore traffic and are discouraged by the lack of dedicated space provided in the roadways. Others often find pavement conditions unsafe, street drainage grates a danger, or have difficulty finding a secure place to park their bike. Additionally, drivers in Baltimore have been observed by cyclists as hostile to their presence on the roads. One Baltimore resident summed up the situation this way, "traffic is too heavy, the pavement is too rough, and there is no space for bikes."

Conditions such as these not only limit bicycling's ability to grow in overall popularity, but create a significant disincentive for residents to choose the bicycle for recreation, commuting or other utilitarian trips.

Bicycle Commuting

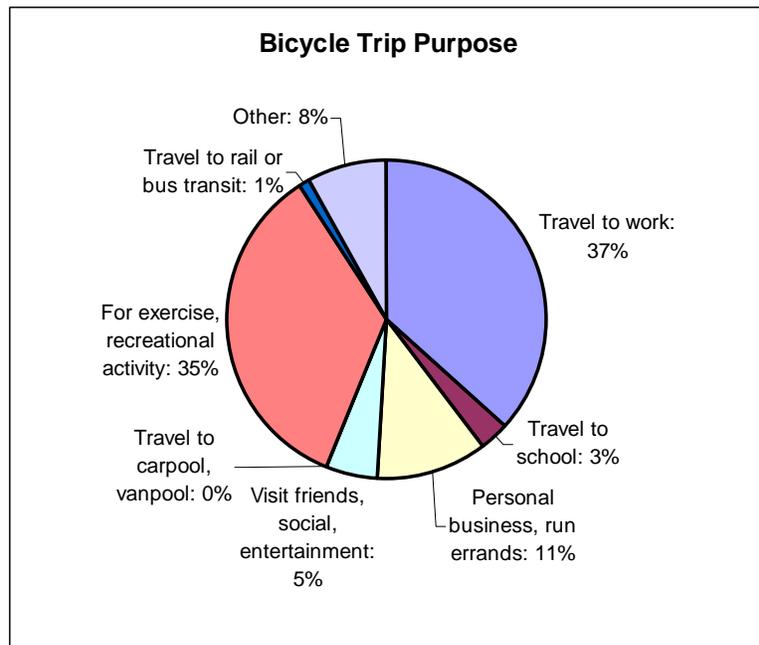
Table 1 shows that Baltimore bike commuting rates are far lower than comparable east coast cities such as Washington, DC, Philadelphia, and New York City. However, they are higher than mid-western industrial cities with a similar social and demographic history, such as Cincinnati and Detroit.

Fifty-nine percent of those responding to a survey conducted as a part of this planning process, reported that their last bicycle trip was for a non-commuting purpose such as for exercise, recreation, visiting friends, or personal business (see *Figure 1*).

Moreover, according to *Journey to Work* data, gathered as part of the 2000 U.S. Census, only 0.33 percent of employed Baltimore residents use the bicycle as their most common form of travel to work. While this data does not include the many non-work trips people make by bike, and is collected in such a way that usually results in an undercount of bike commuting, it still points to low bike commuting rates, as well as low bike use for all transportation purposes.⁵

Table 1. Bicycle Commuting in Selected U.S. Cities⁴

City	Bicycle Mode Share
Madison, WI	3.19%
San Francisco, CA	1.98%
Seattle, WA	1.88%
Washington, DC	1.16%
Philadelphia, PA	0.86%
New York, NY	0.47%
St. Louis, MO	0.35%
Baltimore, MD	0.33%
Cincinnati, OH	0.19%
Detroit, MI	0.16%
Nationwide Average (includes suburban and rural areas)	0.38%



⁴ U.S. Census Bureau. State and County Quickfacts, Online: http://factfinder.census.gov/servlet/DTGeoSearchByListServlet?ds_name=DEC_2000_SF3_U&_lang=en&_ts=93199688005, 2004.

⁵ This number does not include trips made by the following people: those 15 and under, those who are unemployed or underemployed, those who sometimes bike to work but not regularly, and those who use bicycles for non-work trips. Moreover, it is based solely on reported travel patterns for a single week long period in March.

POTENTIAL FOR INCREASED BICYCLING

Despite less than ideal roadway conditions, Baltimore has tremendous potential for higher levels of bicycling.

Street Network and Urban Design

The street network and housing stock is designed to support significant population densities and many neighborhoods are developed on pre-WWII land use patterns, meaning that residential uses are mixed with neighborhood retail, employment, and other activities, significantly increasing the amount of urban travel that involves short trips, for which the bicycle is most effective.

There are 411,600 jobs in Baltimore and many are located in or near the relatively small and centrally located downtown.⁶ Others are at major institutional campuses spread throughout the city such as hospitals and medical centers, universities, industrial parks and government office complexes. Almost all of these locations are easily accessible by bicycle.

Baltimore has growing residential neighborhoods in and around the downtown core, putting many residents within 2-3 miles of downtown jobs. For many people in the close-in neighborhoods, trips to the downtown area are too far for walking and inconvenient to make with a car due to traffic congestion and parking costs. Buses are slowed by congested surface traffic and the rail transit lines serve only limited corridors. Thus, bicycling is often the fastest way to travel to and through downtown.

City Demographics

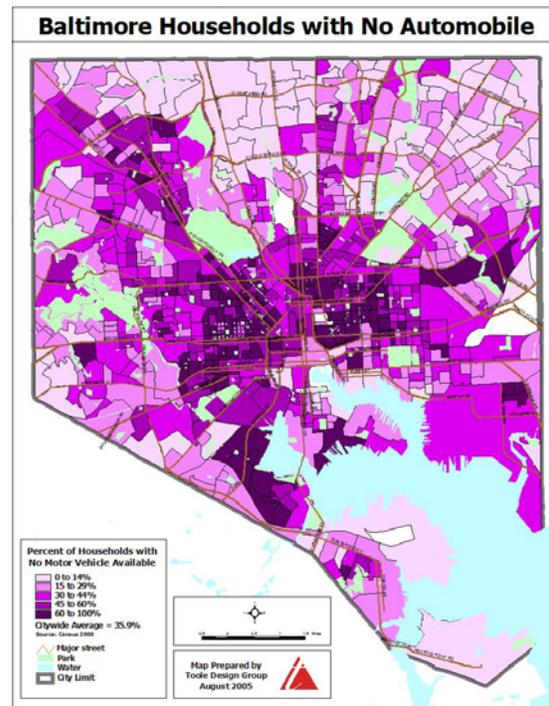
Carless households hold great potential for increased bicycle ridership in the City. Approximately 325,788 Baltimore residents live in households without an automobile or are too young for a driver's license.⁷ Moreover, carless households predominate in a number of neighborhoods that are within 2 miles of the Central Business District (see *Figure 2*).

Bicycling is an inexpensive mode of transportation that can enable low-income people to find and keep jobs, access health care services, and take advantage of shopping, education, and recreational opportunities.

Development Opportunities

With new residential and commercial development occurring throughout the city, the high tech job supply increasing, and strong neighborhoods to build on, there is great potential to increase bicycle use for commuting, other transportation needs and recreation.

To increase usage of bicycles for transportation and improve safety, clear goals and objectives need to be established.



⁶ Bureau of Economic Analysis, 2004.

⁷ U.S. Census Bureau. State and County Quickfacts, Online:

http://factfinder.census.gov/servlet/DTGeoSearchByListServlet?ds_name=DEC_2000_SF3_U&lang=en&ts93199688005, 2004.

SUMMARY OF GOALS AND OBJECTIVES

Mission: To promote and facilitate bicycling as a safe, convenient and comfortable form of transportation and recreation

Goal 1: Develop a comprehensive network of facilities for bicycles.

Objective 1: Make bicycling safe and inviting on the streets of Baltimore.

- Implement proposed bicycle route network (see Map A on page x for Introductory Network).
- Improve continuity of on-street network by overcoming negative impact of existing barriers (see Appendix A and B for lists of intersections and small connector paths).
- Consider the adopted bicycle route network in prioritizing street resurfacing, reconstruction, and streetscape projects.
- Coordinate planning, design, and implementation of bicycle facilities with other city plans.
- Coordinate planning, design, and implementation of bicycle improvements near the City line with Baltimore County, Anne Arundel County and the Baltimore Metropolitan Council.

Objective 2: Increase the availability of bicycle parking and support facilities at destinations across the city.

- Launch a bicycle parking initiative.
- Require new development to provide bicycle parking.
- Improve bicycle parking at transit stations in support of a multi-modal transit system (for list of existing facilities and preliminary needs assessment, see Appendix C).
- Develop bicycle commuting/rental centers to provide focal points for bicycle transportation services and promotion.

Objective 3: Fully integrate bicycling with all public transit facilities and services.

- Work with the Maryland Transit Administration (MTA) to accommodate bicycles on all public transit in support of a multi-modal transit system.
- Explore the potential for bicycle accommodations on the water taxi.

Objective 4: Develop off-road paths to create a connected trail system.

- Complete ongoing trail development.
- Develop new and extend existing trails (for a list of potential trails and extensions, see Appendix D).
- Improve access to trails.

Goal 2: Implement safety, education and encouragement programs to increase bicycle usage.

Objective 1: Improve enforcement of traffic laws related to bicycling.

- Develop partnership with the Baltimore City Traffic Safety Coalition, Department of Transportation Safety Division, Baltimore City Police Department, and the Mayor's Bicycle Advisory Committee to identify and address bicycle-vehicle safety measures through enforcement and new or amended laws.
- Provide training for Baltimore police officers regarding bicycle safety laws and issues faced by on-street bicyclists.
- Identify the most common conflicting movements between bicycle and vehicle users and determine enforcement mechanisms to mitigate these conflicts.
- Develop an amendment for the law restricting bicycle riding on sidewalks and the park rule restricting bicycle riding on park paths.

Objective 2: Educate the public (motorists, bicyclist, and pedestrians) about bicycle and vehicle operation in urban traffic conditions.

- Educate motorists and bicyclists about mutual rights and responsibilities (suggested programs listed in Appendix E).
- Educate future motorists, bicyclists and pedestrians about safe travel behavior and vehicle operation.
- Create and implement Safe Routes to School program.

Objective 3: Encourage increased bicycling by promoting health, recreation, transportation, and tourist opportunities.

- Establish partnerships with health organizations to promote bicycling as healthy transportation.
- Promote bicycling for commuting, errands, socializing, and exercising (for potential programs, see Appendix E).
- Develop and market a City of Baltimore Bicycle Map.
- Partner with Baltimore Area Convention and Visitors Association and the Baltimore Office of Promotion and the Arts to promote bicycle opportunities.
- Begin a bicycle data collection program.

Goal 3: Institute policies that support implementation of Bike Master Plan goals and objectives with community support and input.

Objective 1: Create structure to implement the Bike Plan goals and objectives.

- Create a Bicycle Coordinator position in the Department of Transportation to implement the Bike Master Plan.
- Support Mayor's Bicycle Advisory Committee (MBAC).
- Review and update the Bicycle Master Plan every 6 years.

Objective 2: Institute new policies and procedures in the Departments of Transportation and Planning to support Bike Master Plan goals.

- Utilize the following resources to guide bicycle facility design and application in the Department of Transportation and other agencies: 1) Map C—Preliminary Facility Types, 2) the Bicycle Facility Design Toolkit, 3) nationally recognized and accepted bicycle facility design guides (see Appendix F), and 4) Section III of this plan.
- Provide sufficient funding through the Capital Improvement Program (CIP) for implementation of independent bicycle improvement projects identified in this plan.
- Build internal capacity to design and implement bicycle facilities by providing ongoing training for city staff.
- Adopt policy requiring new development to mitigate traffic impact by providing bicycle facilities or contributing to a fund which is dedicated for bicycle facilities and improvements.

Objective 3: Update street and trail repair and maintenance practices to ensure bicyclists safety and comfort.

- Develop procedures for maintaining public bicycle facilities.
- Establish bicycle related improvement request system through Baltimore 311 call center and website.
- Update specifications for routine and emergency street resurfacing and repair to ensure safe traveling routes and surfaces for bicyclists.

SECTION II. EXISTING CONDITIONS AND PROGRAMS

Prior to developing the plan goals and objectives, an analysis of bicycling conditions throughout the City was undertaken. The findings are organized around two topics: 1) existing bicycling conditions on city streets, transportation infrastructure and in other public spaces and 2) existing city programs that address issues affecting and related to bicycling.

TRANSPORTATION INFRASTRUCTURE

Baltimore has a mix of areas that are both difficult and delightful for bicycling. Downtown Baltimore, most of the central core and most arterial roads are avoided by many cyclists due to heavy traffic, narrow lanes and poor pavement conditions. However, the stream valley trails, park roads, parkways and residential streets, can be favorites for cyclists of all abilities.

Temporal variables affect the bicycle-friendly nature of some streets making them alternately good and bad depending on the time of day, day of the week and/or season of the year. There are many streets that recreational riders report as favorites when used on Saturday or Sunday, but commuters report as “avoid at all cost” during weekday morning or evening rush hours. Other streets vary based on the location of each segment. Charles and St. Paul streets are good examples of thoroughfares that are much more bicycle-friendly along the sections that are in the Charles Village and Guilford neighborhoods as opposed to sections in Mt. Vernon and downtown.

Summary of Existing Facilities and Services

Baltimore’s two best and most loved bicycle facilities are the Gwynns Falls and Jones Falls trails. The Gwynns Falls Trail is complete along a 14-mile stretch and will eventually connect to the Park and Ride lot at I-70 to the Inner Harbor. The Jones Falls Trail is complete along a 1-mile stretch with 7 additional miles in design or construction for completion by 2010.

Outside of the new trail systems, Baltimore has only a few dedicated bicycle facilities. A newly signed bike route has been installed between the Inner Harbor and Ft. McHenry, in conjunction with new bike lanes on a portion of the route. Bike lanes have been installed on Bayard, Bush, Ridgely, Ostend and Warner to provide continuity for the Gwynns Falls Trail on the leg that connects it to the Inner Harbor. For many years, Lake Montebello has had a special bike and pedestrian lane striped in the loop road around the reservoir. The 1970s bikeways initiative created a striped lane along Roland Avenue which is available to cyclists but not up to current standards.

Some public buildings and universities have bicycle racks and lockers. However, many bicycle racks throughout the city are of substandard quality, design and quantity. For example, bicycle parking at Penn Station is frequently full.

Bicycles are permitted on all Maryland Transit Authority (MTA) Light Rail and Metro Subway service except on crowded trains. If the train is crowded due to morning or evening rush hour, sporting events or special events, bicyclists are requested to wait for the next train. The MARC trains currently only allow folding bicycles fully enclosed in a suitable carrying case. Many of the MTA stations are equipped with bicycle racks and lockers. A full list of MTA rack and locker locations can be found in Appendix C.

A summary of existing facilities is provided in Table 2.

Table 2 Existing Bicycle Facilities

Quantity	Bicycle Accommodation
4.7 miles	On-street Bike Lanes
13.8 miles	Off-Street Bike Paths (shared use trails)

2.3 miles	Signed Bike Routes
4	Transit Stations with Bike Lockers
11	Number of Rail Transit and Train Stations with Bike Parking
< 25	Bike Racks in public space that meet minimum design standards.

Summary of Difficult Conditions

In addition to the general lack of bike facilities, the planning process identified the following list of conditions⁸ that make bicycling difficult, unappealing and at times unsafe:

- 1 Inadequate space for bicycling on downtown streets, which have large volumes of motor vehicles
- 2 Large arterial roadways with high-speed traffic and no bike facilities or striped shoulders on most roadways
- 3 Road surface problems: poor pavement, prevalence of potholes, uneven seams and debris on the right side of the road
- 4 Utility and storm water infrastructure problems: crumbling gutter pans and curbs and hazardous storm water drainage grates and utility covers
- 5 Numerous complex and large intersections with vehicles turning in many directions
- 6) Poor access on some bridges, including approach sidewalks lacking curb ramps, narrow passageways on the bridges, and discontinuities such as stairs, that force bicyclists to dismount
- 8 City ordinance making bicycling illegal on all sidewalks
- 9 Curbside parking allowed on the preponderance of streets, which frequently places cyclists in the door zone of parked cars
- 10 Scarce bicycle parking; and existing bike parking of poor quality
- 11 General lack of respect for bicyclists among motor vehicle drivers
- 12 Conflicts with buses
- 13 Significant street discontinuities and neighborhood divisions created by a variety of barriers

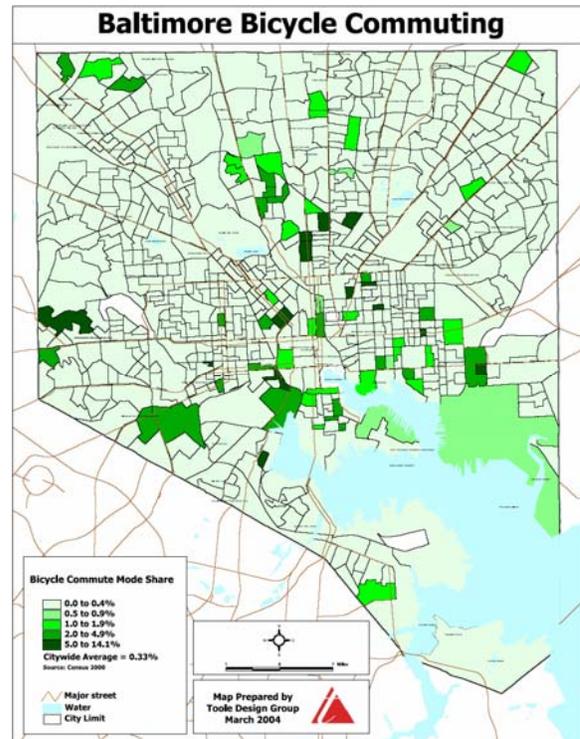
⁸ This list is based on comments received at public meetings, feedback gathered from the Plan Survey and analysis conducted by consultants and staff.

Given these conditions, encouragement alone is unlikely to result in significant increases in bicycling. Clearly, conditions must change before levels of bicycle use will rise.

Baltimore area cyclists agree. According to sixty-four percent of Baltimore bicyclists participating in the Plan Survey, providing more and better bicycle accommodations (*building bikeways and providing bike parking*) would be the most effective way to encourage more people to use bicycles for transportation. Full survey results can be found in Appendix G; the survey form in Appendix H.

EXISTING BICYCLE-RELATED PROGRAMS

A review of existing bicycle-related programs within city agencies and local non-governmental organizations was conducted as a part of the planning process. The following is a summary of key findings.



Law Enforcement

Training specific to bicycle safety and enforcement is not currently provided at the Baltimore Police Academy and bicycle safety or enforcement issues are rarely mentioned at daily roll call, the venue for new information or updated enforcement instructions. Currently, enforcing laws related to bicycle operations and safety in traffic is not among the department's highest priorities, however the Department is conducting periodic pedestrian safety sting operations at high accident locations and speed reduction operations using funding from the Maryland Office of Highway Safety grants program.

The Department continues to operate a bicycle registration program to aid in theft reduction and bicycle recovery.

The International Police Mountain Bicycle Association is based in Baltimore County. This organization provides training and other support to bicycle-mounted police units for Police Departments around the world.

Health and Safety

The Baltimore Department of Health has one staff person working on pedestrian safety education. Walk to School days are organized annually in October in conjunction with nationwide efforts and other safety programs are coordinated with a stakeholder group, the Baltimore City Traffic Safety Coalition.

Through the Baltimore City Traffic Safety Coalition, a safety-trailer program of the Washington Area Bicycle Association (WABA), launched in and around Washington DC, was been extended this fall to nearby counties and Baltimore City. Training to prepare teachers to use the equipment and associated curriculum is offered by WABA and is being promoted through the coalition to Baltimore City Public School teachers. This program is designed to teach both basic bicycle riding skills and proper operations for safety in traffic.

The Department of Transportation continues to operate Safety City at Druid Hill Park, a miniature town where traffic safety is taught experientially to elementary school students. Additionally, in the poor weather months, instructors work inside public and private

schools in Baltimore. From January through March 2006, these instructors served 15,000 kids.

From 2000-2002, in Baltimore City, an average of 306 traffic crashes per year involved bicyclists.

Reporting Unsafe Street Conditions

311 is Baltimore City's overall citizen complaint and service request call-in system. Currently, 311 accepts requests for removal of abandoned vehicles, park maintenance needs, pothole repair, street cleaning, street repair and traffic sign replacement.

Local bicyclists have also launched a web-based reporting system for bicycle infrastructure issues and needs. It is at <http://www.margieroswell.com/maps/bike.htm>. It provides a location to report problems such as the following, and located them on a map so that other cyclists can be made aware:

- 1 Parallel storm drain grate
- 2 Curb cut needed
- 3 Narrow lane
- 4 Very narrow shoulder
- 5 Dangerous pavement
- 6 Needs striping or re-striping
- 7 Dangerous merge area
- 8 Blind spot

Recreational Bicycling

While there are too many recreational programs and opportunities to catalog here, a few are worth noting. The Baltimore Bicycle Club offers organized group rides for riders at a variety of skill levels. They also organize bicycle racing events and cooperate with other organizations in the Mid-Atlantic with regard to these activities.

The Baltimore Department of Parks and Recreation manages the Gwynns Falls and Jones Falls Trail and many other parks and trails where bicycling is accommodated and popular. At Carroll Park, a Bike and Skate Facility provides a venue for trick bike riding.

Tourism

The Baltimore Area Convention and Visitors Association distributes information about bicycling in Baltimore. They operate the visitors center at the Inner Harbor and will be installing a trailhead marker outside the center for all trails and walks in Baltimore City, including the Gwynns Falls Trail. The Center is available as a space to schedule promotions such as displays, information tables, or information videos. Non-vehicular tours are promoted by staff including the following--Heritage Walk, Mt. Vernon, Federal Hill and Fells Point Ghost Tour. Visitors seeking bicycle rental are directed to a nearby bicycle shop.

The Baltimore Office of Promotion and the Arts uses a bicycle tour to celebrate their successful mural program and distributes information about other bicycle rides.

Both agencies use the Baltimore Fun Guide website to list all events, including the bicycle and non-motorized events listed above.

Bicycle Advocacy and Resources

The Mayor's Bicycle Advisory Committee serves as the citizen link to Baltimore City government for concerns related to bicycling. This group meets on the third Tuesday of every month and works on planning, agency coordination, physical problems with existing trails or bike facilities, and an annual bicycle ride, Tour dem Parks, Hon.

One Less Car, an advocacy organization, supports a wide variety of bike events, concerns, and movements. Among other things, they coordinate a state-wide lobby day in Annapolis during the legislative session, provide a citizen voice on bike-ped committees locally and state-wide, and run the Cycle Across Maryland bicycle ride.

Other groups in Baltimore include Baltimore Spokes, an internet based bicycle community discussion board, and Velocipede, a design-stages bicycle repair and distribution cooperative.

Section III. Master Planning Process

This plan represents a collaborative effort of the Baltimore City staff project team, the public and consultant specialists.

Public Meetings and Involvement

Kick-off Meeting

The planning process was launched with a large public meeting in January 2005. More than 120 people gathered in the Department of Planning Pheobe B. Stanton Boardroom to participate in an interactive workshop.

Working in teams, participants marked up maps indicating the destinations they want to go to by bicycle, the routes they prefer to use today for recreation and transportation, the streets they avoid, and where bicycle parking or other amenities are needed. The maps were used by City staff and the consulting team as the starting point for creating a network of bicycle routes and improvements focused on on-street facilities.

Participants also participated in brainstorming “Big Ideas” that should guide Baltimore in its efforts to improve bicycle safety and increase bicycle use. These ideas were organized into subject areas that include Encouragement, Education and Safety, Enforcement, Maintenance, Law and Policy, and Miscellaneous.

Survey

An online survey was developed to provide an additional opportunity for public input. This survey was also distributed on paper at the public meeting and through other venues for a period of three months, January through March 2005. See box for a summary of results. See Appendix H for an example survey form and Appendix G for complete survey results.

Survey Results

Informal surveys were made available to interested Baltimore residents through a variety of mechanisms over a multi-year period. Surveys were distributed at bicycle rides, libraries, universities, and at the January 2005 Public Meeting. The survey was also made available online for about three months in early 2005.

In total, 326 surveys were completed. Most survey respondents were experienced with bicycling in the city.

Highlights include:

- **Preferred facilities for bicycling:**

- 43% - Bike lanes
- 31% - Street with no facilities
- 19% - Bicycle paths
- 7% - Sidewalks

- **Factors for choosing to bicycle:**

- 75% - Safety of travel route
- 59% - Weather
- 53% - Traffic
- 39% - Need for exercise

Respondent profile:

58% Men, 42% Women

Average age: 36

Use bicycle 3 days/week on average

30% involved in a crash

Draft Master Plan Meeting and Public Comment Period

On January 18, 2006, the draft Bicycle Master Plan was unveiled at a meeting attended by more than 100 people. Attendees were presented with details on the progress and process since the first meeting, draft goals and objectives, and maps of the proposed Introductory and Full Bicycle Route Networks for Baltimore City.

Questions and comments were taken at this meeting and through a public comment period that ran from January 19 through February 8, 2006. Copies of the Draft Master Plan, Appendix, Introductory and Full Network Maps were posted on the internet (www.baltimorecity.gov/government/planning/bikeplan.html) and were distributed to every public library in Baltimore City. Comments received were taken into consideration in preparing the Final Bicycle Master Plan.

Planning Commission Hearing

To become official city policy, the Bicycle Master Plan must be adopted by the Baltimore City Planning Commission (scheduled for May 2006). Preceding the hearing, the final master plan document (including maps, appendix, and the design toolkit) was posted to the internet and meeting notification was sent to everyone who provided contact information through meetings, surveys, or comments.

Review Previous and Ongoing Bike Plans

To supplement input from the bicycling public, a review was conducted of maps and planning documents developed in previous bicycle planning efforts and ongoing transportation and community planning processes. A base map was developed using the City's Geographic Information System data, which was supplemented by some bicycle specific data provided by the Baltimore Metropolitan Council.

Coordination with Baltimore County and their bicycle planning efforts was also undertaken, resulting in identification of a number of cross jurisdictional routes of mutual interest.

Advisory Committees

Two Advisory Committees had ongoing involvement with the plan: the Mayor's Bicycle Advisory Committee and a Technical Advisory Committee consisting of representatives of various City agencies (see Acknowledgements page for membership). Each of these committees reviewed draft and final proposed Bicycle Network maps as well as proposed plan recommendations and the Facility Design Toolkit and Standard Details.

Technical Analysis

The technical analysis of street for network inclusion utilized a variety of methodologies.

First, a preliminary bicycle transportation network of about 500 miles of roadway was identified based on public input and routes that were mapped in prior planning processes. Most of this network was field inspected by car and bicycle. Some was reviewed on GIS-aerial photography provided by the City. Bicycle Level of Service evaluations from 2003 were available for some arterial roadways, as were Annual Daily Traffic (ADT) counts.

A variety of criteria were used to evaluate and screen the routes for selection into the Draft Bicycle Network. This Draft Network was provided to the public for a second round of review. After incorporating public comment, this network was presented to the Baltimore Planning Commission for formal adoption as the Bicycle Transportation Network. City staff, the Technical Advisory Committee and the Mayor's Bicycle Advisory Committee participated in the screening process.

Selection criteria used included suitability for bicycling without improvement, potential to be improved, destinations served, public interest in the route, contribution to overall connectivity, coverage of the city, and other factors.⁹ The Draft Network included approximately 415 miles of streets and roadways (excluding trails and other off-road connectors).

The second task of the technical analysis was to identify up to 50 miles of roadway for which preliminary bicycle facility types could be identified. This analysis resulted in 150 miles of preliminary bicycle facilities being identified. An additional 90 miles of streets and roads were found to be generally sufficient as shared use roadways with little or no improvement. See Appendix I for details.

The third task was to evaluate routes regarding relative ease of implementation and timing considerations to create a relative order of priority. The objective of this task was to identify routes that could become part of an “introductory” network to be created in the near term and guide plan implementation and funding decisions. During this task, preliminary routes were cross-referenced with roadways already slated for future improvements in the Capital Improvement Program (CIP).

While identification of an “Introductory” network relied heavily on these logistical considerations, the goal of creating a comprehensive and continuous network for the city was tantamount. It was important that the “Introductory” Network, serve popular destinations, be city-wide in scope, not have significant gaps, not miss key opportunities, serve a variety of bicycling styles and skill levels, and include on-street improvements, not just signed shared roadway. For this reason, the implementation plan includes a mix of simple and complex projects through all stages.

Criteria provided by City transportation staff was used to evaluate routes in terms of project complexity and feasibility of implementation in the near term.

Early Actions

To demonstrate the City’s commitment to bicycling, during the course of this planning process, City staff initiated planning on one new bicycle project, the Collegetown Bike Route, and implemented a second, the Fort McHenry bike route. Three other bicycle projects were reviewed for compatibility with the plan and to consider improvements to facility design:

- Inner Harbor Trail section
- Roland Avenue Bike Lane Plans
- Jones Falls Trail-Clipper Mill section

Moreover, it was important to consider integration of bicycle accommodations into road and bridge improvement projects that were already underway. Three projects that were in design or construction during the planning process were reviewed and modified to address integration of bicycle accommodations into the facilities being improved:

- Edmonson Avenue Bridge over Gwynns Falls
- Harford Avenue Bridge over Herring Run
- Potee Bridge and approach roads

⁹ The factors were not formally weighted. The final proposed network represents a mix of streets that were selected for a variety of different reasons. For a detailed list of criteria, see Section III.

Special Studies

Also as a part of the master plan process, five special studies were undertaken to provide a more detailed look at some of the more complicated projects the City may need to implement in the near term. These included:

- Hopkins & Charles Plaza Connection
- Water and Redwood Streets Cross-town Route
- Veterans Memorial Bridge Accommodations (Hanover St.)
- Jones Falls Trail/Inner Harbor East Trail Connection.
- Charles Street

SECTION IV. THE BICYCLE NETWORK

The Bicycle Network proposed by this plan is a 450-mile system of on-street and off-street bicycle facilities and routes.

Because the planned trail network is well established, this plan focuses primarily on the on-street system (including multi-use trails and key sidewalks and promenades selected for network connectivity). The *on-street* Bicycle Network is comprised of striped bicycle lanes and other on-street facilities, signed bicycle routes, intersection improvements, and small off-street connections. For implementation purposes, the on-street bicycle facilities and routes are organized into three groups, or phases: 1) The Introductory Network, 2) Medium Term Network Additions, and 3) projects with Variable Timing & Long Term Priorities. Map A (see page x) shows the Introductory Network. Map B, available only in poster size, shows the entire Network, all three phases.¹⁰

This section of the plan establishes the Network objectives, discusses its policy implications, and describes the criteria used to select Network routes and the criteria used to prioritize these routes for implementation. It also describes the various types of facilities and improvements needed to implement the Network and provides a pictorial glossary of select bicycle facility types.

Key to Plan Maps

Map A Introductory Bicycle Network (format: 8.5 x 11 & poster)

- Tier 1 & 2 On-Street Facilities and Routes
- Related Intersection Improvements
- Related Off-Street Connectors
- Primary Trails

Map B Full Network (format: poster only)

- Tiers 1-5 On-Street Facilities and Routes
- Connections to Surrounding Jurisdictions
- All Intersection Improvements
- All Off-Street Connectors
- Existing, Planned and Proposed Trails

Map C Facility Types (format: poster only)

- XX On-Street Facility Types
- Related Off-Street Connectors
- Existing, Planned and Proposed Trails

There are other, more advanced, facility types being used across the country and in Europe that this plan does not recommend in the near term but which should be considered over time (for a list, see Appendix J).

ON-STREET NETWORK: STREET AND ROUTE SELECTION

Network Objectives

The overarching objectives of the Network include the following:

- a. Achieve thorough geographic coverage of the City;
- b. Avoid, if possible, the most heavily traveled and high speed arterials;
- c. Provide the best possible safety in traffic;
- d. Where possible overcome barriers and street discontinuities; and

¹⁰ Due to the amount of detail in the complete Bicycle Network Map B could not be included in this document format (8.5 x 11). This poster-sized map can be viewed at the Baltimore City Planning Office.

- e. Ensure that routes meet bicyclist's expectations for continuity, directness, convenience, and linkage with other routes.

Route Selection Criteria

Each of the routes in the network were selected for a reason or set of reasons, based upon what benefits the route provides in terms of bicycle access and transportation, or the degree of difficulty that may be encountered when pursuing improvements to the route. A list of these criteria follows:

- Contribution to providing bicycle access to important destinations, such as commercial districts, shopping areas, employment centers, transit stations, parks, trails, cultural institutions, schools, libraries, etc.
- Relatively low traffic volumes and speeds, generally comfortable for bicycling without major improvements;
- Existing street (or ROW) width sufficient for making improvements;
- Relative ease with which a bicycle improvement (lane, striping, signing, curb ramp, short connecting path) could be implemented;
- Opportunity for improvement exists because of already scheduled capital improvement project;
- Complements off-road trails to create a unified bicycle travel corridor;
- Topography;
- Advantages the route offers in circumventing barriers such as water, major highways, inaccessible bridges, railroads, large institutions, forests, or steep topography, etc.
- Connectivity provided to highly isolated neighborhoods;
- Connectivity provided to communities and destinations outside the city;
- Recommended by the bicycling public, or city staff;
- Use of the route by transit buses, trucks and heavy vehicles;

Transportation Policy for Bicycle Network Streets

Designating particular streets to be a part of the Bicycle Network is important for the following policy reasons:

1. **Preservation:** To ensure that conditions that make the street comfortable, safe and attractive for bicycling are preserved in the routine activities of street maintenance and improvement.
2. **Identify Opportunities:** To indicate which streets have significant opportunities to be improved for bicycling and ensure that when the opportunities arise, they are not missed.
3. **Identify Challenges:** To indicate which streets are particularly difficult for bicycling, but are needed in the Bicycle Network nonetheless, to provide a comprehensive and continuous system that serves all bicycle transportation needs. To improve these routes special study and design may be necessary to make them suitable for bicycling.

- Presence of unconventional, difficult-to-navigate, or difficult-to-modify intersections along the route;
- Presence of a viable, or better, alternative route that could serve the same destinations and neighborhoods.

Route Implementation Priorities

As described above, the on-street routes and connectors are organized into three groups and five priority Tiers. The primary purpose of prioritizing is to identify the routes that will make up the Introductory Network, to be created in the near term. However, all routes have been assigned a Tier to guide overall plan implementation and funding decisions.

The following criteria were used to set priorities:

- 1) Relative ease of implementation,
- 2) Service to popular destinations,
- 3) Contribution to city-wide coverage,
- 4) Avoiding significant gaps,
- 5) Potential to include significant on-street improvements, not just a signed, shared roadway.
- 6) Not passing up opportunities that may not be available in the future, and
- 7) Serving a variety of bicycling styles and skill levels.

While ease of implementation played a large role in determining what routes would be selected for Tier 1 and 2, in some cases, projects of medium complexity were included in Tier 1 or 2, and some simple routes were slated for later implementation. Thus, each of the Tiers 1-4 includes a mix of “easy” and “more complex” projects.

Implementation Phases and Tiers

Introductory Network

1. Tier One - Top priority routes recommended for implementation in the near term.
2. Tier Two - Second priority routes recommended for implementation in the near term.

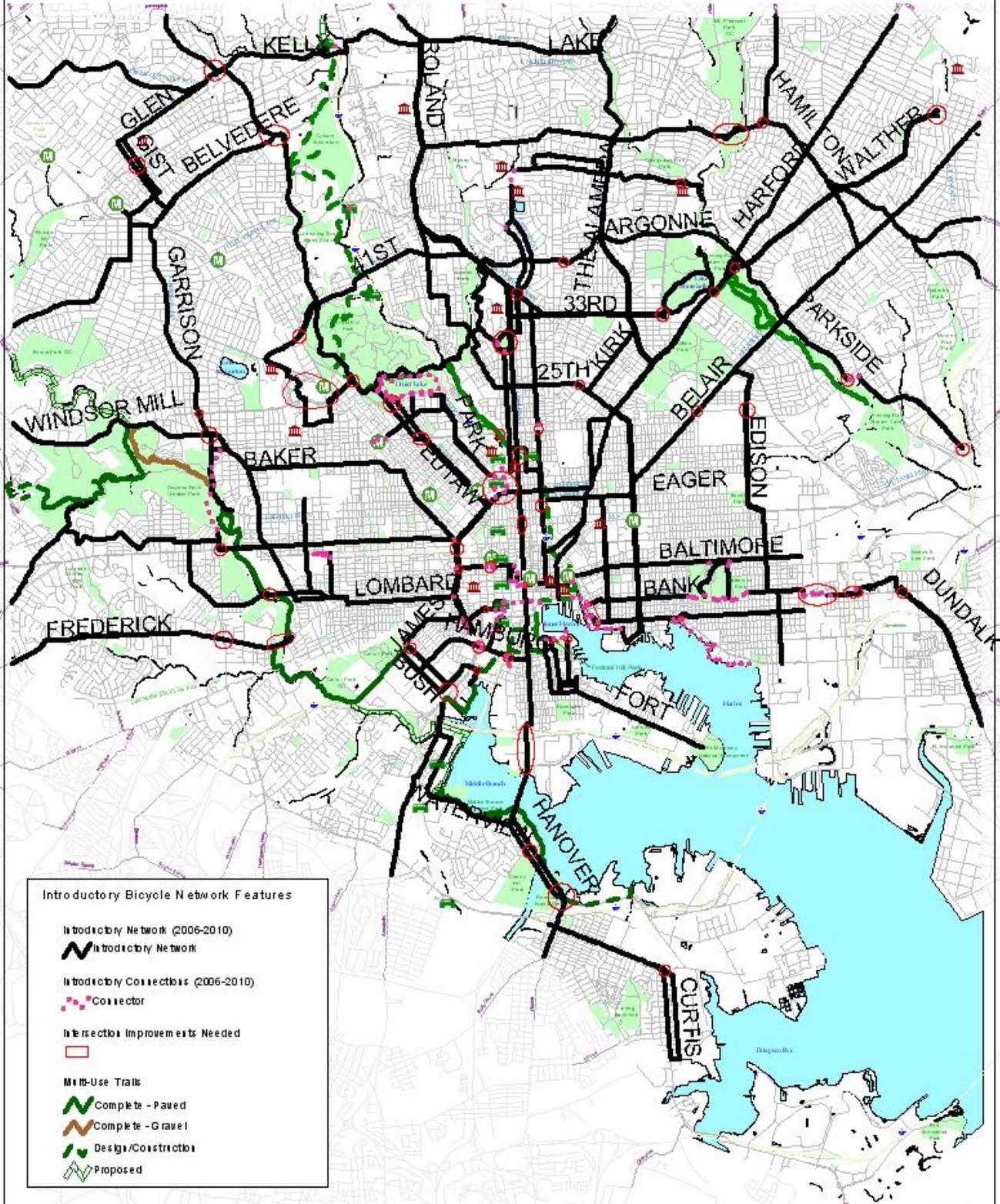
Medium Term Network Additions

3. Tier Three - Third priority routes recommended for implementation in conjunction with other planned roadway improvements.
4. Tier Four - Fourth priority routes recommended for implementation in conjunction with other planned roadway improvements

Projects with Variable Timing & Long Term Priorities

5. Tier Five - Most difficult projects to implement but sometimes provide routes key for a continuous and comprehensive network. Routes are recommended for further study to determine feasibility and implementation as overlap with other planned roadway projects occurs. Project timing will be determined by overall roadway improvement needs and CIP scheduling. Most opportunities are likely to occur in 10-20 year timeframe, 2015-2025.

Map A: Introductory Network Baltimore City Bicycle Master Plan



Introductory Bicycle Network Features

- Introductory Network (2006-2010)
Introductory Network
- Introductory Connectors (2006-2010)
Connector
- Intersection Improvements Needed
Intersection
- Multi-Use Trails
 - Complete - Paved
 - Complete - Gravel
 - Design/Construction
 - Proposed

ON-STREET NETWORK: FACILITY TYPES

To facilitate a safe Network across a wide range of street and road types in the City, a variety of bicycle facilities and accommodations will need to be employed. On-street bicycle facilities will include bicycle lanes, shared use pavement markings, wide outside lanes, striped shoulders, signed routes, bicycle safety regulatory and warning signs and a variety of other improvements designed to improve safety and accommodate bicyclists in traffic.¹¹

To illustrate these facilities, a Pictorial Glossary, is provided, see page x. Other facilities are described in The Bicycle Design Toolkit, produced in conjunction with this plan. Some of the accommodations described in the Toolkit including the following:

- Shared bus/bicycle lanes,
- Approaches for striping streets with peak hour restricted parking,
- Contra-flow bike facilities,
- “Dooring” prevention warning signs,
- Motorist educational signs for new facility types, and
- Various “share the road” signs.

Replacement of bicycle-unsafe storm water drainage grates and pavement quality are important on-street safety concerns. Details describing bicycle-safe designs are provided in the Toolkit along with guidance describing a recommended approach for the City.

¹¹ Signing of a bicycle route will depend on the route’s need for special wayfinding information. In some cases, on-street bicycle lanes or other markings may be provided on a street that is not a part of a signed route.

PICTORIAL GLOSSARY OF COMMON BICYCLE FACILITIES

Different types of facilities will be needed to provide safe and comfortable accommodation for bicycles in the Baltimore City bicycle network. Following, is a short list of common bicycle facility types. Specific design guidelines for these and other bicycle facilities are provided in a variety of documents published by AASHTO, SHA, various states and cities and in a *Toolkit* developed as a part of this Plan (see bibliography in Appendix F).

Bike Lane

A bike lane is a portion of the roadway that has been designated by striping, signing and pavement markings for the preferential or exclusive use of bicyclists. Bike lanes are always located on both sides of the road (except one way streets), and carry bicyclists in the same direction as adjacent motor vehicle traffic. The minimum width for a bicycle lane is 5 feet.

Shared Roadway Pavement Marking “Sharrow”

Motor vehicle/bicycle sharing of the travel space can be emphasized by using special shared roadway pavement markings or “Sharrows.” Sharrows can be helpful on multi-lane streets where there is insufficient space to add bicycle lanes and traffic volumes and/or motor vehicle speeds are at medium levels. In some cases they may be used on two-lane roadways as well. The Sharrow marking also assists with wayfinding and can be used in conjunction with signs to delineate specific bicycle routes.

Shared Roadway

Shared roadways are streets and roads where bicyclists can be served by sharing the travel lanes with motor vehicles. Usually, these are streets with low traffic volumes and/or low motor vehicle speeds, which do not need special bicycle accommodations in order to be bicycle-friendly. Shared roadways can also include streets with wide outside lanes (13 to 14 feet). Increasing the outside lane width increases comfort for bicyclists but can also encourage increased vehicular speeds.

Signed Route

A signed route is a continuous set of streets and roads that have been signed to assist bicyclists with wayfinding and/or direct them to particular streets, which generally have better conditions for bicycling. Signed Bike Routes will include signage that provides the bicyclist with frequent distance and destination information. This type of facility may also include bike lanes, *Sharrow* pavement symbols and other bicycle related traffic signs to improve the safety of bicycle operations on the route.

GLOSSARY OF COMMON BICYCLE FACILITIES (CONTINUED)

Shared-Use Pathway (Multi-Use Trail)

Shared-use pathways provide a high quality walking and bicycling experience in an environment that provides separation from traffic. Shared-use paths should be a minimum of ten-feet wide and paved. Their width may be reduced to eight feet if there are physical or right-of-way constraints. These types of paths can be constructed within a roadway corridor, in their own corridor (such as a greenway trail or rail-trail), or be a combination of both. On high speed boulevards, there may be a need for shared-use paths in addition to bike lanes. Shared-use paths should not be used to preclude on-road bicycling but rather to supplement a system of on-road bicycle facilities for less experienced cyclists.

Bike-Friendly Traffic Calming

Slowing motor vehicle speeds and limiting motor vehicle access helps improve the on-street bicycling environment. Entry restrictions and narrowing of street widths, while maintaining bicycle access are ways that neighborhood and collector streets can be improved to calm and reduce auto traffic. Bike lanes and shoulders can also calm traffic when outside edge-lines are used to narrow the motor vehicle lanes.

Lane Reduction (Road Diet)

A road diet is the conversion of a four-lane roadway into a two-lane road with bicycle lanes. The new street configuration includes a center turn lane to accommodate left-turn movements without holding up through traffic. Baltimore will have a few key opportunities where there is excess lane capacity that can be recycled. A regular travel lane can also be converted to bike lane on one-way streets that are multi-lane, low volume streets. The extra space can be used for a greater buffer between curbside parking and the travelways; a center turn lane is not required. In other cities, Road Diets have actually improved through traffic flow and safety, in addition to providing bicycle accommodations.

Bike Box at Intersection

Bike boxes are installed to allow bicyclists to move in front of cars waiting at an intersection to increase their visibility and reduce conflicts with turning vehicles. They are typically used at intersections where cyclists need to turn left and/or many vehicles turn right. During a red signal phase, bicyclists are able to better position themselves for a left turn by moving left across the bike box.

Signed Bicycle Routes

In conjunction with this plan, the City proposes to adopt a Bicycle Route Signing Protocol, which establishes a design framework for providing special wayfinding guidance for bicyclists. Providing the Signed Routes are intended to make the following contribution to the overall Network:

- 1) Provide a set of spine routes that provide directional guidance, destination and distance information that is easy to follow for all users, including novice bicyclists, new bicycle commuters, new city residents, tourists, and experienced Baltimore bicyclists.
- 2) Provide routes that touch every part of the city and serve the most important destinations needing bicycle access and wayfinding guidance.
- 3) Contribute to the physical and visual presence of bicycle facilities on the City street and roadway system, which alerts motorists and all other users of the transportation system that bicyclists have “a right to the road,” and are to be expected along these and other routes throughout the City.
- 4) Provide a discrete, yet citywide feature of the bicycling infrastructure that can be referenced by cyclists and city officials as a part of bicycling promotion efforts.

Intersection Improvements

Intersections present a particular challenge for bicyclists. Baltimore has some complex intersections that are part of the on-street Network because they cannot be avoided, or creation of a detour would require a major inconvenience for bicyclists, who would be unlikely to use it.

Many of these intersections will require special design considerations. Their unique nature suggests that a wide variety of solutions may be employed, such as the following:

- Bicycle signal heads
- Advance Bicycle Boxes
- Bicycle detection technology to actuate traffic signals
- Adjustment of signal phases and timing
- Special striping patterns
- New curb ramps and crosswalk striping
- Curb extensions
- Changes in one-way street patterns
- Providing for contra-flow bicycle movements
- Providing curb separated travel space on existing or expanded sidewalks
- Signs communicating safety precautions, operational directives and wayfinding

Intersections are circled in red on the draft introductory and full network maps. Appendix A provides a list of these intersections arranged in priority order consistent with the priority of the route within which it is located.

Off-Street Connectors

Off-street connectors are addressed in the *On-Street Network* section because these linkages are primarily necessary for making the on-street system safe, continuous and convenient.

Off-street linkages, include improvements such as short segments of path or sidewalk, curb ramps, street crossing improvements, railroad crossings, stairway retrofits, mid-block crossings, access to park roads, access across public parking lots, sidewalk designations, underpass rehabilitation, and in some cases new bridge structures to cross streams, railroad tracks or large highways.

The connectors identified in the plan were selected because they are necessary for continuity of Network routes, provide bicycle access to transit stations, provide links to/from isolated neighborhoods, connect the Network to key destinations, and/or allow passage across major barriers.

Generally, these improvements are relatively small in nature, and inexpensive. Sometimes they will require simple execution of permits, a couple of signs and special striping. The more costly items include new bridges or major rehabilitation of aging underpass and overpass infrastructure originally designed with only pedestrians in mind.

The existing and proposed connectors are shown on the introductory and full network maps. Appendix B provides a list by name or location detailing facility type, status (existing/proposed), Priority Tier designation, and type of action needed.

Bicycle Parking

The Bicycle Design Toolkit provides standards for acceptable bicycle parking equipment. It addresses a range of parking types, short term, medium term and long term, and where these types are typically needed according to typical land use categories. It also provides on-street siting and installation guidance.

Off-Street Network

The on-street network is complemented by off street facilities including shared use paths (multi-use trails), and bicycle use of select sidewalks and portions of the inner harbor promenade.

Multi-Use Trails

Trails play a key role in the bicycle transportation system, while doubly serving as recreation facilities. Baltimore's network of stream valley and shoreline trails serve as key routes in the spine system and will allow novice cyclists a less harrowing introduction to bicycle commuting. Following are some keys to ensuring that the trails will serve transportation uses:

- Frequent, bicycle accessible, and well signed access points connecting to surrounding neighborhoods and crossing streets. The main trails as well, should be well signed with distance and destination information.
- Bicycle lanes or *Sharrows* on roadway sections that connect off-road trail segments, or extend trails to highly used destinations.
- Expansion of the trails system to eliminate gaps, surmount barriers and extend its reach. Phasing should be based on when and where opportunities arise or need is demonstrated, especially related to potential rail-trail conversions.

- Sufficient width (10-15 feet) to ensure safety for both bicyclists and other trail users.

Sidewalks, Sidepaths and Promenades

Generally sidewalks, sidepaths and heavily used pedestrian promenades are not recommended for inclusion in bicycle transportation networks. In fact, throughout Baltimore, a city ordinance makes bicycling on city sidewalks illegal; however, it is very lightly enforced.

Due to limited opportunities and other considerations, in a number of locations this Plan recommends considering use of these facilities for bicycling. Special attention will be required in the design process to ensure user safety.

Sidewalks: Sidewalks may be useful for bicycling for a number of reasons:

- Bicycle access is needed but bicycle volumes and/or pedestrian volumes are expected to be low.
- Right-of-way or traffic safety (high speeds, high volumes, lots of trucks) issues suggest that sidewalk use may be the only option or even preferred.
- They can be designed to accommodate separated, one-way bicycling on each side of the road so that bicyclists can safely and easily transition to and from the road at each end of the segment. Sidewalk bike routes should not result in cyclists riding opposed to motor vehicle traffic when they re-enter the street.

Martin Luther King Blvd. is the primary roadway where sidewalk bicycling should be accommodated, as there is no other direct alternative to use of this corridor.

Sidepaths: Sidepaths are essentially trails that are located on the side of a roadway, where a sidewalk normally would be. However sidepaths are often located only on one side of a road and are intended to provide two-way bicycle and pedestrian travel. While this type of facility is not ideal, sometimes it is the only option or even the safest option, for similar reasons as noted above. Sidepaths can function well if some of the following key design features can be achieved:

- The roadway is an expressway, or limited access in nature and the path can be located in an area where there are no, or only a few conflicts with crossing roadways, which may be signalized.
- Crossings of free flow ramps can be avoided, minimized or made sufficiently safe.
- Sufficient width is available to build a facility with a buffer from traffic and path surface wide enough to safely serve the expected volume of bicycle and pedestrian traffic.

A sidepath may be the best facility along Frankfurst, and Hanover streets in south Baltimore, and Hilton Parkway across the Gwynns Falls valley, and in a few other locations.

Promenades: The Inner Harbor promenade is a special place for outdoor recreation and strolling. Currently bicyclists are only allowed before 10 am. Outer sections of the promenade on the north side of the harbor, and future outer sections on the south side could be opened to bicycling at all hours, but should be regulated to keep speeds reduced and provide pedestrians the right-of-way. This additional access will serve users who seek an alternative to streets like Boston and Key Highway, or who are traveling

to/from waterfront destinations, which include residences, yachts, restaurants, and places of employment.

The Executive Summary provided a brief description of the core goals and objectives established by the Plan. Section V, which follows, provides an expanded discussion of the goals and objectives, including specific action recommendations and identification of measurable outcomes.

SECTION V. GOALS, OBJECTIVES, RECOMMENDED ACTIONS AND PERFORMANCE MEASURES

Goal 1: Develop a comprehensive network of facilities for bicycles.

Objective 1: Make bicycling safe and inviting on the streets of Baltimore.

Recommendation 1: Implement proposed bicycle route network.

- Install recommended bicycle facilities as outlined in Map C, the Preliminary Facilities map.
- Retrofit unsafe storm water inlet grates and address difficult intersections as routes are implemented
- Ensure continuity and sufficient access through downtown, to transit stations and across bridges
- Create a wayfinding system with the proposed signage protocol, to ensure navigability

Measurable Outcome: Install the Introductory Network (Figure 4) by 2010, using Motor Vehicle Revenue (MVR), federal TEA funds, and other fiscal means. Install Full Network through road projects.

Recommendation 2: Improve continuity of on-street network by overcoming negative impact of existing barriers (see Map B and Appendices A and B for lists of intersections and connector paths).

- Allocate MVR funds annually to design safety improvements at complex intersections and construct off-road paths.
- Address barriers created by freeways, railroad lines, industry, large developments, street discontinuity, stream valleys, and one-way streets.

Measurable Outcome: Identify barriers and address at the same time as design of connecting bicycle routes.

Recommendation 3: Consider the adopted bicycle route network in prioritizing street resurfacing, reconstruction, and streetscape projects (see maps B and C).

Measurable Outcome: Implemented street improvements that overlap the Bicycle Route Network and include bicycle accommodations in design.

Recommendation 4: Coordinate planning, design, and implementation of bicycle facilities with other city plans (see maps B and C).

- Consider bicycle master plan and bicycle facility planning in all roadway reconstruction projects, SNAP plans and other planning endeavors.

Measurable Outcome: Bicycle accommodations will be included in all city plan documents and discussions.

Recommendation 5: Coordinate planning, design, and implementation of bicycle improvements near the City line with Baltimore County, Anne Arundel County and the Baltimore Metropolitan Council (see Map B).

Measurable Outcome: A regionally continuous bicycle network.

Goal 1: Develop a comprehensive network of facilities for bicycles.

Objective 2: Increase the availability of bicycle parking and support facilities at destinations across the city.

Recommendation 1: Launch a bicycle parking initiative.

- Install racks at existing destinations, in city retail districts, at all public schools and libraries, and elsewhere along bicycle routes.
- Provide installation by request at existing locations open to the general public
- Advise employers in providing bicycle parking
- Adopt policy requiring city government offices to provide bicycle parking

Measurable Outcomes: Install 100 racks per year.

Recommendation 2: Require new development to provide bicycle parking.

- Include bicycle parking requirements in Comprehensive Rezoning initiative based on motorized vehicle parking standards
- Enforce bike parking initiative through Site Plan Review Committee and the Development Guidebook

Measurable Outcome: All new development with motorized vehicle parking requirements includes bicycle parking, starting summer 2006.

Recommendation 3: Improve bicycle parking at transit stations in support of a multi-modal transit system (for list of existing facilities and preliminary needs assessment, see Appendix C).

- Evaluate needs and existing equipment at subway, light rail, MARC, train, and bus transfer stations

Measurable Outcome: All transit stations have adequate bicycle parking by 2009.

Recommendation 4: Develop bicycle commuting/rental centers (*Bikestations*¹²) to provide focal points for bicycle transportation services and promotion.

- Establish Bicycle Stations at: college campuses, high density neighborhoods, major employment centers, major tourist destinations, and transit hubs
- Develop threshold and standards for commuting centers at government offices

Measurable Outcome: Create 3 commuting/rental centers by 2012.

¹² Bikestation is a Registered Trade Mark of the Puget Sound Regional Council.

Goal 1: Develop a comprehensive network of facilities for bicycles.

Objective 3: Fully integrate bicycling with all public transit facilities and services.

Recommendation 1: Work with the Maryland Transit Administration (MTA) to accommodate bicycles on all public transit in support of a multi-modal transit system.

- Address bus yard space issues and rack acquisition to allow all busses to be equipped with bicycle racks
- Create space for bicycles on MARC trains
- Encourage MTA to host weekend regional bicycle tour promotions

Measurable Outcome: Bike racks on all city buses and all types of bicycles permitted on MARC trains by 2008.

Recommendation 2: Explore the potential for bicycle accommodations on the water taxi.

Measurable Outcome: Determine issues and address for allowing bicycles on water taxi.

Goal 1: Develop a comprehensive network of facilities for bicycles.

Objective 4: Develop off-road paths to create a connected trail system.

Recommendation 1: Complete ongoing trail development.

Measurable Outcome: Complete Jones Falls Trail by 2010. Complete plans for Herring Run and Western Run Greenway by 2008.

Recommendation 2: Develop new and extend existing trails (for a list of potential trails and extensions, see Appendix D and Map B).

Measurable Outcome: Identify all possible trails by 2008. Keep at least one trail segment in design and construction each year.

Recommendation 3: Improve access to trails.

- Install wayfinding signs from neighborhoods and nearby attractions to trails
- Create solutions to existing physical barriers between neighborhoods and trails

Measurable Outcome: All neighborhoods adjacent to trails will have identified access routes to these trails (for these proposed routes, see Map B).

Goal 2: Implement safety, education and encouragement programs to increase bicycle usage.

Objective 1: Improve enforcement of traffic laws related to bicycling.

Recommendation 1: Develop partnership with the Baltimore City Traffic Safety Coalition, Department of Transportation Safety Division, Baltimore City Police Department, and the Mayor's Bicycle Advisory Committee to identify and address bicycle-vehicle safety measures through enforcement and new or amended laws.

Measurable Outcome: Convene committee and implement recommendations by 2008.

Recommendation 2: Provide training for Baltimore police officers regarding bicycle safety laws and issues faced by on-street bicyclists.

- Assess existing bicycle training for police officers and address gaps
- Ensure understanding of bicycles as vehicles, how to determine fault in and document crashes, and bicycle-motorized vehicle interaction
- Increase number of police on bicycle mounted patrol

Measurable Outcome: Police Academy curriculum and ongoing training will include bicycle law and safety information by 2007.

Recommendation 3: Identify the most common conflicting movements between bicycle and vehicle users and determine enforcement mechanisms to mitigate these conflicts.

- Develop counter measures program including training for officers, public service announcements, engineering, etc.

Measurable Outcome: Counter measures program developed and implemented by 2009.

Recommendation 4: Develop an amendment for the law restricting bicycle riding on sidewalks and the park rule restricting bicycle riding on park paths.

- Convene agency stakeholder group to define legislative recommendations (e.g. 7 mph speed limit on sidewalks, yield to pedestrians, downtown no-sidewalk-riding zone, etc.)

Measurable Outcome: City parks rule adjustment proposed in 2008. Legislation for sidewalks introduced in 2009.

Goal 2: Implement safety, education and encouragement programs to increase bicycle usage.

Objective 2: Educate the public (motorists, bicyclist, and pedestrians) about bicycle and vehicle operation in urban traffic conditions.

Recommendation 1: Educate motorists and bicyclists about mutual rights and responsibilities (suggested programs listed in Appendix E).

- Create information campaigns to clarify the right and requirement of bicyclists to operate in the street like a motor vehicle.
- Encourage motorists and bicyclists to exhibit respect and to share the road equitably.
- Ensure campaigns are presented in English, Spanish, and other pertinent languages.
- Create safe cycling informational brochure for distribution

Measurable Outcome: Launch at least 2 distinct public information campaigns by 2008.

Recommendation 2: Educate future motorists, bicyclists and pedestrians about safe travel behavior and vehicle operation.

- Support and expand existing safety education programs (Department of Transportation's Safety City, Traffic Safety Coalition, Washington Area Bicyclist Association's safety trailer).
- Encourage greater participation by teachers of students grades 3-5 (bicycle riding age).
- Distribute bicycle helmets, coordinate youth bike rides, and develop age specific brochures to youth education.

Measurable Outcome: Create brochures and public service announcements. Set specific safety agenda for implementation.

Recommendation 3: Create and implement Safe Routes to School program.

- Partner with Baltimore City Public School System to increase bicycle safety through sidewalk and street crossing improvements, teaching safe bicycling, and promoting healthier lifestyles.
- Target elementary schools first and then extend to middle and high schools
- Use new Federal Transportation funds dedicated for Safe Routes to School to fund a program in Baltimore.

Measurable Outcome: Physical improvements and school-targeted safety, education and encouragement programs by 2007.

Goal 2: Implement safety, education and encouragement programs to increase bicycle usage.

Objective 3: Encourage increased bicycling by promoting health, recreation, transportation, and tourist opportunities.

Recommendation 1: Establish partnerships with health organizations to promote bicycling as healthy transportation.

- Address organization and city health goals through joint research, funding requests, and safety and health promotion campaigns.

Measurable Outcome: With health partner, launch 1-2 efforts to promote bicycling and safety.

Recommendation 2: Promote bicycling for commuting, errands, socializing, and exercising (for potential programs, see Appendix E)

- Create a program and target higher education, city government and other employers to encourage bicycle commuting to work or school
- Support recreational bicycle rides
- Use innovative means to encourage bicycling for errands and socializing (e.g. admission to the Bicycle Movies Series at the Creative Alliance is discounted if you ride to the performance).

Measurable Outcome: Work with One Less Car to support and expand their employer encouragement program by 2009.

Recommendation 3: Develop and market a City of Baltimore Bicycle Map

Measurable Outcome: Develop Bicycle Map for the internet and seek funding for making print copies available by 2009.

Recommendation 4: Partner with Baltimore Area Convention and Visitors Association (BACVA) and the Baltimore Office of Promotion and the Arts to promote bicycle opportunities.

- Promote bicycle trails, events, and rental locations via brochures, staff recommendation at visitors center, and on websites.
- Develop a bicycle rental station at the Inner Harbor (possibly at visitors center)
- Encourage hotels to house and distribute bicycle related information

Measurable Outcome: Create bike rental station with BACVA by 2008. Develop bicycle information fliers and distribute through BACVA by 2008.

Recommendation 5: Begin a bicycle data collection program.

- Analyze police crash data to find problems to address with the safety programs.
- Determine basic data points to assist in prioritizing bicycle projects and creating baseline for identifying trends.

Measurable Outcome: Identify pertinent data points to bicycle safety and facility use. Collect and use to prioritize program and facility implementation.

Goal 3: Institute policies that support implementation of Bike Master Plan goals and objectives with community support and input.

Objective 1: Create structure to implement the Bike Plan goals and objectives.

Recommendation 1: Create a Bicycle Coordinator position in the Department of Transportation to implement the Bike Master Plan.

- Responsibilities of this position would include, but not be limited to:
 - Reviewing street projects for bicycle facilities and network compatibility
 - Reviewing development projects for bicycle parking and access;
 - Coordinating safety, education and encouragement programs;
 - Staffing Mayor's Bicycle Advisory Committee;
 - Developing, with other agency input, city policy and procedure amendments to support Bike Master Plan goals and objectives;
 - Coordinating 311 spot improvement program; and
 - Managing the implementation of the Bicycle Master Plan and Route Network
- Position could be funded by the Maryland Comprehensive Traffic Safety Program and/or Safe Routes to School

Measurable Outcome: Staff positions, locations, and individuals identified and in place by 2007.

Recommendation 2: Support Mayor's Bicycle Advisory Committee (MBAC).

- Shift city staffing from Department of Planning to Department of Transportation.
- Diversify membership
- Update mission statement

Measurable Outcome: In 2006, develop list of desired types of members and launch targeted membership drives. The MBAC shall provide an annual report on progress.

Recommendation 3: Review and update the Bicycle Master Plan every six years.

- Annually identify goals met and broadcast within city government, to the bicycling community and media.

Measurable Outcome: Regular updates will go to public and government. Formal review of the Bicycle Master Plan will be financially programmed in to FY 2011.

Goal 3: Institute policies that support implementation of Bike Master Plan goals and objectives with community support and input.

Objective 2: Institute new policies and procedures in the Departments of Transportation and Planning to support Bike Master Plan goals.

Recommendation 1: Utilize the following resources to guide bicycle facility design and application in the Department of Transportation and other agencies: 1) Map C—Preliminary Facility Types, 2) the Bicycle Facility Design Toolkit, 3) nationally recognized and accepted bicycle facility design guides (see Appendix F), and 4) Section III of this plan.

- Update roadway design policies and specifications with information provided in these documents
- Review and adjust scope, design, and cost estimating specifications of roadway resurfacing, reconstruction, and streetscaping projects to incorporate bicycle facility accommodation
- Assure all consultant teams hired have sufficient capacity to design bicycle facilities

Measurable Outcome: New road projects include bicycle facilities as per information in the identified documents.

Recommendation 2: Provide sufficient funding through the Capital Improvement Program (CIP) for implementation of independent bicycle improvement projects identified in this plan.

- Establish Introductory Network by 2010 (including design, construction and installation).
- Complete special projects to ensure connectivity (for project lists, see Appendices A, B and D)

Measurable Outcome: Introductory network and connectivity solutions are completed by 2010 through CIP funding (fiscal years 2007-2009).

Recommendation 3: Build internal capacity to design and implement bicycle facilities by providing ongoing training for city staff.

Measurable Outcome: Through 2009, at least one training per year by a recognized bicycle facility design professional shall be conducted for city staff. After 2009, specific training needs will be determined and provided by bicycle coordinator.

Recommendation 4: Adopt policy requiring new development to mitigate traffic impact by providing bicycle facilities or contributing to a fund which is dedicated for bicycle facilities and improvements.

- Include bike facility development requirement in Development Guidebook and Site Plan Review Committee requirements list.

Measurable Outcome: Convene committee to determine bicycle facility expectations for Development Guidebook and Site Plan Review Committee and develop calculation for non-compliance fee.

Goal 3: Institute policies that support implementation of the Bike Master Plan goals and objectives with community support and input.

Objective 3: Update street and trail repair and maintenance practices to ensure bicyclists safety and comfort.

Recommendation 1: Develop procedures for maintaining public bicycle facilities.

- Include street and trail sweeping, trimming/clearing vegetation, replacement of bike lane stripes and symbols, inspection and repair of signs
- Train operation and maintenance crews and supervisors in identifying conditions of concern to bicyclists: small potholes, glass, pavement cracks, overgrown vegetation, improperly installed signs, crumbling curbs, and dangling wires
- Include bicycle facilities in street sweeping and snow removal strategy

Measurable Outcome: Develop maintenance guidelines with visuals and create small version for distribution to maintenance crews by 2008.

Recommendation 2: Establish bicycle related improvement request system through Baltimore 311 call center and website.

- Develop system, identify agency and department for addressing specific concerns and create new 311 forms
- Create category to designate callers as bicyclists

Measurable Outcome: Track storm grate inlet retrofit and other bicycle related maintenance requests through 311 by 2009.

Recommendation 3: Update specifications for routine and emergency street resurfacing and repair to ensure safe traveling routes and surfaces for bicyclists.

- Include bicycle traffic in Maintenance of Traffic plans for all trail and street repairs that interrupt a trail or on-street bicycle route
- Identify unsafe specifications and update per the design guides recommended herein
- Assure specifications for road repair prevent pavement break-up, heaving or cracking which create dangerous conditions for bicyclists

Measurable Outcome: Bicycle facilities are included and protected in ongoing repair projects.

SECTION VI. IMPLEMENTATION

The City of Baltimore began current efforts to improve bicycling conditions in 1995, with development of the Gwynns Falls Trail. This Plan points the way forward for development of an on-street Bicycle Network focused on accommodating bicycle travel throughout the City for both transportation and recreation. The mission set forth in this plan, is to *“promote and facilitate bicycling as a safe, convenient, and comfortable form of transportation and recreation.”*

In the previous section three basic goals are identified along with objectives and recommended actions:

- Goal 1: Develop a comprehensive network of facilities for bicycles.
- Goal 2: Implement safety, education and encouragement programs to increase bicycling.
- Goal 3: Institute policies that support implementation of Bike Master Plan goals and objectives with community support and input.

In the near term, 2006-2008, funding and implementation resources will be directed toward making the Introductory Network a reality (see Appendix K, for details). In addition to installing bicycle facilities on the street network, the City will begin program work in safety education and enforcement, and building city government capacity through training and policy changes.

First and foremost, these initial activities need to increase safety and promote bicycling as an accepted and respected mode of travel within Baltimore. As experience and momentum are gained, more bicyclists take to the streets, and more facilities are installed, approaches will be expanded and a wider range of activities will be embraced.

The goals call for a formal review of the Bicycle Master Plan by 2012. At this point, the City will have made physical accommodations and real progress in adjusting City policy and citizen perspectives on bicycling in Baltimore. The formal review will allow the City to determine what new tactics and accommodations are appropriate, based on the achievements facilitated by this Bicycle Master Plan.

APPENDICES

Appendix A – List of Intersections

Appendix B – List of Connector Paths

Appendix C – List of Transit Stations: Existing Facilities and Preliminary Needs Assessment.

Appendix D – List of Potential Trails

Appendix E – List of Safety, Education, and Encouragement Program Ideas

Appendix F – Bibliography of Bicycle Facility Design Guidelines

Appendix G – Complete Survey Results

Appendix H – Example Survey Form

Appendix I – Estimated Mileage of Select Bicycle Facility Types

Appendix J – Advanced Bicycle Accommodations for Consideration in the Future

Appendix K – Capital Budget Request for Introductory Network Installation

Appendix L – Collegetown Bicycle Network Map

APPENDIX A – Intersections Where Bicycle Safety Improvements are Needed

The intersections of the following streets in the Introductory Network are locations in need of special consideration and treatments to provide greater safety to bicyclists.

Street 1	Street 2	Street 3	Street 4
Greenspring Ave	Cross Country Blvd		
Greenspring Ave	Belvedere	Northern Pkwy	
Woodbourne	Belvedere	Perring Pkwy	
McClellan	Hamilton		
Walther	Northern Parkway		
Old York Road	Argonne		
Walther	Harford		
33 rd	Perring	Curran	
St. Paul	University Parkway	Greenway	
Art Museum Drive	Charles Street	San Martin Drive	Maryland
Druid Park Lake Drive	Eutaw	Madison	
Perring	Pentwood		
Harford	Curran Drive		
Gwynns Falls Parkway	Swan Drive		
Mondawmin Mall	Liberty Heights Road	Gwynns Falls Parkway	Reisterstown Road
Druid Park Drive	Reisterstown Road	Park Heights Ave	
Garrison Blvd	Gwynns Falls Parkway		
Garrison	Windsor Mill Road		
Edmondson	Hilton Parkway		
Eutaw	North Ave		
Guilford	North Ave		
Guilford	Eager	Read	
25 th	Bonaparte		
Penn Station			
State Center			
Charles Street	Monument Street	Washington Monument	
Lexington	MLK Blvd		
Lexington	Eutaw	Paca	
Belair	Sinclair		
Edison	Sinclair		
Street 1	Street 2	Street 3	Street 4
Sinclair	Parkside Drive		

Moravia Park Drive	Pulaski Highway		
Eastern Ave	Dundalk		
Eastern Ave	Mason Lord Drive		
Eastern Ave Underpass			
President	Fleet	Aliceanna	
Redwood	Charles		
Washington	Camden		
MLK	Russell	Washington	
Russell	Hamburg		
Hamburg	Sharp		
Warner	Ostend		
Bayard	Bush	Ridgley	Russell
Bayard	Washington		
Frederick	Bridge over Gwynns Falls Trail		
Frederick	Hilton Parkway		
Baltimore	Ellicott		
Hanover	Wells	Cromwell	
Key Highway	Covington	Battery	
Boston	Aliceanna		
Potee	Hanover	Reedbird	
Potee	Hanover	Frankfurst	
Patapsco	Curtis	Pennington	
MLK Blvd	Mulberry	Franklin	
Waterview	Kloman		

APPENDIX B – PROPOSED CONNECTORS

<u>ID</u>	<u>Location/Name</u>	<u>Facility Type</u>	<u>Existing Facility (1)</u> <u>Needed Facility (0)</u>	<u>Tier</u>	<u>Action Needed</u>
11	Ashland St Connector	Path	1	0	None
23	Carrollton Overpass	Overpass	1	0	None
25	Chase St Connector	Path	1	0	None
63	Evesham Playlot Overpass	Overpass	1	0	None
171	Stricker St Overpass	Overpass	1	0	None
47	Druid Hill Pk Connector	Path	0	1	Construct
75	Hopkins Plaza Cut Thru	Ramp or Stair Retrofit	0	1	Construct
87	James St Connector	Path	0	1	Construct
89	Kenwood Connector	Path	0	1	Construct
93	Lakewood Connector	Ramp	0	1	Construct
94	Lakewood Connector	Path	0	1	Construct
101	Lexington Connector	Sidewalk & Xing	0	1	Construct
111	Hopkins Plaza Cut Thru	Ramps or Stair Retrofit	0	1	Construct
136	Park Coconnector	Bike Xings	0	1	Construct
140	Parkside Dr Connector	Path	0	1	Construct
142	Patterson Park Connector	Path	0	1	Construct
157	Pratt St Sidewalk Bike R	Sidewalk	0	1	Construct
165	St. Paul Connector	Sidewalk/Curb Ramp	0	1	Construct
182	Wayman Park Dr Connect	Xing, Curb ramp	0	1	Construct
190	Druid Hill Pk Connector	Path	0	1	Construct
195	Druid Hill Pk Connector	Path	0	1	Construct
197	W Balt Marc Stn	Median Sidewalk	0	1	Construct
207	Inner Harbor Promenade	Waterfront Promenade	0	1	Construct
10	Aliceanna Connector	Sidewalk	1	1	Designate
17	Camden Yd Connector	Path	1	1	Designate
18	Camden Yd Connector	Sidepath	1	1	Designate
19	Camden Yd Connector	Sidepath	1	1	Designate
34	Conway Connector	Sidewalk	1	1	Designate
55	Eastern Ave Connector	Path	1	1	Designate
59	Eutaw St Connector	Bike Access to Prom.	1	1	Designate
73	Hopkins Plaza Cut Thru	Sidewalk	1	1	Designate
74	Hopkins Plaza Cut Thru	Sidewalk	1	1	Designate
76	Pratt St Sidewalk Bike R	Sidewalk	1	1	Designate
82	Inner Harbor Connector	Promenade & Sidewalk	1	1	Designate
86	James St Connector	Sidewalk	1	1	Designate
112	MLK Connector	Sidewalk	1	1	Designate
113	MLK Connector	Sidewalk	1	1	Designate
114	MLK Connector	Sidewalk	1	1	Designate
115	MLK Connector	Sidewalk	1	1	Designate
125	North Ave Connector	Sidewalk	1	1	Designate
131	Notre Dame Connector	Parking Access Rd	1	1	Designate
138	Park St Connector	Sidewalk	1	1	Designate

158	Preston Connector	Crossing & Path	1	1	Designate
166	Stadium Connector	Sidewalk	1	1	Designate
167	Stadium Connector	Sidewalk	1	1	Designate
176	W Balt Marc Stn	Sidewalk	1	1	Designate
177	W Balt Marc Stn	Sidewalk	1	1	Designate
178	W Balt Marc Stn	Sidewalk	1	1	Designate
179	W Balt Marc Stn	Sidewalk	1	1	Designate
180	W Balt Marc Stn	Sidewalk	1	1	Designate
193	Eutaw Connector Camden Y	Bike Access to Prom.	1	1	Designate
194	Water St. Connector	Sidewalk	1	1	Designate
198	Inner Harbor Promenade	Waterfront Promenade	1	1	Designate
199	Inner Harbor Promenade	Waterfront Promenade	1	1	Designate
201	Inner Harbor Promenade	Waterfront Promenade	1	1	Designate
202	Inner Harbor Promenade	Waterfront Promenade	1	1	Designate
203	Inner Harbor Promenade	Waterfront Promenade	1	1	Designate
204	Inner Harbor Promenade	Waterfront Promenade	1	1	Designate
205	Inner Harbor Promenade	Waterfront Promenade	1	1	Designate
206	Inner Harbor Promenade	Waterfront Promenade	1	1	Designate
24	Cathedral Sidepath	Sidewalk	1	1	Improve
49	Druid Hill Pk Connector	Path	1	1	Improve
53	Eastern Ave Connector	Sidewalk & Underpass	1	1	Improve
54	Eastern Ave Connector	Sidewalk & Underpass	1	1	Improve
56	Eastern Ave. Connector	Sidewalk & Underpass	1	1	Improve
64	Fawn St Connector	Promenade & Median Xing	1	1	Improve
66	Guilford Connector	Path	1	1	Improve
77	Hylton Pkwy Sidepath	Sidepath	1	1	Improve
78	Hylton Pkwy Sidepath	Sidepath	1	1	Improve
96	Leadenhall Connector	Path	1	1	Improve
97	Leadenhall Connector	Path	1	1	Improve
100	Lexington Connector	Xing	1	1	Improve
102	Lexington Connector	Path & Xing	1	1	Improve
103	Lexington Connector	Sidewalk & Xing	1	1	Improve
104	Lexington Connector	Xing	1	1	Improve
105	Light Rail Connector	Sidewalk	1	1	Improve
106	Linden Connector	Crossing	1	1	Improve
107	Linden Connector	Crossing	1	1	Improve
117	Maryland Ave Connector	Sidewalk & Xing	1	1	Improve
124	Mt Washinton Connector	Sidewalk and Bridge	1	1	Improve
139	Park St Connector	Sidewalk	1	1	Improve
143	Patterson Park Connector	Path	1	1	Improve
144	Patterson Park Connector	Path	1	1	Improve
145	Patterson Park Connector	Path	1	1	Improve
146	Patterson Park Connector	Path	1	1	Improve
147	Patterson Park Connector	Path	1	1	Improve
12	Baltimore St Connector	Path	1	1	None
13	Baltimore St. Connector	Path	1	1	None
15	Bank St Connector	Park Road	1	1	None
16	Bank St. Connector	Sidewalk & Xing	1	1	None
33	Cold Spring LRT Access	Ramp	1	1	None
44	Druid Hill Park Path	Path	1	1	None

52	Druid Lake Ring Road	Closed Park Road	1	1	None
91	Lake Drive Trail	Path	1	1	None
92	Lake Drive Trail	Path	1	1	None
116	MLK Xing	At Grade Crossing	1	1	None
135	Paca St Connector	Sidewalk	1	1	None
149	Patterson Park Connector	Path	1	1	None
208	Inner Harbor Promenade	Waterfront Promenade	1	1	None
36	Druid Pk Lk Dr Ctr	Sidepath	0	2	Construct
85	Inner Harbor Promenade	Promenade	0	2	Construct
90	Key Hwy Connector	Path	0	2	Construct
137	Park St Connector	Path	0	2	Construct
26	Chesterfield Connector	Path	0	3	Construct
27	Chesterfield Connector	Path	0	3	Construct
29	Clover Lane Connector	Sidepath	0	3	Construct
31	Cold Spr Stn Connector	At Grade RR Xing	0	3	Construct
32	Cold Spring Connector	Sidepath, Bridge & Xing	0	3	Construct
39	Druid Hill Park Overpass	Overpass	0	3	Construct
40	Druid Hill Park Path	Path & Crossing	0	3	Construct
45	Druid Hill Park Path	Path	0	3	Construct
48	Druid Hill Pk Connector	Sidepath	0	3	Construct
50	Druid Hill Pk Connector	Sidepath	0	3	Construct
51	Druid Hill Xing	Crossing Imp.	0	3	Construct
57	Erdman Xing	Path	0	3	Construct
58	Erdman Xing	Path	0	3	Construct
60	Evesham Connector	Path	0	3	Construct
61	Evesham Connector	Path	0	3	Construct
62	Evesham Connector	Path	0	3	Construct
65	Federal Hill Pk Ctr	Path	0	3	Construct
69	Herring Run Connector	Bridge & Path	0	3	Construct
98	Lee Park Connector	Path & Xing	0	3	Construct
99	Lee Park Connector	Path	0	3	Construct
119	Memorial Stadium Connect	Path	0	3	Construct
120	Memorial Stadium Connect	Path	0	3	Construct
121	Middle Br Tr Connecor	Path	0	3	Construct
122	Middle Br Tr Connector	Path	0	3	Construct
123	Montebello Connector	Path	0	3	Construct
126	North Ave Sidepath	Sidepath	0	3	Construct
127	North Ave Sidepath	Sidepath	0	3	Construct
128	Northern Pkwy Connector	Path	0	3	Construct
129	Northern Pkwy Connector	Path	0	3	Construct
132	Notre Dame Connector	Path	0	3	Construct
134	Ostend St Connector	At Grade RR Crossing	0	3	Construct
141	Parkside Dr Connector	Path	0	3	Construct
152	Patterson Park Connector	Path	0	3	Construct
153	Powder Mill Pk Connector	Path	0	3	Construct
155	Power Line ROW	Path	0	3	Construct
156	Power Line ROW	Path	0	3	Construct
159	Reisterstown Stn Conn	Path	0	3	Construct
160	Reisterstown Stn. Conn	Path	0	3	Construct
161	Reservoir Connector	Path	0	3	Construct

164	Chesterfield Connector	Path	0	3	Construct
169	Stockholm St Connector	Trail with Rail	0	3	Construct
174	Towanda Connector	Path	0	3	Construct
175	Towanda Connector	Path	0	3	Construct
183	Western Run Connector	Path	0	3	Construct
185	Western Run Connector	Path & Bridge	0	3	Construct
186	Wilmarco Connector	Path	0	3	Construct
187	Wyman Pk Dr Connector	Path	0	3	Construct
189	Balt Com College Connect	RR Xing	0	3	Construct
192	Coppin St Connector	Path	0	3	Construct
196	W Balt Marc Stn	Midblock Crossing	0	3	Construct
1	28th St Overpass	Sidewalk/Overpass	1	3	Designate
3	29th St Overpass	Sidewalk/Overpass	1	3	Designate
5	29th St Overpass	Sidewalk/Overpass	1	3	Designate
6	29th St Overpass	Sidewalk/Overpass	1	3	Designate
7	29th St Overpass	Sidewalk/Overpass	1	3	Designate
8	29th St Overpass	Sidewalk/Overpass	1	3	Designate
9	29th St Overpass	Sidewalk/Overpass	1	3	Designate
30	Clover Lane Connector	Sidepath	1	3	Designate
184	Western Run Connector	Sidewalk	1	3	Designate
191	Coppin St Connector	Path	1	3	Designate
0	Melrose Ave Footbridge	Bridge	1	3	Improve
2	28th St Overpass	Overpass	1	3	Improve
4	29th St Overpass	Sidewalk/Overpass	1	3	Improve
20	Carroll Park Connector	Path	1	3	Improve
21	Carroll Park Connector	Path	1	3	Improve
35	Druid Pk Lk Dr Ctr	Sidepath	1	3	Improve
37	Druid Pk Lk Dr Ctr	Sidepath	1	3	Improve
38	Druid Pk Lk Dr Ctr	Sidepath	1	3	Improve
41	Druid Hill Park Path	Path	1	3	Improve
42	Druid Hill Park Path	Path	1	3	Improve
43	Druid Hill Park Path	Path	1	3	Improve
79	I-95 Overpass	Path and Ramp	1	3	Improve
80	I-95 Overpass	Overpass	1	3	Improve
81	I-95 Overpass	Overpass	1	3	Improve
148	Patterson Park Connector	Path	1	3	Improve
150	Patterson Park Connector	Path	1	3	Improve
151	Patterson Park Connector	Path	1	3	Improve
154	Power Line ROW	Path	1	3	Improve
163	Sharp St Connector	Path	1	3	Improve
170	Stricker St Connector	Paved Closed Street	1	3	Improve
173	Towanda Connector	Path	1	3	Improve
200	Inner Harbor Promenade	Waterfront Promenade	1	3	Improve
46	Druid Hill Park Road	Closed Park Road	1	4	Designate
14	Bank St Connector	Path & Overpass	0	5	Construct
22	Carroll Park Connector	Path	0	5	Construct
28	Chesterfield Connector	Path	0	5	Construct
83	Inner Harbor Promenade	Promenade	0	5	Construct
84	Inner Harbor Promenade	Promenade	0	5	Construct
88	Kane St Connector	Rail-Trail & Overpass	0	5	Construct

118	Masonville Cove Conn.	Path and Xing	0	5	Construct
172	Stricker/Carroll Pk Ctr	Path, At Grade RR Xing	0	5	Construct
181	W Frederick Connector	Sidepath	0	5	Construct
68	Herkimer St Connector	Path	0	6	?
168	Stafford St. Connector	Path	0	6	?
188	Hanover St Connector	Sidewalk	0	6	?

APPENDIX C – LIST OF TRANSIT STATIONS: EXISTING FACILITIES AND PRELIMINARY NEEDS ASSESSMENT

During the planning process the MTA provided information about its bicycle parking facilities at rail stations. A count of the lockers and racks that are installed and usable at each station was not provided. Below is a list of the stations that have lockers, racks or both, as well as those stations that will likely need bicycle parking equipment in the near term.

In general, racks and lockers are most useful for the outlying transit stations, where the bicycle can be used to get between the station and home. However, with increasing numbers of people living in and near the heart of the city, and job locations that may require reverse commutes, some downtown stations should also provide bicycle parking. In addition to parking a number of transit stations need access improvements to make it easier to get to the station by bicycle.

<u>Transit Station</u>	<u>Has Lockers</u>	<u>Has Racks</u>	<u>Needs Lockers or Racks</u>	<u>Needs Improved Access</u>
Light Rail				
Mt. Washington		x	x	x
Cold Spring			x	x
Woodberry			x	x
North Ave.		x	x	x
Mt. Royal		x	x	x
Westport			x	
Cherry Hill		x	x	
Patapsco		x	x	
Metro				
Reisterstown Plaza	x	x		x
Rogers Ave	x	x		
West Cold Spring	x	x		x
Mondawmin	x		x	x
Penn North			x	
Upton			x	
State Center			x	
Shot Tower Marketplace			x	
J. Hopkins Med. Ctr.			x	
Marc				
Camden Stn.		x	x	x
Penn Stn.		x	x	x
West Baltimore Stn.			x	x

APPENDIX D – POTENTIAL TRAILS AND EXTENSIONS

- Western Run
- Catonsville Short Line (West of Caton Avenue): Frederick Ave to City Line
- Gwynns Falls Parkway (Gwynns Falls Trail offshoot): Clifton to Franklinton Road
- Wetheredsville Road (Gwynns Falls Trail offshoot): Windsor Mill Road to Pickwick Road
- Western Maryland Rail Trail: Liberty Heights Avenue (West of Mondawmin Mall) to Carver Vocational-Technical High School
- Clifton Park Connector: 25th Street and Harford Road to Erdman Avenue and Norman Avenue
- BGE Transmission Line Trail (East of Sinclair Lane and Cold Spring Lane): Bowleys Lane to City Line
- East Baltimore Rail Trail (N-S Trail, East of Haven Street): Monument Street to Boston Street
- Franklin and Mulberry Trails (West Baltimore): Fremont Avenue to Fulton Avenue
- Stoney Run
- Gwynns Falls Trail offshoots in Cherry Hill (East of Annapolis Road, West of Patapsco River) to Light Rail station, Cherry Hill Park and City Line
- Herring Run Trail – Northern extension to Lake Montebello, Morgan State University and City Line
- Herring Run Trail – Southern extension to Armistead Gardens, add bridge over street to connect Federal Street with Bowley's
- Harbor and Middle Branch – extend bicycle and pedestrian path along shore

APPENDIX E – SAFETY, EDUCATION AND ENCOURAGEMENT PROGRAM IDEAS

- Use the mass media (radio, tv, outdoor advertising) for a bicycle safety campaign.
- Create bumper stickers: “Share the Road, Hon,” or “Believe in Bicycling”
- Distribute existing bicycle safety brochures developed by MDOT
- Develop pollution reduction by biking brochure for distribution at DMV offices and emissions inspection stations.
- Develop a laminated card for bicyclists to give to drivers who don’t show respect.
- Provide sensitivity training to bus drivers about sharing the streets with bicyclists.
- Get question about bicycle laws and safe interaction on the state driver’s license test
- Coordinate educational efforts through the Hispanic Liaison Office to ensure that the Latino population is reached with bicycle safety messages.
- Ask the radio and TV traffic reporting organizations to include information useful to bicycle commuters.
- Establish a citizen/volunteer bike patrol to keep watch over city bike routes and trails.
- Educate the teachers in driving schools.
- Expand city rideshare program to include bicycling incentives and encouragement
- Develop incentive program for city employees who ride/walk/take public transit to work regularly
- Ensure that regular bicycle riding safety and skill classes are available at low cost.
- Safe Routes to School Program
- Outreach to all communities and faiths
- Make bike helmets “cool”
- Ravens/Orioles advertising encouraging people to ride
- Valet bike parking
- Use traffic reports for bicycle public service announcements
- Tax breaks for businesses where employees ride to work
- Live where you work campaign
- Bicycle rehab cooperative: reuse old bicycles, train youth in bicycle repair
- Create bicycle hotline, website, email exchange; include good and safe routes information, general safety information,
- In media campaigns, include economic and public health benefits of bicycling
- Driver retraining to share the road (beyond driver’s test question): signs, ad campaigns, etc.
- Mass public media education campaign on car/biking etiquette
- Art bikes at Artscape
- Tax breaks to buy bikes associated with back to school
- Create fine for vehicles parked in bicycle lanes
- Establish Baltimore Bicycle Community Project Fund (for neighborhood events, trail watch, maintenance, clean-up projects, after-school programs, special information signs along routes)
- Focus education for bicyclists on proper lane position, night lighting and signaling
- Focus education for drivers on proper passing (speed and margin)
- Arrest and prosecute motorists who harass cyclists

- Start Baltimore specific independent bicycle advocacy organization
- Develop personal safety program (protection from crime and assault)
- Target bicycle routes for increased law enforcement
- Cyclovia – Bogota, Columbia program closing miles of streets each Sunday to motorized vehicle traffic – streets become pedestrian and bicyclist space for Sunday errands and outdoor activities

APPENDIX F – BIBLIOGRAPHY OF BICYCLE FACILITY DESIGN GUIDELINES

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US Department of Transportation (FHWA) and ITE "Traffic Calming: State of the Practice," Reid Ewing, August 1999.

Institute of Transportation Engineers, "Innovative Bicycle Treatments: and Informational Report," May 2002.

APPENDIX G – COMPLETE SURVEY RESULTS

326 people completed all or a portion of this survey. Blank answers for any particular question are not represented thus any raw numbers may not necessarily add up to 326. Percentages are calculated using the total number of respondents to that particular question, unless otherwise noted.

1. Based on your experience, which Baltimore streets are best for bicycling?

Street	Mentions	Street	Mentions	Street	Mentions
33 rd	3	36 th	2	Baltimore	3
Bank	7	Boston	6	Broadway	3
Calvert	2	Charles	11	Eastern	2
Edmondson	2	Eutaw	2	Falls	21
Fleet	2	Fort	7	Frederick	2
Gough	7	Greenmount	2	Greenway	2
Guilford	8	Gwynns Falls Pkwy	2	Harbor Promenade	2
Harlem	2	Hillen	2	Hollins	2
Hudson	3	Key Highway	3	Lake	4
Lake Montebello	2	Light	5	Loch Raven	2
Maryland	6	Mount Royal	2	Northern Parkway	2
Park	4	Pratt	11	Roland	9
St. Paul	6	University	3	Walther	3
York	2				

2. Which Baltimore streets are worst for bicycling?

Street	Mentions	Street	Mentions	Street	Mentions
33 rd	6	All	27	Baltimore	2
Belair	3	Boston	3	Broadway	2
Calvert	8	Charles	17	Col Spring	2
Downtown	4	Eastern	2	Falls	10
Fayette	4	Fleet	5	Fort	3
Frederick	2	Fulton	2	Greenmount	4
Gwynns Falls Parkway	2	Hanover	4	Harford	4
Howard	6	Liberty	3	Light	11
Lombard	4	Madison	3	MLK Blvd	4
Monument	2	North	3	Northern Parkway	3
Orleans	3	Potee	2	Pratt	16
President	2	Roland	2	St. Paul	14
University	2	Washington	2	Wolfe	6
York	11				

3. What are the best off-street routes (paved trails or sidewalks) in Baltimore?

Route	Mentions	Route	Mentions	Route	Mentions
B&A Trail	4	Falls Road	5	Fort McHenry	2

Gwynns Falls Trail	4	Promenade	5	Lake Montebello	2
NCR Trail	3	Thomas Ave	2		

4. What are the worst off-street routes (paved trails or sidewalks) in Baltimore?

Route	Mentions	Route	Mentions	Route	Mentions
Calvert	2	Downtown	4	Druid Hill Park	2
Jones Falls Trail	12	Fayette	2	Federal Hill Park	2
Fells Point	3	Franklin Square Park	2	Hanover Street/Bridge	2
Herring Run Trail	4	Promenade or Trolley Lane	10	Lake Montebello	2
Lake Roland	2	Patterson Park	2	Pratt	4
Sidewalks	5	Wyman Park Drive	2		

5. On which streets would you like to see bicycle lanes or other bicycle facilities?

Street	Mentions	Street	Mentions	Street	Mentions
25 th	3	33 rd	9	Aliceanna	5
All	14	Boston	4	Broadway	2
Calvert	10	Charles	18	Cold Spring Falls	2
Eastern	3	Edmondson	2	Fort	8
Fayette	2	Fleet	5	Guilford	3
Frederick	2	Greenmount	2	Harford	2
Gwynns Falls Parkway	2	Hanover	4	Keswick	2
Hillen	2	Howard	3	Light	5
Key Highway	3	Liberty	2	Maryland	3
Lombard	5	MLK Blvd	3	Northern Parkway	5
Monument	2	North	3	President	2
Orleans	4	Pratt	17	Washington	2
Roland	3	St. Paul	16		
Wolfe	2	York	6		

6. At which locations would you like to see additional bicycle parking (racks or lockers) provided? (Provide a neighborhood, address, intersection or business name.)

Location	Mentions	Location	Mentions
36 th Street/Hampden	7	Parks	2
Schools	2	Markets/Grocery Stores	6
Broadway	3	Camden Yards	4
Canton	8	Charles (Mt. Royal to 33 rd)	6
City Offices	4	Courthouse	2
Cross St Market	3	Downtown	7
Eastern Ave	2	Fells Point	4
Gallery Place	2	Harbor	9
Hopkins Hospital	6	Korean Memorial	2
Light Street	2	Light Rail	2

MICA	2	Mt. Vernon	3
Poly/Western	2	Pratt	3
South side	2	Thames	2
UMB	3	Waverly	4

7. What was the primary purpose of your last bicycle trip? (Please circle only ONE reason.)

Travel to work: 37%	104
Travel to school: 3%	9
Personal business / errands: 11%	31
Visit friends / social / entertainment: 5%	15
Travel to subway / light rail / bus: 1%	3
Travel to carpool / vanpool: 0%	0
For exercise / recreational activity: 35%	99
Other: 8%	23

“Other” Answers provided:

All of the above

All purpose, no other mode of transportation
all travel

Bike Messenger

Checking out potential bike commute (to work). Haven't taken the job yet.

don't know how to drive

errands, visit, exercise

go to school

I have just moved to Baltimore and I'm living downtown, and as yet have to get a bike - but I believe bike lanes and paths are truly important. You might want to look at the Twin City, MN as an example.

I ride to Penn Station M-Fri for the MARC line.

Just enjoy Baltimore

Just riding

our family likes to use our bicycles as transportation

shopping at Galleria mall

to come to Bike Master Plan Meeting

To take a walk

Today's event, my first time

Touring and ride to Bike Jam

Travel to MARC train

Travel to train station/For exercise

Travel to work, errands and exercise

travel to work, personal business/errands and visit friends

Who the hell knows. It's freezing out, I haven't been on my bike since November. I do like to use my bike to go from my house in Locust Point to the farmer's market. I also use my bike to go to the library and hair stylist on Light Street. Sometimes I like to ride to Fells Point.

8. Which of the following factors plays a role in whether or not you ride your bike to your destination? (Circle as many as apply.)

Travel time	38%
Availability of bicycle parking	30%
Safety of travel route for bicyclists	75%
Traffic	53%
Costs of other travel modes	11%
Need for exercise	39%
Availability of showers/changing facilities	21%
Weather	59%
Hills	17%
Other (please explain)	17%

"Other" Answers provided:

1. alcohol consumption 2. safety and availability of bike parking

Ability to combine bike route with public transportation

ability to take bike inside

Always ride: only form of transportation

Are bicycles allowed on city sidewalks. I would like to ride with my two sons N. on MLK from Hollins Market to Bolton Hill, but I am worried about safety with the 6-year-old. The sidewalks seem safest, but I thought legally bikes were supposed to drive in the traffic lanes.

Availability of car parking

bicycle maintenance in the area

Condition of roads sewer grates

Condition of street. A part of 'Safety of travel route', but also a distinct category. This is the BIGGEST problem I see in Baltimore - absolutely terrible streets for biking.

crappy public transportation

Distance

Do not own car

Grossness of sidewalk or neighborhood -- is it a pretty trail, or are you sucking in exhaust?

helping the environment, as everyone driving all of the time is not sustainable

I absolutely refuse to pay exorbitant prices to park my car at the Inner Harbor. Also, the Balt City meter maids have the enthusiasm of a pit bull. I'd much rather walk or ride my bike safely to where I need to go, than deal with a multitude of court dates.

I always bike, rain or shine. Buses aren't reliable.

I ride as my main mode of transportation. Traffic, safety of the street does not stop me, but affects the stress level in riding. I take the bus in snow or very bad rain.

I want to make sure that my bike is safe. The last time I went riding, and me and my boyfriend stopped at the Inner Harbor to get a smoothie. We locked the bikes up well, but when we got back, we had a wheel stolen and several other items were missing from other bikes. It's a shame to see that happen in a very touristy section in the middle of the day.

If I need to go somewhere, I ride

If its night and neighborhoods aren't safe, I will drive if I don't have a biking partner.

Less polluting

MARC allowing me to take my folding bike on the train easily. Now a bulky, non-biker friendly case required! Not practical.

Metro schedule

Mood (I love to ride)

Need to carry supplies to work.

Neighborhood safety

No factors - bicycle is exclusive transportation

none, always bike

parking safety

Perceived safety from assault or other crimes.

Places to park

Poor condition of streets

pot holes all over the place....roads are so bad they will bend the wheel frame that is why messenger services ride there bikes on the sidewalk and endanger people
 Pot holes and parked cars
 Proximity of bicycle-accessible 'needs;' for example, if there were more REAL retail in the city (i.e. BestBuy, Gap, etc.) I would consider riding to it from my neighborhood.
 Safety and weather are top of list
 safety of being a female alone in this city
 safety of bike while in it's locked up
 Safety safety safety safety! Darkness in the winter
 Security of bicycle parking
 Security of bike. I have a really nice bike.
 Smooth roads with few potholes and storm grates that are cyclist friendly
 Time of day - Because I am forced to take a lane for safety I try to get into work by 7am - later in the am I avoid biking because of the anger factor of car commuters and trucks - In the evenings I try to leave at same time so my fellow commuters are used to seeing me and have learned to live with a bike commuter.
 Time of day (darkness)
 tourist
 Transport of work clothes
 Viable options- Outfit more MTA buses with bike racks on the front- it seems only one in ten has them. Expand (AND MAKE IT LOGICAL!) the Subway and Light Rail systems to the East/West, not just Owings Mills/Lutherville to south.

9. When making a bicycle trip, which of the following do you prefer to use? (Circle only ONE)

On-street	31%
Bike lanes	43%
Sidewalks	7%
Off-street paved trails	19%

10. How many days during the last week did you use the following forms of transportation? (Check as many as apply.)

Transportation Mode	Average Number of Days
Bus	1.46
Subway/Lightrail	.84
Bicycle	2.94
Walk	4.33
Drive	5.74

11. Did you take your bike on the following modes of public transportation in the last week?

Transportation Mode	Yes	No
Subway/Lightrail	14	267
Bus	11	273

12. If you have been involved in a crash while riding your bike in the City of Baltimore, please answer the following two questions.

Total respondents to any portion of the crash question: 97
 Percentage of all survey respondents reporting involvement in a crash: 30%

12a. Please indicate who else was involved in the crash (Circle as many as apply.)

Involved	Percent
Motorist	55%
Bicyclist	10%
Pedestrian	8%
Other Cause (i.e. slippery surface, uneven pavement, etc)	56%

12b. On what type of facility did the crash occur?

Location	Percent
Street	92%
Sidewalk	5%
Trail	3%

13. Which of the following factors do you think would do the most to encourage bicycling in the City of Baltimore? (Circle only ONE.)

Build bikeways	59%
Safety outreach and education	4%
Enforce laws applying to bicyclists	2%
Enforce laws applying to motorists	6%
Reduce street traffic	3%
Increase police protection	2%
Provide bicycle storage	5%
All	11%
Don't know	1%
Other	8%

14. What is the closest street intersection to your home? (If you live outside the City of Baltimore, please indicate your jurisdiction.)

15. What is your age?

Average Age: 37 years old

16. What is your gender?

Male: 59%
Female 41%

APPENDIX H – EXAMPLE SURVEY FORM

Baltimore Bicycle Master Plan Survey

The City of Baltimore is undertaking a comprehensive bicycle master plan project. We want to know how we can make your trip safer and more convenient by bike. Please help us by answering the following questions. Return to: Bike Master Plan; 417 E Fayette St, 8th Floor; Baltimore, MD 21202.

1. Based on your experience, which Baltimore streets are best for bicycling? (Be as specific as possible about location, for example: Roland Ave, between Lake Ave and Northern Pkwy.)

2. Which Baltimore streets are worst for bicycling?

3. What are the best off-street routes (paved trails or sidewalks) in Baltimore?

4. What are the worst off-street routes (paved trails or sidewalks) in Baltimore?

5. On which streets would you like to see bicycle lanes or other bicycle facilities?

9. At which locations would you like to see additional bicycle parking (racks or lockers) provided? (Provide a neighborhood, address, intersection or business name.)

7. What was the primary purpose of your last bicycle trip? (Please circle only ONE reason.)
 - a. travel to work
 - b. travel to school
 - c. personal business /errands
 - d. visit friend/social/entertainment
 - e. travel to metrorail / metrobus
 - f. travel to carpool / vanpool
 - g. rode for exercise/recreational activity
 - h. other (please explain)_____

8. Which of the following factors plays a role in whether or not you ride your bike to your destination? (Circle as many as apply.)

- a. travel time
- b. availability of bicycle parking
- c. safety of travel route for bicyclists
- d. traffic
- e. costs of other travel modes
- f. need for exercise
- g. availability of showers/changing facilities
- h. weather
- i. hills
- j. other (please explain)_____

9. When making a bicycle trip, which of the following do you prefer to use? (Circle only ONE)

- a. On-street
- b. Bike lanes
- c. Sidewalks
- d. Off-street paved trails

10. How many days during the last week did you use the following forms of transportation? (Check as many as apply.)

- a. Bus _____days
- b. Subway/Lightrail _____days
- c. Bicycle_____days
- d. Walk _____days
- e. Drive _____days

11. Did you take your bike on the following modes of public transportation in the last week?

- a. Lightrail ____yes____no
- b. Bus____yes____no

12. If you have been involved in a crash while riding your bike in the City of Baltimore, please answer the following two questions.

12a. Please indicate who else was involved in the crash (Circle as many as apply.)

- a. Motorist
- b. Bicyclist
- c. Pedestrian
- d. Other cause (i.e. slippery surface, uneven pavement, etc.)

12b. On what type of facility did the crash occur?

- a. Street
- b. Sidewalk
- c. Trail

13. Which of the following factors do you think would do the most to encourage bicycling in the City of Baltimore? (Circle only ONE.)

- a. Build bikeways
- b. Safety outreach and education
- c. Enforce laws applying to bicyclists
- d. Enforce laws applying to motorists
- e. Reduce street traffic

- f. Increase police protection
- g. Provide bicycle storage
- h. Nothing
- i. All
- j. Don't know
- k. Other (please specify)

14. What is the closest street intersection to your home? (If you live outside the City of Baltimore, please indicate your jurisdiction.)

15. What is your age?

16. What is your gender?

b. _____M

c. _____F

Thank you for helping with the Baltimore Bike Plan!

If you want to be contacted for the public meetings related to the plan, please fill out this portion:

Name: _____

Address: _____

E-Mail Address: _____

(WRITE NEATLY PLEASE!!)

APPENDIX I – ESTIMATED MILEAGE OF SELECT BICYCLE FACILITY TYPES

The Proposed Network totals approximately 417 miles (centerline miles).

- 111 miles – Tier 1
- 46 miles – Tier 2
- 58 miles – Tier 3
- 119 miles – Tier 4
- 83 miles – Tier 5

A preliminary facility type (85 percent confidence rate) was identified for a total of approximately 150 miles. An additional 90 plus miles of roadway was found to be generally suitable for shared use, or no better facility option was possible.

A total of 17 miles in Tiers 1-3 was not reviewed in sufficient depth to make a facility recommendation. Twelve miles were studied, however a clear facility recommendation could not be determined.

GIS Code	<u>Tier 1 Mileage</u>	<u>Tier 1-5 Mileage</u>	<u>Facility Type</u>	<u>Design Concept/Rationale</u>
2	26.1	45.5	Bike Lanes - Traditional	Space exists for two 4.5 – 5 ft bike lanes.
3	38.5	54.7	Sharrow	Continuity is needed; not enough space for bike lanes; emphasize road sharing.
4	12.4	25.6	One-Way Bike Lane	Single bike lane paired with bike lane on a parallel one-way street.
5	2.2	5.7	Contra Flow Section	Use signs or formal lane, may use sharrow in one or both directions.
6	0.0	1.0	Striped Shoulders	Less than bike lane width, curbless roadway.
7	71.6	93.1	Shared Roadway	No special treatment.
8	2.4	3.5	One Way Shared Road	One-way road, no special treatment.
9	5.3	7.6	Wide Outside Lanes	13-15 feet
10	2.7	3.6	Sidepath	Minimum 8' in very low volume situations; 10-12' recommended; minimum 2' buffer to curb
11	1.9	5.4	Bike-on Sidewalk Pairs	Minimum 6' sidewalks on each side; 8'

				recommended plus a tree lawn.
14	0.0	4.1	Median Path	Generally not a recommended facility types.
16	0.0	0.3	One Way Sidewalk	Used for route continuity where there is minimal bike or pedestrian volumes.
17	0.0	0.3	Shared Bike/Bus Lane	Bus or shuttle lanes or loading zones exist; no room for bike lane.
18	1.4	2.0	Shared Peak-Hour Restricted Parking Lane	Bikes use left or right side of peak-hour restricted parking lane.
19	1.4	1.4	Sharrow on One Side, Bike Lane on the Other Side	Hilly roads without sufficient room for two bike lanes.

APPENDIX J – ADVANCED BICYCLE ACCOMMODATIONS FOR FUTURE CONSIDERATION

The following approaches to bicycle accommodations were proposed during the course of the plan. These approaches are generally used in communities with well-developed bicycle networks and high levels of bicycle use. A number of these ideas have been successfully implemented in European cities.

1. **Bicycle Boulevards**—These are created by using through neighborhood streets, which parallel busier arterials, as the designated bike route. These streets usually have less traffic, and are retrofitted to further calm traffic and give priority to bicycle travel through design and operational controls. A number of “side-street” routes are proposed in the Plan, however without recommendations for physical traffic calming and controls which is more costly and requires extensive coordination with local residents. However, these facilities may be quite applicable in future years as the network is more fully developed.
2. Use the Northern European model of creating bike lanes curb separated from the roadway as well as separated from sidewalk. This design approach is not applicable on streets with curbside parking, which is typical in Baltimore.
3. Brand of bike lanes by using special colors or symbols to treat the roadway surface between the white stripes. This approach may be very useful in the future, however it adds cost to facility implementation.
4. Provide self-service bicycle rentals where bicycles locked to special equipment that is located in public places can be released by use of a credit card, used and returned. A fee is charged. A uniform, mass-produced bicycle is typically offered. Theft or vandalism could be a problem with such systems. While successfully used in Europe, they have not yet been successfully piloted in the US.
5. Establish “Car-free Zones” in downtown areas, or other areas where bicycle and pedestrian use is high and needs to be encouraged.
6. Take a more aggressive approach to providing bicycle parking equipment and space by reducing motor vehicle parking and replacing it with bicycle parking. For example, replace 1 of every 100 motor vehicle parking spaces with bike parking.
7. Develop neighborhood bicycle routes.
8. Provide outdoor information kiosks with bike route maps at key places through out the city, or along a bike route. This is already being done along the Gwynns Falls Trail. Once a significant amount of the route system is in place, outdoor maps may be very helpful.

APPENDIX K – INTRODUCTORY NETWORK INSTALLATION CAPITAL BUDGET REQUEST

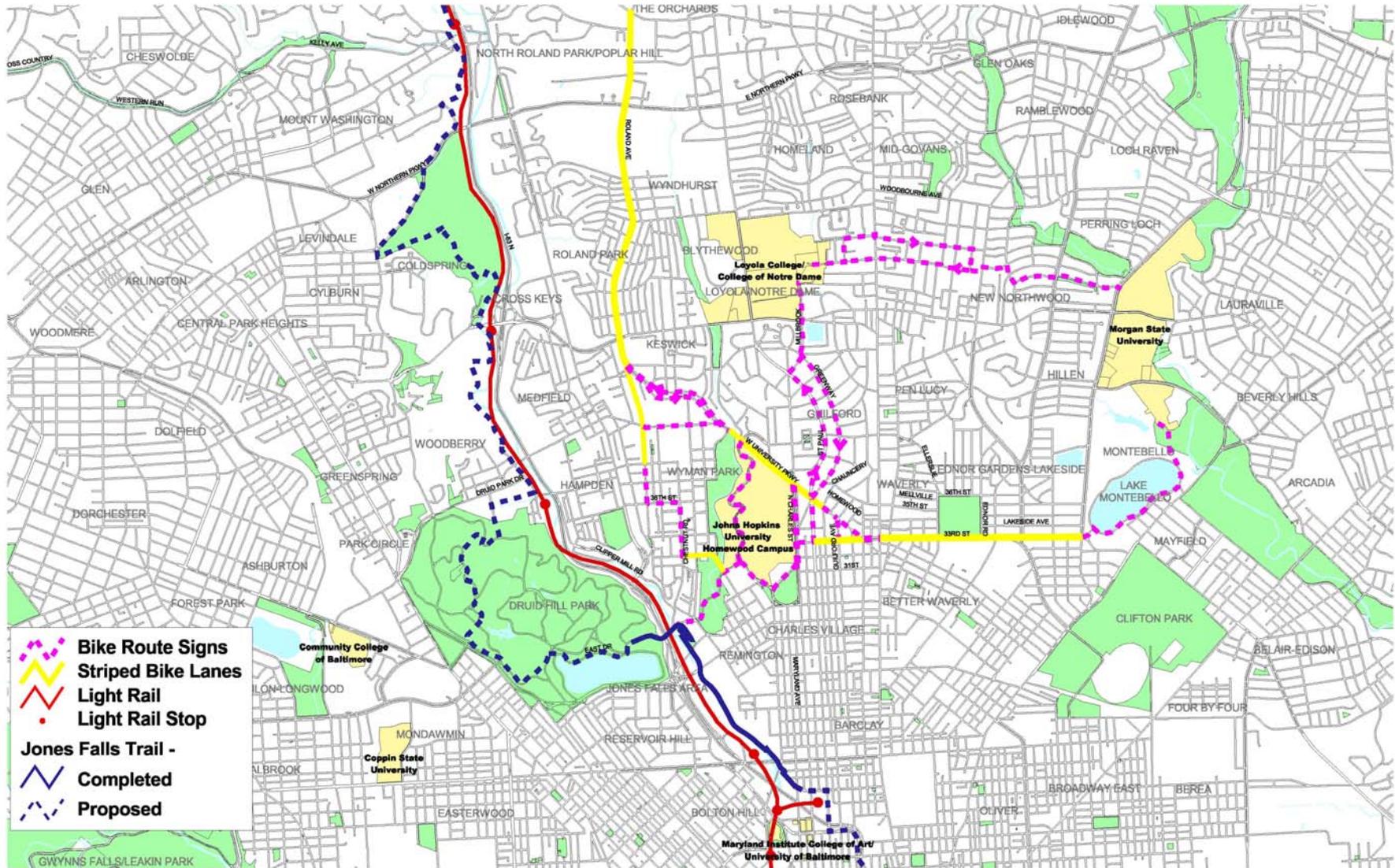
FY 2007 – FY 2009	Total Budget: \$3,525,000
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Year 1: Facility Improvements (Design and Construction)	Responsibility	Cost
Install Early Action Project, Collegetown Bike Route, and associated facilities, including signs and pavement markings. \$85,000 from Federal CMAQ Funds, \$175,000 from Transportation MVR or other Capital funds.	Transportation	\$175,000
2 Major Improvements: Engineering and Design of accommodations in Hopkins and Charles Plaza; Redwood and Water Street re-configuration.	Transportation	\$60,000
Small infrastructure improvements including bicycle parking, storm water grate improvements, intersection improvements, mid-block crossings, short paths, curb ramps, or stairway retrofits. (Budget includes E & D costs.)	Transportation	\$285,000
On-call consultant to provide in-house design, engineering, planning and related services to the Traffic Engineering Division. Design for 2/3 of Introductory Network.	Transportation	\$175,000
Total Year 1 Cost		\$695,000

Year 2: Facility Improvements (Design and Construction)	Responsibility	Cost
Install designed portion of Introductory Network (approx. 110 miles of bicycle lanes, other pavement markings, or signed bike routes). \$15,000 per mile for est. 30 miles of street markings; \$7,000 per mile for est. 70 miles of signed bike routes	Transportation	\$1,000,000
3 Major Improvements: Construction of accommodations in Hopkins and Charles Plaza, Redwood and Water Street re-configuration; Engineering and Design of accommodations for Hanover Street from Riverside to Veterans Bridge.	Transportation	\$330,000
Small infrastructure improvements including bicycle parking, storm water grate improvements, intersection improvements, mid-block crossings, short paths, curb ramps, or stairway retrofits. (Budget includes E & D costs.)	Transportation	\$260,000
On-Call consultant to provide in-house design, engineering, planning and related services to the Traffic Engineering Division. Design for remaining 1/3 of Introductory Network.	Transportation	\$150,000
Total Year 2 Cost		\$1,740,000

Year 3: Facility Improvements (Design and Construction)	Responsibility	Cost
Install designed portion of Introductory Network (approx. 60 miles of bicycle lanes, other pavement markings, or signed routes). \$15,000 per mile for est. 20 miles of street markings; \$7,000 per mile for est. 40 miles of signed bike routes	Transportation	\$580,000
2 Major Improvements: Construction of accommodations for Hanover Street from Riverside to Veterans Bridge.	Transportation	\$150,000
Small infrastructure improvements including bicycle parking, storm water grate improvements, intersection improvements, mid-block crossings, short paths, curb ramps, or stairway retrofits. (Budget includes E & D costs.)	Transportation	\$260,000
On-Call consultant to provide in-house design, engineering, planning and related services to the Traffic Engineering Division.	Transportation	\$100,000
Total Year 3 Cost		\$1,090,000

APPENDIX L – COLLEGETOWN NETWORK MAP



Collegetown Bicycle Network



Bicycle Facility Design Toolkit

A Component of the Baltimore Bicycle Master Plan



Prepared For:

City of Baltimore
Department of Transportation
Department of Planning

Prepared By:

Toole Design Group, LLC
College Park, Maryland
April 2006



INTRODUCTION

This Toolkit is provided as a supplement to national bicycle facility planning and design guidelines, such as the AASHTO *Guide for the Development of Bicycle Facilities*, 1999, the *Manual on Uniform Traffic Control Devices*, and the SHA *Maryland Bicycle and Pedestrian Design Guide* (expected publication 2006). It should be used in conjunction with the basic bicycle facility design guides mentioned above and with other publications developed by national transportation engineering organizations to describe best practices in bicycle facility design.

In older East Coast cities--which have narrower rights-of-way, variable street and intersection patterns, and diverse street parking conditions--the implementation of standard on-street bicycle facility designs can be a challenge. The purpose of this Toolkit is to provide the Department of Transportation, Baltimore-specific design guidance that can be useful in addressing these challenges. This Toolkit addresses a select set of topics that are both typical within, and generally unique to Baltimore.

The Toolkit has been developed in conjunction with the City of Baltimore Bicycle Master Plan (hereafter referred to as the Master Plan). The Master Plan provides an overall planning and policy framework for future development of bicycle facilities in the City.

The Toolkit provides standard design details, a route signing protocol, and strategic guidance to be used by City staff, traffic engineers, facility designers and planners in implementation of many of the bicycling accommodations recommended in the Master Plan. It is divided into the following three sections:

Section 1: Standard Design Details

This section provides seven design details where the specifics of facility design may be uniform (or relatively so) when applied in similar settings throughout the city. Moreover, the Standard Design Details are provided in a format that is more easily duplicated for direct integration into design and construction plan sets. **The first 5 details are applications of standards found in AASHTO and the MUTCD adapted to the City of Baltimore setting. Details 6 and 7 are based upon proposals that are currently before the NCUTCD¹ for inclusion into the MUTCD. There are ongoing experiments with these devices in other jurisdictions around the country.**

Section 2: Bicycle Route Signing Protocol

This section provides comprehensive guidance for the planning and design of on-street bicycle route signing within the City of Baltimore. **The sign protocol is based upon existing MUTCD guidance with the exception of the sign design. The sign design is based upon a proposal currently before the NCUTCD for inclusion into the MUTCD. A close variation of this sign design is currently utilized in the City of Chicago. The NCUTCD proposal is based upon the City of Chicago design.**

Section 3: Strategic Guidance

This section provides example strategies that may be considered by engineers who are attempting to retrofit existing Baltimore Streets to improve bicycle accommodation. It addresses ten roadway retrofit situations that are common to Baltimore. Since specific geometric or land use conditions vary frequently from location to location, this retrofit guidance may not be useful in every situation that is

¹ NCUTCD – The National Committee on Uniform Traffic Control Devices (NCUTCD) or the "National Committee" is an organization whose purpose is to assist in the development of standards, guides and warrants for traffic control devices and practices used to regulate, warn and guide traffic on streets and highways. The NCUTCD recommends to the Federal Highway Administration (FHWA) and to other appropriate agencies proposed revisions and interpretations to the Manual on Uniform Traffic Control Devices (MUTCD) and other accepted national standards. (From NCUTCD homepage – <http://www.ncutcd.org/purpose.shtml>)

encountered. **It is not a design standard, and should not be used as such. Application of each retrofit concept requires the use of engineering judgment while utilizing a flexible approach to develop a solution that enhances bicycle accommodation within the constraints of the retrofit project.** The discussion for each retrofit situation provides a range of options for consideration during the design process. The City of Baltimore is encouraged to consider developing before and after studies when implementing ideas in this guidance. **The City is also encouraged to follow the MUTCD experimentation process when implementing new traffic control devices that are not in the MUTCD.**²

It should also be noted that, short of formal experimentation, there is a fairly wide variety of options within the national bicycle planning and design guidelines, particularly related to the appearance of symbols, signs and pavement markings. The City of Baltimore may choose to review the existing options and develop a uniform appearance for bicycle facility traffic controls. While complete uniformity is not required by the national guidance, this may help ensure that a clear message is being relayed to the public as well as simplifying design and installation options, and reducing maintenance costs. The national guidance addresses some of these options in the following locations:

- Pavement Marking Symbols and Text
AASHTO Guide for the Development of Bicycle Facilities, 1999, Page 31
Manual on Uniform Traffic Control Devices, 2003, Page 9C-8
- Bicycle Related Signing
Manual on Uniform Traffic Control Devices, 2003, Page 9B-1 to 9B-13
- Bicycle Lane Striping
AASHTO Guide for the Development of Bicycle Facilities, 1999, Page 24 to 30
Manual on Uniform Traffic Control Devices, 2003, Page 9C-1 to 9C-7

While this toolkit seeks to provide design guidance that is customized for the City of Baltimore it includes treatments utilized successfully in various cities around the country, including San Francisco, Chicago, Philadelphia and Washington, DC. It is not intended to address every topic related to bicycle facility design. Nor does it reiterate the basic design guidelines and principals that are available in the national resources noted above. The reader is encouraged to become familiar with these references and other standard guidance documents that address roadway, street, bikeway and pedestrian facility design.

² The MUTCD recognizes that traffic control devices must evolve to better solve existing problems or to address new problems. The MUTCD provides an experimentation process (Section 1A.10) to assess the effectiveness of new or unconventional applications of existing devices to provide engineers flexibility. Where flexible approaches are required to create a bicycle friendly roadway, the City is encouraged to utilize the experimentation process established within the MUTCD to assess and analyze the design.

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STANDARD MID-BLOCK BICYCLE LANE STRIPING ADJACENT TO PARKING

TRAVEL LANE

Typical lane widths will vary between 10'-12'. The number of travel lanes will vary.

BICYCLE LANE LINE

6" Solid white line.

BICYCLE LANE

Bicycle lane may vary in width between 5'-6'.

BICYCLE LANE SYMBOL

Utilize 4'x8' preformed symbol.

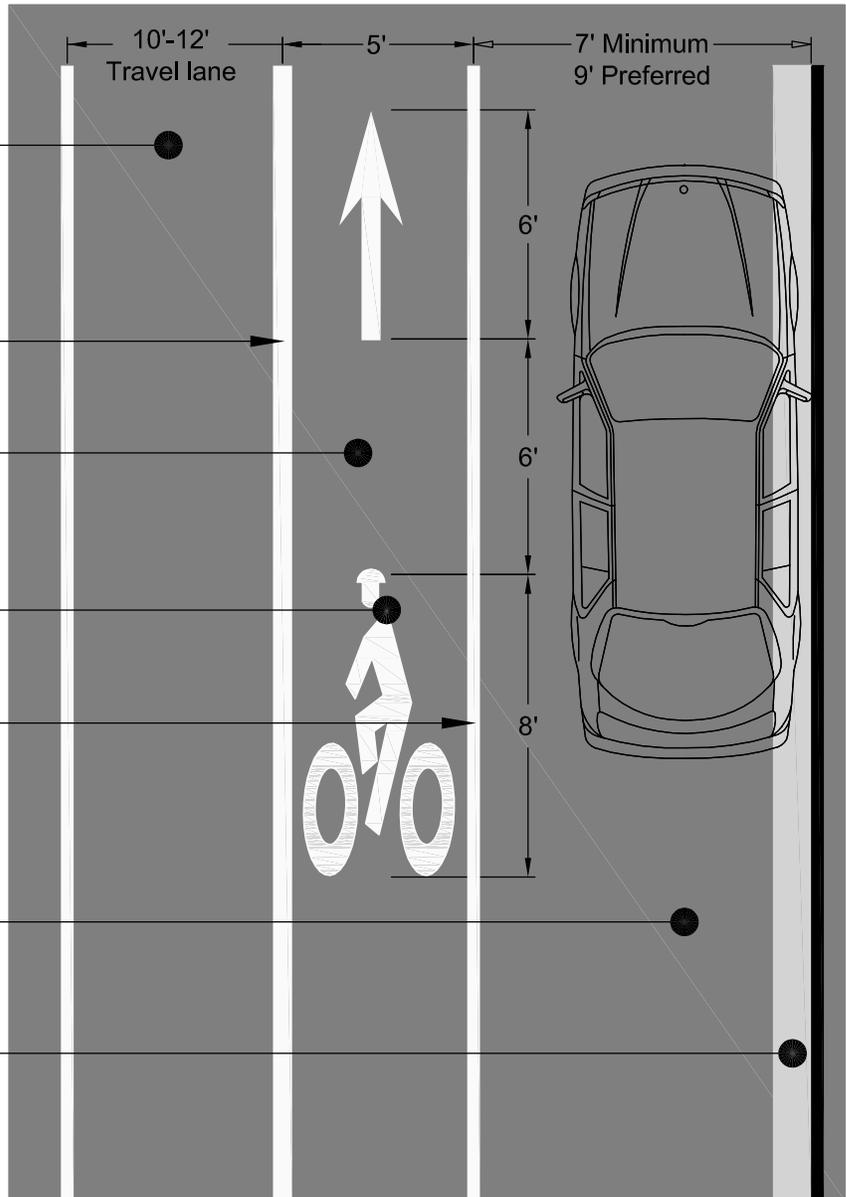
PARKING LANE LINE

4" Solid white line.

PARKING LANE

CURB AND GUTTER

Gutter is typically 1' in width of concrete. All measurements are to face of curb.



NOTES:

1. STRIPING: Utilize white thermoplastic on asphalt, high contrast tape on concrete.
2. SYMBOL PLACEMENT: Symbols shall be placed prior to and just after each intersection. Symbols may be placed every 250' between intersections.
3. SYMBOLS ON PAVEMENT: Utilize white preformed thermoplastic symbols.
4. SYMBOLS ON CONCRETE: Utilize high contrast tape symbols.
5. PAVEMENT CONDITION: The pavement should be inspected and damaged pavement should be replaced prior to striping of bicycle lanes.
6. BICYCLE LANE SIGNAGE: The placement of regulation or warning signs is governed by the MUTCD except where defined within this design guide. The use of the bicycle lane sign (R3-17) is not required unless directed by the Department of Transportation.

City of Baltimore
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Bicycle Facility Design Guide

REVISED:
April 2006
SCALE:
1" = 5'

1

STANDARD MID-BLOCK BICYCLE LANE STRIPING ADJACENT TO CURB

TRAVEL LANE

Typical lane widths will vary between 10'-12'.
Number of travel lanes will vary.

BICYCLE LANE LINE

6" Solid white line.

BICYCLE LANE

Bicycle lane may vary in width between 5'-6'. A 6' width is preferred for a curb side bicycle lane.

RIDEABLE SURFACE

A rideable surface must be a 3' minimum smooth surface. The gutter pan does not count as a rideable surface. If the joint between the rideable surface and the gutter pan is not smooth, provide 4' minimum rideable surface to the left or right of the joint.

BICYCLE LANE SYMBOL

Utilize 4'x8' preformed bicycle symbol.
Center symbol within lane.

CURB AND GUTTER

Gutter is typically 1' in width of concrete material. Rideable surface measurements are to edge of gutter line. Bike lane measurements are to face of curb.



NOTES:

1. STRIPING: Utilize white thermoplastic on asphalt, high contrast tape on concrete.
2. SYMBOL PLACEMENT: Symbols shall be placed prior to and just after each intersection. Symbols may be placed every 250' between intersections.
3. SYMBOLS ON PAVEMENT: Utilize white thermoplastic preformed symbols.
4. SYMBOLS ON CONCRETE: Utilize high contrast tape symbols.
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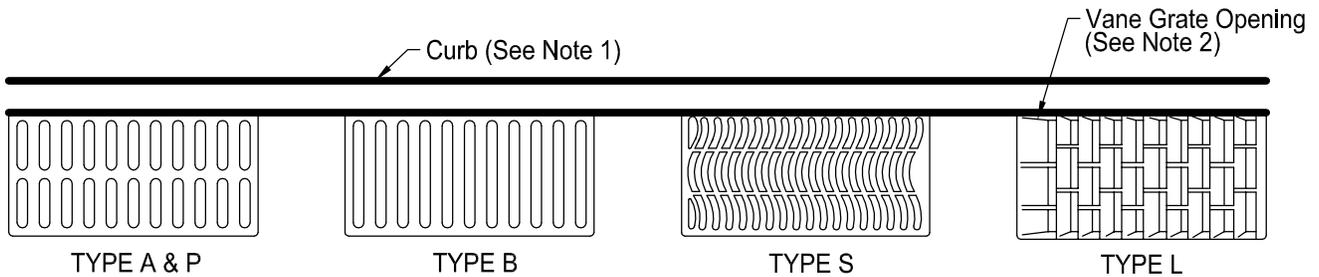
City of Baltimore
Department of Transportation
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REVISED:
April 2006
SCALE:
1" = 5'

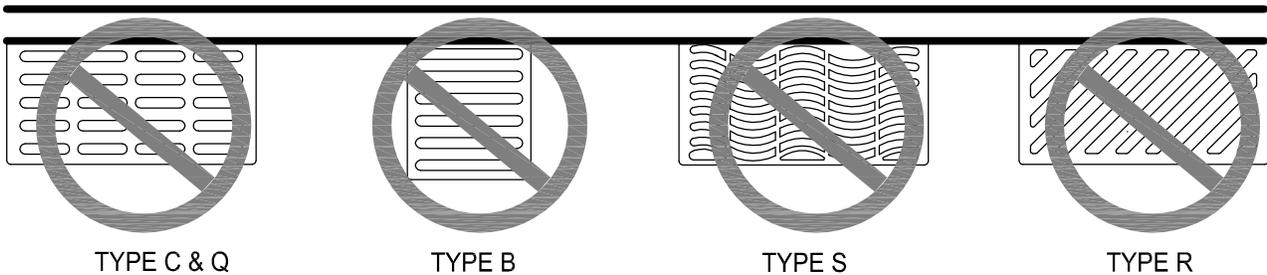
2

BICYCLE SAFE STORMWATER GRATES

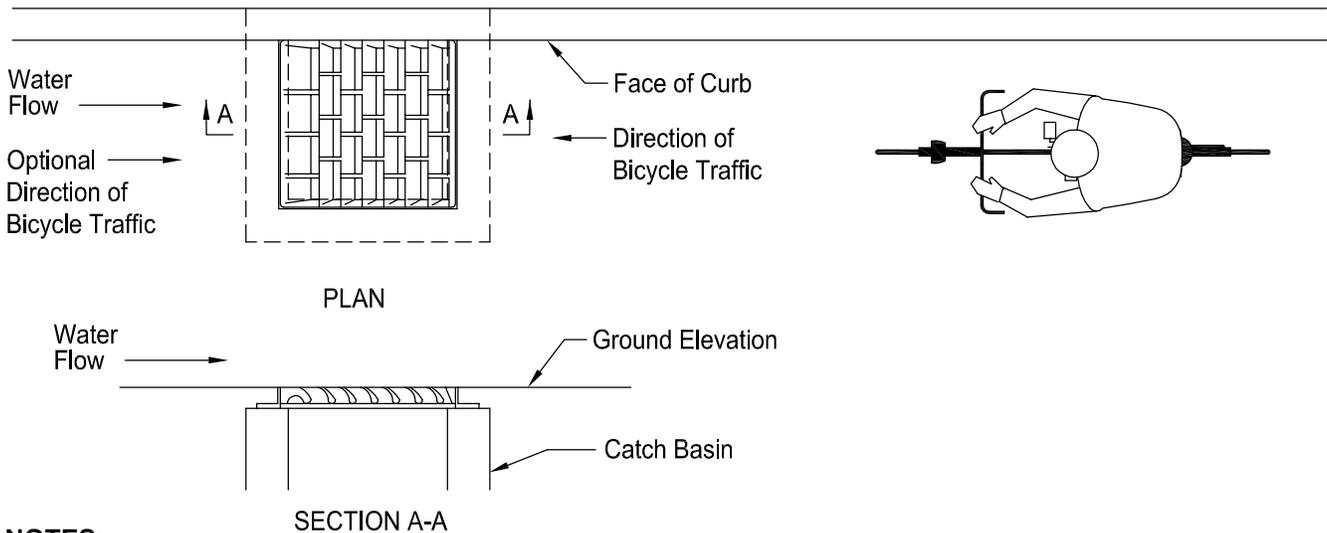
ACCEPTABLE GRATE DESIGNS



UNACCEPTABLE GRATE DESIGNS



EXAMPLE INSTALLATION WITH VANE GRATE



NOTES:

1. Grate types are only considered bicycle safe with the curb orientation as shown.
2. Vane grate openings are desirable in locations where higher hydraulic capacity is needed. The grate must be oriented with the direction of flow as shown in the "example installation with vane grate" detail.
3. These grates are based upon Neenah Models. Other manufacturer grates may be installed if they meet the grate design specifications shown here.

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 Aug. 2005
 SCALE:
 N.T.S.

3

PLACEMENT OF BICYCLE PARKING RACKS

RACK PLACEMENT RULES:

5' from:
Fire hydrant
Crosswalk

4' from:
Loading zone
Bus stop
Bus shelter
Bus bench

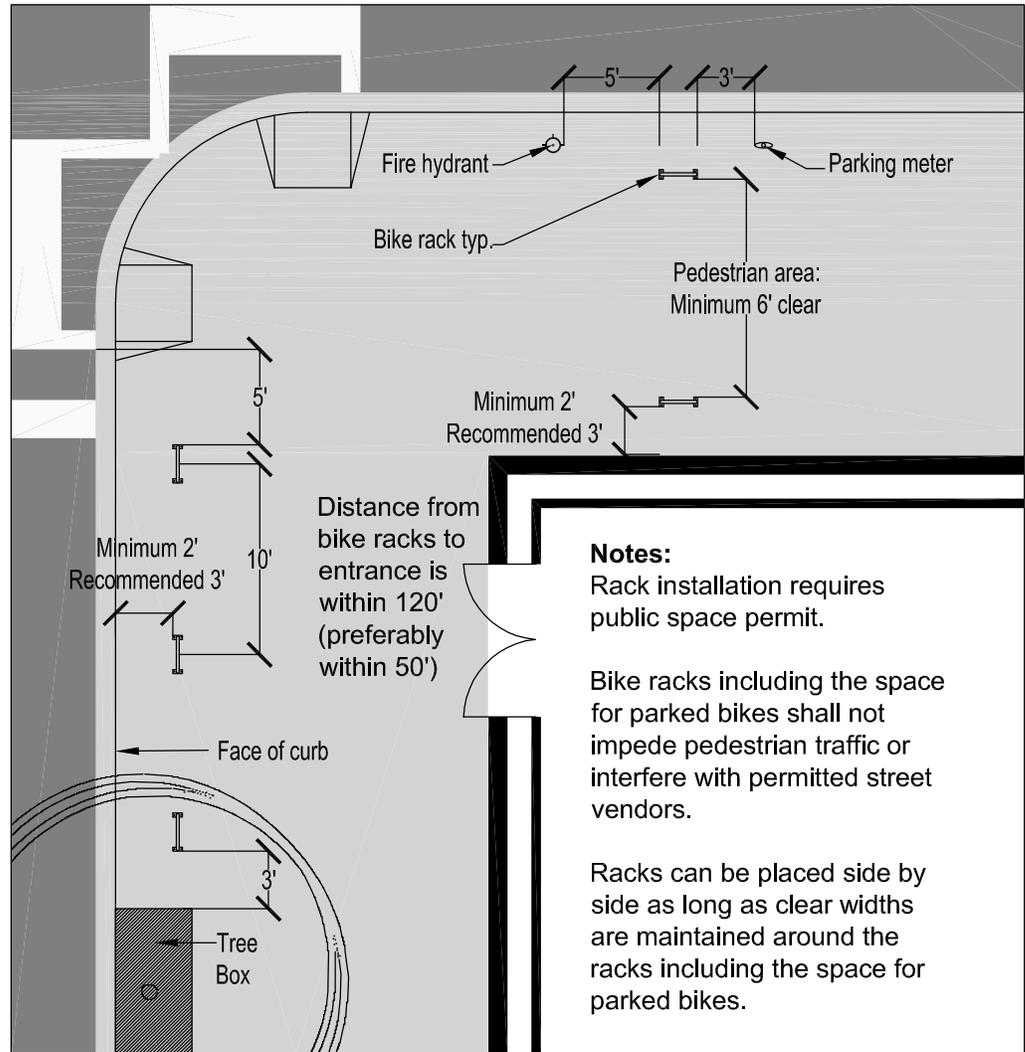
Min. 2', Rec. 3' from:
Curb

3' from:
Parking meter
Newspaper rack
US mailbox
Light pole
Sign pole
Driveway
Tree space
Trash can
Other street furniture
Other sidewalk obstructions

WALL SETBACKS

For racks set parallel to a wall:
Min. 24", Rec. 36"

For racks set perpendicular to a wall:
Min. 28", Rec. 36"



Notes:

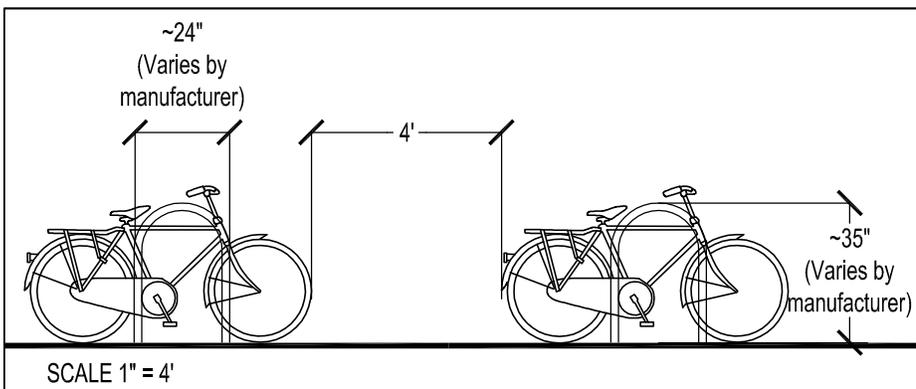
Rack installation requires public space permit.

Bike racks including the space for parked bikes shall not impede pedestrian traffic or interfere with permitted street vendors.

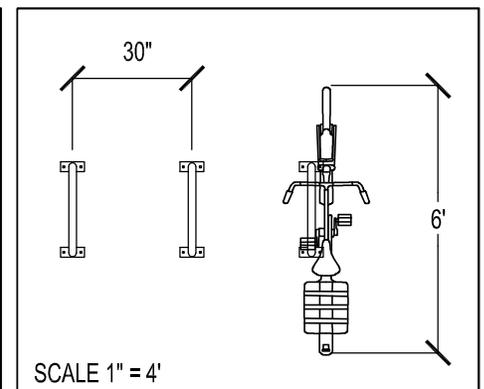
Racks can be placed side by side as long as clear widths are maintained around the racks including the space for parked bikes.

SCALE 1" = 10'

SIDE VIEW



SIDE BY SIDE RACKS:



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Aug. 2005
SCALE:
AS NOTED

4

BICYCLE DETECTION AT ACTUATED SIGNALIZED INTERSECTIONS

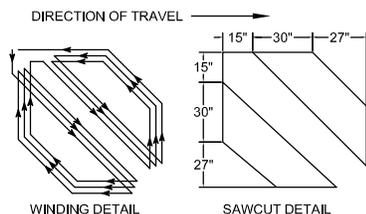
SIGNAL ACTUATION SIGN (R10-22)

Place in advance of pavement marking.

BICYCLE DETECTION ZONE

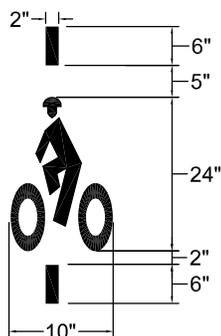
Utilize a diagonal quadrupole detector. Locate behind stop line.

DIAGONAL QUADRUPOLE PATTERN



BICYCLE LOOP DETECTOR SYMBOL

BICYCLE DETECTOR PAVEMENT MARKING

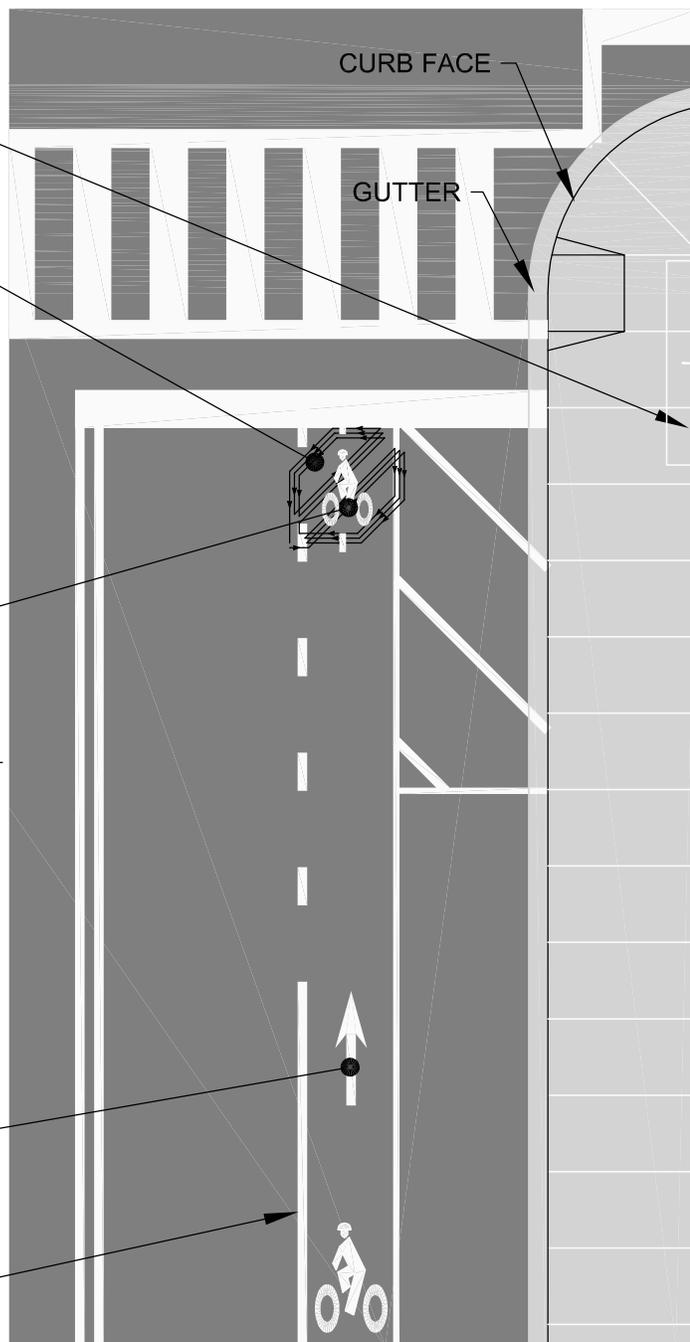


BICYCLE LANE SYMBOL

Locate arrow 1' from stop line.

BICYCLE LANE LINE

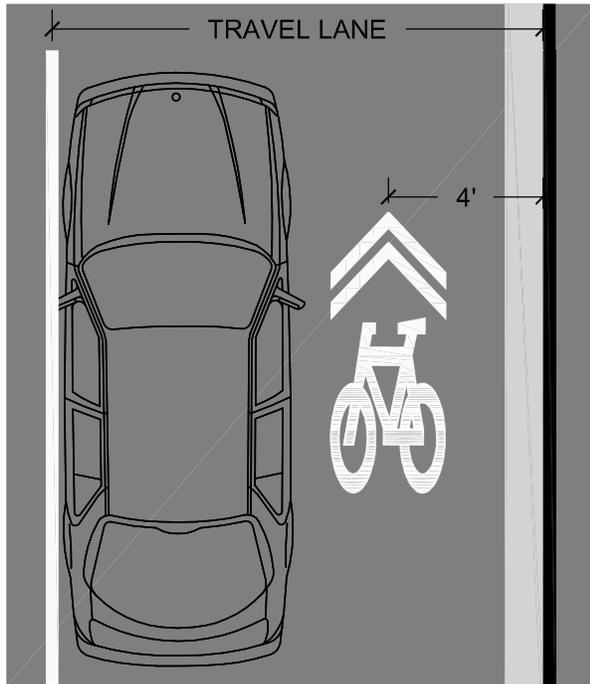
6" Solid white line.



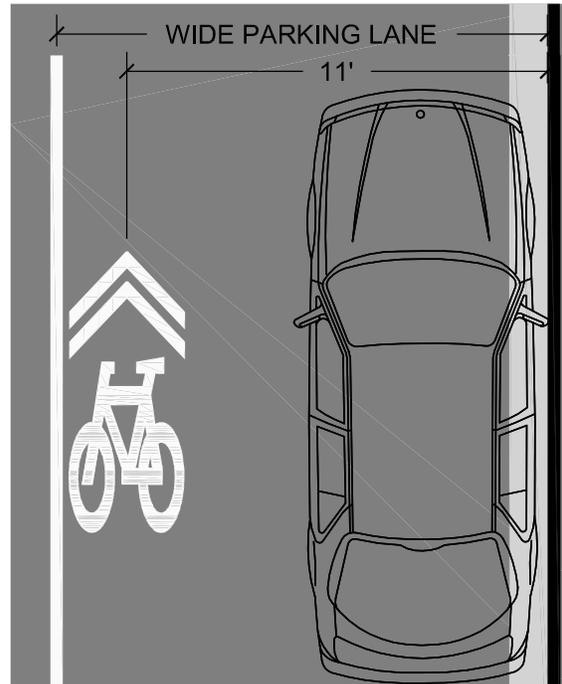
SCALE 1" = 10'

SHARED LANE SYMBOL PLACEMENT

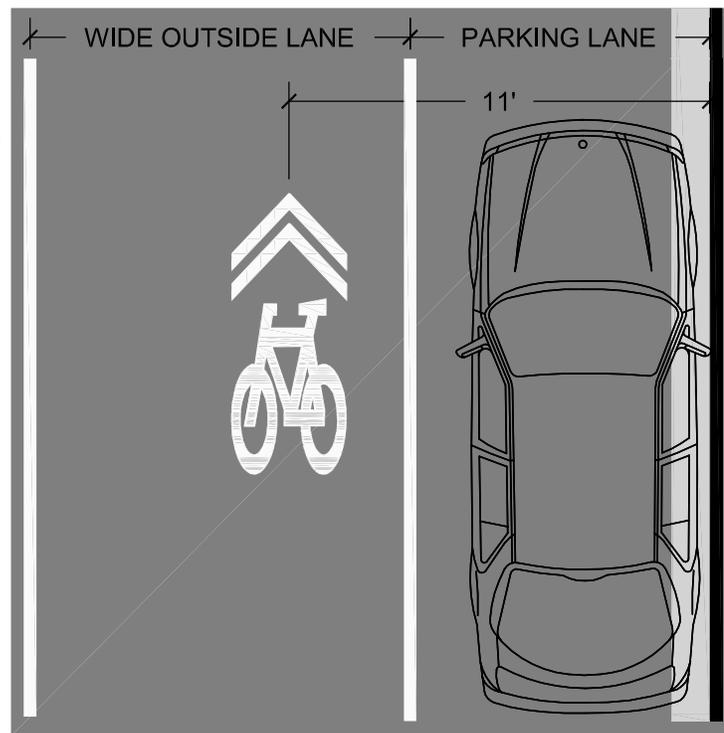
WIDE OUTSIDE LANE



WIDE PARKING LANE



WIDE OUTSIDE LANE ADJACENT TO PARKING



SYMBOL USE GUIDELINES:

1. Symbols may be used on roadways that are too narrow for bicycle lanes.
2. Symbols may be used on narrow roadways to connect disconnected bicycle facilities such as bicycle lanes, designated routes, and shared use paths.
3. Symbols may be used on roadways that have high levels of bicycle traffic.

SYMBOL PLACEMENT NOTES:

1. Symbols shall be placed after each intersection. Symbols may be placed every 250' thereafter.
2. If used on roadways with on-street parking, symbols shall be placed so that their centers are a minimum of 11' from the adjacent curb face.
3. Symbols placed in a shared lane without parking shall be placed so that their centers are a minimum of 4' from the adjacent curbface.
4. Do not place symbols on lane lines.

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Department of Transportation
Bicycle Facility Design Guide

REVISED:
Aug. 2005

SCALE:
1" = 5'

BICYCLES MAY USE FULL LANE SIGN



OPTION:

The bicycles may use full lane (R4-11) sign may be used on roadways with no bicycle lanes or adjacent shoulders usable by bicyclists and where travel lanes are too narrow for bicyclists and motor vehicles to operate side by side.

The bicycles may use full lane sign may be used in locations where it is important to inform road users that bicyclists may occupy the travel lane in order to prevent unsafe passing.

R4-11 SIGN DESIGN:

SOURCE: PROPOSED FOR MUTCD (NCUTCD COMMITTEE)

SIZE: 30"x30"

COLOR: black letters on
white reflective background

TYPE: highway gothic

City of Baltimore
Department of Transportation
Bicycle Facility Design Guide

REVISED:
Aug. 2005

SCALE:
Custom

7

Bicycle Route Signing Guidelines

Purpose

To implement Recommendation 1.2 of the Baltimore Bicycle Transportation Master Plan, the City will identify and sign select Bicycle Routes to improve wayfinding among popular destinations in the city. A system of signed bicycle routes will advance bicycle transportation and recreation in the following ways:

1. **Provide a set of spine routes that will be easy to follow**...for novice bicyclists, new bicycle commuters, new city residents, and tourists.
2. **Provide a set of spine routes that touch every Ward and serve the most important destinations** needing bicycle access and wayfinding guidance.
3. **Contribute to the physical and visual presence of bicycle facilities on the City street and roadway system**, which alerts motorists and all other users of the transportation system that bicyclists have “a right to the road,” and are to be expected along these and other routes throughout the City.
4. **Provide a discrete, yet citywide, feature of the bicycling infrastructure** that can be used as the lead feature for bicycle marketing and promotion efforts.

Approach

For a signed bicycle route network to function effectively, be understood and help bicyclists it must be based on consistent patterns of sign design and usage, i.e. it must be guided by a sign protocol. This protocol will establish the following features of the sign system:

- Hierarchy of routes and facility types
- Informational elements to be included, such as direction arrows, place names, distance, and special facility identification logos
- A consistent pattern of sign usage along a route that provides Bike Route Signs, marks route turns, crossing routes, etc.
- Standard sign panel formats and combinations

This protocol also addresses detailed design and logistical issues

- Design of graphics—symbols and logos and how they are used
- Colors and how they are used
- Sign sizes
- Fonts styles and sizes
- Ensuring legibility
- Support and post materials and method options
- Recommended posting locations in the streetscape

The objectives of the sign protocol are as follows:

- To ensure continuity and consistency in features that need to communicate the same message to users regardless of location.
- To allow enough flexibility to address the wide variety of transportation facilities and neighborhood settings that a bicycle route may pass through.
- To provide variable features that are used to communicate meaningful distinctions.
- To ensure uniformity in features that may allow for bulk production of some signs and thus lower capital and maintenance costs.
- To ensure that the signs and messages that they communicate are visible, clear, unambiguous, timely, useful and unlikely to contribute to unsafe or dangerous bicycle movements.

Draft Protocol

Signage Approach for a Hierarchy of Routes and Facility Types

1. **Regular On-Street Bike Routes** will use a modified version (D11-1a) of the Bicycle Route signs provided in the Manual on Uniform Traffic Control Devices (MUTCD). Additional and modified protocols are described below. See Detail Sheet for graphic examples.
2. **Special On-Street Bike Routes** can be created at the Transportation Department's discretion to feature a route because it has a) a unique service area or destination that is served, b) a community partnership associated with the route, or c) is intended to be marketed to and provided especially for visitors to the City.

The Collegetown Bike Route is the first example of such a route.

- a. *These routes should use the modified on-street route sign (D11-1b) that includes the route/partnership logo and special destination reference, i.e. each sign on the Collegetown route will include the name of the next school to be encountered on the route.*
 - b. *No other variations should be necessary.*
3. **On-Street Trails and Transitions:** At locations where shared use path systems continue on city streets the On-Street Bike Route signage system should be used, with the following elements (See D11-1c and D11-1d):
 - a. Include the bicycle and pedestrian symbol graphics and text as shown on the Detail Sheet.
 - b. The sign can be modified to show the appropriate graphics and text in variable situations, i.e. when the route is on-street and uses a shared lane pavement marking instead of a bike lane, the shared lane marking can be used in the sign graphic with the wording "SHARE THE ROAD" instead of the bike graphic and wording "USE BIKE LANE".
 - c. Include the appropriate trail logo on a separate panel.
4. **Pathway/Bike Route Linkages:** At locations where these trails connect to the on-street bicycle route network the On-Street Bike Route signage system should be used to provide route name, destinations, directional arrows, etc.
5. **Major Trails:** The shared use paths that are within the City Park System should continue to use the existing signage system, developed for the Gwynns Falls Trail, for all trails throughout the system, using a unique graphic trail logo for each distinct trail. This protocol may be used for interim signage at the discretion of the Departments of Parks & Recreation and Transportation.

Other Sign Types Used

Other sign types used will include the following:

- MUTCD Arrow Subplates: M7-1 through M7-7
- MUTCD Facility Label Plates: D1-1c
- MUTCD Bike Parking: D4-3
- MUTCD Route Beginning and Ending: M4-11 & M4-12
- Customized signs to address unique situations, as needed.

Route Labeling

Routes should always be named using a relatively known place reference that is at the end of the route in that direction of travel. Technically, each route will have two names, one for each direction of travel, however, many routes may use Downtown, or Inner Harbor as the ultimate destination in one direction. The unique name used for the opposite direction will likely become the commonly used route name.

A text reference to the ultimate destination for each direction of travel on the route will be provided on each sign used for that direction of travel.

Ultimate destination references should be carefully selected. They may be a city neighborhood, a neighborhood or suburb just outside the city, a prominent street, a prominent institution, a park, or other know or easily located landmark.

Sign Types, Purposes and Locations

Sign plans should be developed using the following sign types, purposes and locations (See detail sheet for example signs).

- **Bike Route Sign (D11-1a)**, provided at confirmation locations (see below) or if confirmation locations are infrequent, approximately every 0.25 miles.
- **Junction/Intersection (D1-1b)** with other signed bike route or shared use path
- **Turn** in the route (use MUTCD arrow plates, or arrow integrated into Bike Route Sign)
- **Confirmation (D11-1a)**, provided within 200 feet after a turn in the route or after a signed approach has joined or crossed the route.
- **Approaches to the Route (D11-1a, with M7-5 arrow, or other arrow)**, provided at intersection, on select crossing streets (such as arterials, collectors, streets used by many bicyclists) to alert bicyclists of the signed route.
- **Transitions (D11-1d)**, provided where facility types change (trail continues on street in bike lanes and on sidewalk) and/or bicycle/pedestrian positioning on the facility needs to shift.
- **In-Street/Pavement Route Marking** to be used when a sign on the right may not effectively communicate critical information, such as a left turn in the route.

Informational elements such as directions, place names, distance and units used

Both on-street and park trails should provide directional arrows and destination place names at key intersections (all intersections along a trail). Distance to the destination in miles should also be provided. Mileage format should be “X.X” for distances with a fraction of a mile and “X” for whole miles.

- The on-street sign system may use arrow sub-plates or include an arrow on the main sign, as appropriate.
- On-route destinations and mileage should be provided periodically on a sub-plate with an arrow;
- The turning point to important side destinations should be marked periodically on a sub-plate with an arrow.
- At the crossing or merging points of two bike routes the bicycle symbol should be included on the side destination sub-plate to indicate that a signed-route will be provided to the destination.

Sign Details

Generally, sign details will meet the requirements established in other guidelines, standards and specifications as appropriate including the MUTCD, American Association of State Highway and Transportation Officials (AASHTO) Roadside Design Guide, Maryland State Highway Administration and City of Baltimore standards and specifications.

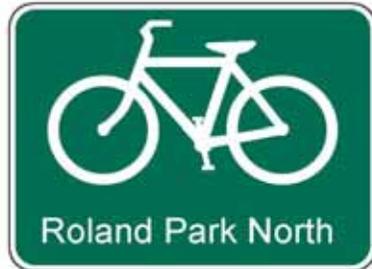
- **Sign Panel Details** such as sign color, size, fonts, graphics/symbols, panel layout and panel combinations should be in accordance with the MUTCD unless otherwise modified by these guidelines.

- **Sign Location** along shared use paths should be in accordance with the MUTCD. Signs located along urban roadways should be located behind the face of curb a minimum of 1.5 feet and in accordance with the AASHTO Roadside Design Guide. Care should be taken to assure that signs are easily seen by cyclists and will not frequently be blocked by parked vehicles, queuing traffic or other obstructions. Signs should be located prior to intersections or decision points where turns are required to give sufficient time to make a decision.
- **Sign Support Details** should be in accordance with the City of Baltimore or Maryland State Highway Administration Standards as applicable. Mounting signs to steel posts, wood posts, existing utility/signal poles, or other structures is generally acceptable unless otherwise contradicted by the above mentioned guidelines.
- **Supplemental Pavement Markings** may be advantageous in some situations such as complex intersections or junctions. Directional arrows or the Shared Lane Pavement Markings may be appropriate and should be designed in accordance with the MUTCD and these guidelines. (See Shared Lane Pavement Marking detail).

Note

The NCUTCD is currently revising Section 9B.19 and 9B.21 to create a more flexible guide sign. The design of the signs in this route signing protocol is based upon the designs developed for inclusion in the 2008 MUTCD.

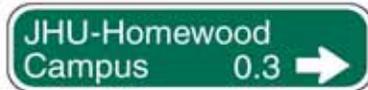
Bicycle Route Signing Guidelines
(Detail Sheet)



Standard Route Blaze - D11-1a



Special Route Blaze - D11-1b



Side Destination - D1-1a



Junction with Crossing Bike Route - D1-1b



Facility Label - D1-1c



Transition to Shared Use Path or Possible Trail Blaze D11-1c



On-Street Trail Blaze or Transition to On-Street Trail D11-1d



Example of Panel Combination

Experimental Vehicle Doors Opening Into Bicyclists (Dooring)

Issue

Bicyclist traveling adjacent to parked vehicles, either in designated bicycle lanes or on a shared roadway, must be concerned with the possibility of vehicular doors opening into their travel way. A collision with an open door, or a door knocking a bicyclist into moving traffic, can cause serious injury or death. This area of concern for bicyclists is called the “door zone” and typically extends 3-4 feet from the edge of a parked vehicle.

Locations with infrequent parking turnover, and/or low traffic volumes, such as local neighborhood streets, do not typically present potentially hazardous “dooring” situations.

Strategies

Signing and pavement markings can be used to inform both motorist and cyclists of the dooring potential. While specific warrants are not available to determine where special warnings may be used, the following factors may be considered, particularly on streets that are part of the City Bicycle Network:

- The presence of a striped bike lane, shared lane pavement marking, signed bike route, or designation of the street as a component of the City Bicycle Network.
- Frequency of parking turnover, i.e. short-term metered parking spaces, commercial and retail shopping areas, or other activities with frequent turnover.
- Parking lanes of 8’ or less, travel lanes of 11’ or less, with medium to high traffic volumes reduce the ability of a cyclist to safely make an emergency maneuver to avoid an open or opening door.
- Documented or expected bicycle volumes.
- Reported dooring incidents or near dooring incidents.
- Frequency of Taxi use (i.e. near hotels, taxi stands, theatres, sports venues, etc.)
- Bicyclists expected travel speed relative to proximity to an opening door (i.e. downhill riding vs. uphill riding)



Figure 1: Example “Look for Bikes” Sign

Source:

Based on decals proposed for NYC taxicabs – www.transalt.org

Note

The “Dooring Sign” is not a standard sign in the MUTCD. The design and use of the sign should follow standard MUTCD practices. Engineering judgment shall be utilized in determining appropriate locations for its use. It is recommended that the City follow the MUTCD experimentation process when implementing the dooring warning sign.

Experimental Vehicle Doors Opening Into Bicyclists (Dooring) (Continued)

Strategy One - Signs: The *Look for Bikes* sign can be used to alert drivers of parked vehicles to look for oncoming cyclists prior to opening the driver side door (see Figure 1). These signs may be located along the curb line adjacent to the parking lane.

Strategy Two - Parking Lane Width: A parking lane width of 9' or greater coupled with drivers' practice of parking close to the curb (typical in Baltimore), provides more room for a bicyclist to travel outside of the "door zone" and be passed comfortably by vehicles in the adjacent travel lane.

Strategy Three - Mark the "Door Zone" in the Bike Lane: Figure 2 shows how diagonal "tic-marks" can be added to the right side of a bike lane to alert bicyclists of the door zone. Some communities have added the text *Door Zone* to the pavement marking design every 50-100 feet.

Standard Detail 1 shows how a bike lane may be offset from a parking lane to reduce door zone conflicts. Standard Detail 6 shows how the shared lane pavement marking may be offset from a parking lane to reduce door zone conflicts.

Strategy Four - Education Campaign: An active public education campaign to raise awareness about the risk of dooring. This may include handing out stickers for use on rear view or side view mirrors that remind drivers to "Watch for Bikes" when turning or opening car doors (Figure 3). It may also include a sticker campaign for the backs of taxi seats to warn customers to look before opening a door onto a public street or sidewalk.

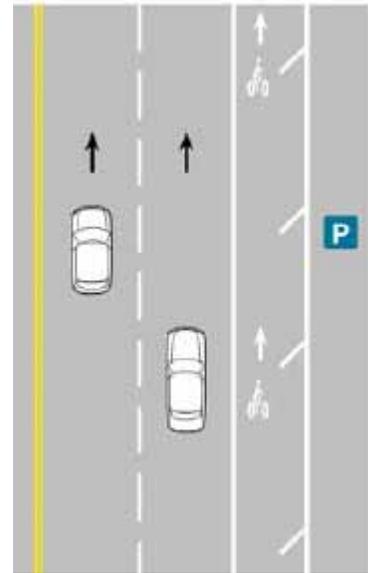


Figure 2: Door Zone Pavement Marking

Source:

San Francisco Bicycle Plan Design Guidelines.



Figure 3: Example "Look for Bikes" Decal

Source:

*City of Cambridge, MA education campaign.
Decal is sent out with parking permits.*

Note

The door zone pavement marking is not a standard marking in the MUTCD. The door zone pavement marking shown in Figure 2 is a variation of the standard parking space markings found in the MUTCD (Section 3B.18). It is recommended that the City follow the MUTCD experimentation process when implementing the modified pavement marking layout to depict door zones.

Bicycle Parking

Issue

Lack of convenient, safe and weather protected bicycle parking is a major disincentive to bicycle use. Conveniently located and secure bicycle parking facilities are needed throughout Baltimore City.

Strategies

Bicycle parking may be provided in public spaces throughout the City. The City may also require private building managers and commercial/retail property owners to provide bicycle parking. All bicycle parking may be designated by prominent signage, and utilize safe functional and attractive equipment.

The basic piece of bicycle parking equipment is the bicycle rack. However not all bicycle racks on the market meet the appropriate design requirements (figure 5). A good bicycle rack design includes the following features:

- Support the bicycle frame in at least two places
- Allow the frame and wheel to be locked using a U-lock or cable lock.
- Prevent the wheel of the bicycle from tipping over and not damage the bicycle.
- Be durable and securely anchored.
- Allow front-in or back-in parking.

Strategy One – Short Term Bicycle

Parking: Short term bicycle parking generally means the use of a bicycle rack. Whenever possible, bicycle racks may be covered by a shelter or roof overhang, to provide the additional convenience of weather protection.

Strategy Two – Medium Term Bicycle

Parking: Bike parking equipment such as that shown in Figure 7 provides greater security and weather protection, than a basic bike rack. However, because the service requirements of bicycle lockers are not necessary (prior arrangements, long term commitment, rental fees, and key deposits), greater protection can be offered on a first come first serve basis.



Figure 4: Desirable Bicycle Rack Designs



Figure 5: Dish Rack Style – Not Acceptable



Figure 6: Covered Bicycle Parking

Bicycle Parking (Continued)

Medium-term bike parking is an effective way to meet the needs of non-regular bike commuters, such as at transit stations, universities and other locations where parking durations increase the need for weather protection and/or added security, but bicycle lockers may be too costly and difficult to manage.

Strategy Three – Long Term Bicycle Parking: Employees or students who ride regularly, often need parking accommodations that provide even greater security and weather protection because their bikes remain parked for longer periods of time. This can be provided with bike lockers, indoor bicycle storage rooms or fenced bicycle parking areas in school yards or parking garages.

Table 1 presents characteristics associated with the various types of bicycle parking equipment and facilities. It can be used to select the best equipment for the type of location and bicyclists to be served.



Figure 8: Bike Lockers



Figure 7: Bike Lid

BICYCLE PARKING EQUIPMENT CHARACTERISTICS							
Equipment	Service Type	General Service Period	Security	Access Control	Weather Protection	Users/Trip Types Served	Typical Locations
Rack	Short Term	Up to 3 hours	User provided locks	First Come, First Serve	None	Utilitarian Transportation & Recreation Trips: shoppers, recreational riders, tourists	Retail shopping districts/centers, restaurants, points of interest, park activity areas, schools, libraries, post offices, main streets, commercial areas, CBDs, Universities, etc.
Rack in sheltered area	Short Term	Up to 6 hours	User provided locks	First Come, First Serve	Sheltered from sun/rain under an awning, bldg. entry, or specially designed structure, etc.	Utilitarian Transportation & Recreation Trips: Shoppers, recreational riders, tourists, people using bus or rail transit	Retail shopping districts/centers, restaurants, points of interest, park activity areas, schools, libraries, post offices, main streets, commercial areas, CBDs, etc.
Bike Lid	Medium Term	Up to 12 hours	User provided locks, may have added security from location within site of stationed or patrolling security personnel	First Come, First Serve	Sheltered from sun/rain by equipment design.	Bike Commuters, Utilitarian Transportation & Recreation Trips: Shoppers, tourists, people using bus or rail transit	Railroad and transit stations, retail shopping districts/centers, restaurants, points of interest, park activity areas, schools, libraries, post offices, main streets, commercial areas, CBDs, etc.
Locker	Long Term	Overnight and multiple days	High Security Equipment; may have added security based on siting location.	Subscription or rental required.	Sheltered from sun/rain by equipment design.	Bike Commuters: people using rail transit carpools, vanpools, etc., people making same trip on a regular basis.	Transit and Train Stations, Universities, Schools, Park and Ride Lots, Major Office Parks, etc.
Bicycle Storage Room, Fenced Bicycle Parking Area	Long Term	Overnight and multiple days	Highest Security resulting from locks and limited access.	Select Users, special key or pass required.	Sheltered from sun, rain, moisture and all elements by being in doors; some fenced bike parking areas may not be covered, such as on schools grounds (K-12).	Commuters, Employees, Students, Residents of multi-family residential bldgs.	Large office buildings, other employment locations, parking garages, residential bldgs., schools, university dorms, etc.

Table 1: Bicycle Parking Equipment Characteristics

Newly Constructed Bicycle Facilities

Issue

When on-road bicycle facilities are newly constructed, roadway users must go through a learning period to fully understand the changes and exactly what the new bicycle signage, symbols and markings mean. During this time period, inappropriate maneuvers by drivers and bicyclists may be more frequent.

Strategies

A coordinated and timely effort to educate the public about changes to a transportation facility may shorten the public's learning period, make road users feel more comfortable with and accepting of the changes, and improve overall safety.

Strategy One – Construction Information

Signs: This strategy involves placing construction information signs to inform the public that changes have occurred and explain what the new symbols, signage and markings mean. Details for these construction signs and their locations would be included in the construction staging/maintenance of traffic section of the design plans. These signs would be in place for approximately thirty to sixty days following the implementation of the new facility.

Strategy Two – Other Public Outreach:

The public information effort can be supported through other types of outreach strategies such as using variable message signs, providing information on City websites, at design public meetings, and in handouts for civic associations and neighborhood groups, etc.



Figure 9: Example Awareness Signs

Source: TDG Image Created for Baltimore
New Traffic Pattern Ahead – Virginia DOT
Share the Road and Bike Lane Sign

Note:

Temporary traffic control (TTC) devices are found in the Chapter 6 of the MUTCD. These signs are based upon the principal of providing information to roadway users as detailed in Section 6F.55 of the MUTCD for variable message boards following the principals set forth in Chapter 6 of the MUTCD for TTC devices. It is recommended that the City follow the MUTCD experimentation process when implementing these new bicycle facility awareness signs.

Sharing the Road

Issue

Due to the relatively high speed differentials between bicycles and vehicular traffic, there is frequently a need to warn drivers to watch for slower forms of traffic sharing the roadway. There may also be the need to inform bicyclist of where they may be located within a shared roadway for safest operation or to simply make it clear that bicyclists are allowed to use the road

In some situations, shared roadways serve as a link in a bicycle route network where a more desirable facility can't be implemented due to some type of constraint, i.e. a few blocks that are too narrow for bike lanes on a road that otherwise has them designated at each end.

Shared roadways may also serve as a transition for bicyclists where a dedicated bicycle facility terminates onto a roadway appropriate for bicycle use.

Shared roadways may also serve as a transition for bicyclists where a dedicated bicycle facility, such as a bicycle lane, terminates onto a roadway appropriate for bicycle use. "Share the Road" signs should be used to identify these transition locations.

Strategies

Strategy One - Share the Road Signs:

"Share the Road" signs can be used to inform drivers that slower forms of traffic are using the roadway. It also warns bicyclists that they will be required to share travel lanes with motor vehicles. "Share the Road" signs can be used on roads within the bicycle route network or locations outside the network that are deemed appropriate, i.e. a road suitable for shared use that may be encountering inappropriate driver behavior. "Share the Road" signs may only be used on roads that have no dedicated space for bicyclists and they are not for use in designating signed bike routes.

There is currently a wide variety of "Share the Road" sign types in use around the country. It's

recommended that the City of Baltimore examine possible sign options to choose the variation most appropriate for the City. It is recommended that the City follow the MUTCD experimentation process if implementing a non-standard sign type.



Figure 10: "Share the Road" Signs
Source: MUTCD, Part 9



Figure 11: Variation of the "Share the Road" Sign
Source: TDG Photo – Route 6A, Cape Cod Massachusetts
Non MUTCD sign used in Massachusetts

Sharing the Road (Continued)

Strategy Two - Bike May Use Full Lane

Signs: “Bikes May Use Full Lane” signs are used on shared roadways where travel lanes are too narrow for bicycles and vehicles to operate side by side (9’ to 11’ travel lane). They inform the bicyclist that they can or may operate towards the center of the travel lane for safest operation. (See Bicycle Design Guide Details for “Bike May Use Full Lane” sign details).

Strategy Three – Shared Lane Marking:

The shared lane pavement marking is typically used where a bike lane is desired but can not be implemented due to insufficient roadway width or other constraint. Use of the shared lane marking would be applicable in the following situations:

- In a wide lane (12’ or greater) on a two lane roadway.
- In the right lane of a 4 to 6 lane arterial.
- On a **signed bike route** where lane widths narrow (12’ or less) or where traffic volumes and speeds are relatively high, possibly in conjunction with “Share the Road” signs.
- For route continuity between sections of roadway where a more desirable facility can’t be implemented.
- Within a shared bus/bicycle lane.

The pavement marking warns the motorist of the presence of bicycles while helping the bicyclist determine which the part of the road they may use to be most visible to drivers, and to help avoid conflicts with parked cars. It can also serve to identify a link in a bicycle route network and assist in wayfinding. See Bicycle Design Guide Detail 6.

Periodic use of the “Share the Road” sign is recommended to accompany the Shared lane marking. If share the road signs are used, they may be located immediately adjacent to the pavement marking and may include a downward arrow (45 degrees down and left) pointing directly at the symbol, making it clear what the symbol means.

The strategies presented above can be implemented individually or in conjunction with

one another. Also, refer to the MDSHA Bicycle and Pedestrian Guidelines for further policies regarding shared roadways.



Figure 12: “Bike May Use Full Lane” Sign

Source: NCUTCD

The sign is currently under consideration by the NCUTCD for inclusion in the MUTCD.

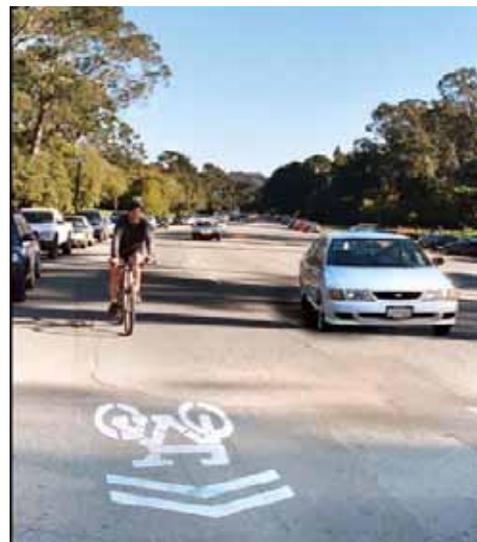


Figure 13: Shared Lane Pavement Marking

Source: TDG Photo from San Francisco.

The marking is currently under consideration by the NCUTCD for inclusion in the MUTCD. It was adopted by the California DOT.

Note

The shared lane marking and the “Bikes May Use Full Lane” sign are currently under consideration by the NCUTCD for inclusion in the MUTCD. It is recommended that the City follow the MUTCD experimentation process when implementing these new traffic control devices. The shared lane marking symbols are currently in use in Cambridge, San Francisco, Portland, and Colorado Springs.

Bicycle Facilities with Peak Hour Restricted Parking **Issue**

Peak hour parking restrictions on roadways where a designated bicycle facility is desired create a particular challenge. During peak times vehicles are restricted from parking along the curb, therefore bicyclists may position themselves adjacent to the curb. At all other times bicyclists naturally ride in the area just to the left of the parked vehicles in the left over space of the lane. This situation requires bicyclists to position themselves at different locations within the street depending upon the time of day, which creates a challenge when providing signs and/or pavement markings to direct bicyclists to proper position.

Strategy

Pavement marking schemes can be used to designate a single lane to function as a parking lane and designated bicycle facility depending on the time of day. During peak times when parking is not allowed, bicyclists can share the right most lane with motor vehicles using the area to the right of the “Parking T” (as shown in the Figure 12). During off-peak hours when parking is allowed, bicyclist can use the area between edge of the travel lane and the parked vehicles, i.e. to the left of the “Parking T”.

The right most lane (parking lane) may be a minimum of 13 feet wide. This allows 8 feet for parking and 5 feet for the cyclist during off peak times. However, the lane may not be so wide to encourage two vehicles to travel side by side during peak times, or use the space between the right lane line and the “Parking T” as a travel lane. Overall lane widths greater than 16 feet and a spacing between the right lane line and “Parking T” greater than 6 feet may be avoided as wider widths encourage motor vehicle usage.

A shared lane pavement marking may be used in the first and last parking space of each block to designate that this area is shared by bicyclists and motor vehicles during peak hours. (See Bicycle Design Guide Standards for “Shared Lane” marking details). This pavement marking strategy may be used with parking restriction signs establishing the times for various uses.

When the total width of the parking lane approaches the minimum of 12 feet, use of the “Look for Bikes” dooring sign (as shown in Figure 1) may be used.



Figure 14: Bicycle Facility with Peak Hour Restricted Parking

Source: Created for City of Baltimore based on observations in Charlotte, NC

Note

This strategy would require that the City adopt a broken line spacing that meets the MUTCD requirement of 1:3 (solid:gap) but differs from Baltimore City practice of providing a 10' line with a 30' gap. The use of a shared lane marking in this circumstance has been observed in Toronto. It is recommended that the City follow the MUTCD experimentation process when implementing this modified traffic control marking approach.

Contra-Flow Bicycle Facilities

Issue

Two-way bicycling accommodations are sometimes necessary on one-way roads because directing bicyclists to an adjacent street is not possible, would be inconvenient, or would make wayfinding difficult.

Providing two-way bicycle accommodations on a one-way street creates a “contra-flow” situation—i.e. a situation where one direction of bicycle travel will be going against motor vehicle traffic unaccompanied by parallel motor vehicle traffic. These situations are challenging from a design and operations standpoint due to the potential for conflicts and fact that motorists may not be expecting on-coming bicyclists.

However, in many cases, signing, pavement markings, special signalization and/or traffic calming measures can be used to help cyclists and drivers operate safely within contra-flow sections.

Careful consideration shall be given to all alternative routings before implementing a contra flow facility. An engineering study shall be performed for all contra flow facilities to determine appropriate traffic control measures.

Strategies

To implement a safe and effective contra-flow bicycle facility a variety of factors shall be considered, including:

- street classification—generally contra-flow facilities are not applicable on arterials or streets with posted speeds above 25 mph.
- the character of the street, i.e. is it a residential neighborhood street, or a street with retail or commercial establishments, etc.
- the street width and length of contra-flow section needed
- typical vehicle speeds, traffic volumes, posted speed limits and nature of existing traffic flow



Figure 15: Example Contra-Flow Signage.

Source: MUTCD

One Way (R6-1)

Do Not Enter (R5-1)



Figure 16: Example Contra-Flow Signage.

Source: San Francisco Bicycle Design Guideline

- parking regulations and typical turnover rate, number of connecting streets and driveways within the proposed contra-flow section
- needs for emergency vehicle access, maintenance vehicles such as garbage trucks, and other street uses

Note

Contra flow facilities are not recommended as a solution unless there is no other alternative. Special consideration should be given to providing signs that can effectively warn all roadway users of the potentially unexpected bicycle travel pattern. It is recommended that the City follow the MUTCD experimentation process when implementing new signs such as those shown in Figure 16.

Contra-Flow Bicycle Facilities (Continued)

Based upon existing conditions a variety of traffic control interventions can be considered.

Strategy One - Signs: On very short stretches (1-3 blocks), or on local neighborhood streets with low vehicular speeds and volumes, simply adding signs may be sufficient to inform the cyclist that they can use the facility while warning drivers that oncoming bicycle traffic is to be expected.

Strategy Two - Pavement Markings: For longer contra-flow sections, or where traffic speeds and volumes are more challenging, a contra flow bicycle lane, can be added. To provide a contra-flow bicycle lane, sufficient roadway width must be available. The precise location of contra-flow lanes is critical in situations where parking is allowed on both sides of a street. Wider contra flow lanes may be considered adjacent to parking. Additional signage or more frequent pavement markings may be needed where parking turns over frequently.

Strategy Three - Signals: In situations where intersections are already controlled by traffic signals, contra flow cyclists will need bicycle signal heads installed to indicate their movements. Bicycle loop detectors can also be installed to include the contra-flow movement in the cycle only when needed thus eliminating unnecessary delay to motor vehicles. (See Bicycle Design Guide Standards for bicycle detection details).

Strategy Four—Traffic Calming: Traffic calming measures that do not pose a hazard to bicyclists can be used to slow vehicular traffic and make the contra-flow environment safer. Appropriate locations include at the entry points to contra flow sections, or at in between locations on longer contra-flow segments.

Please note that some of the strategies presented above can be implemented individually or in conjunction with one another.

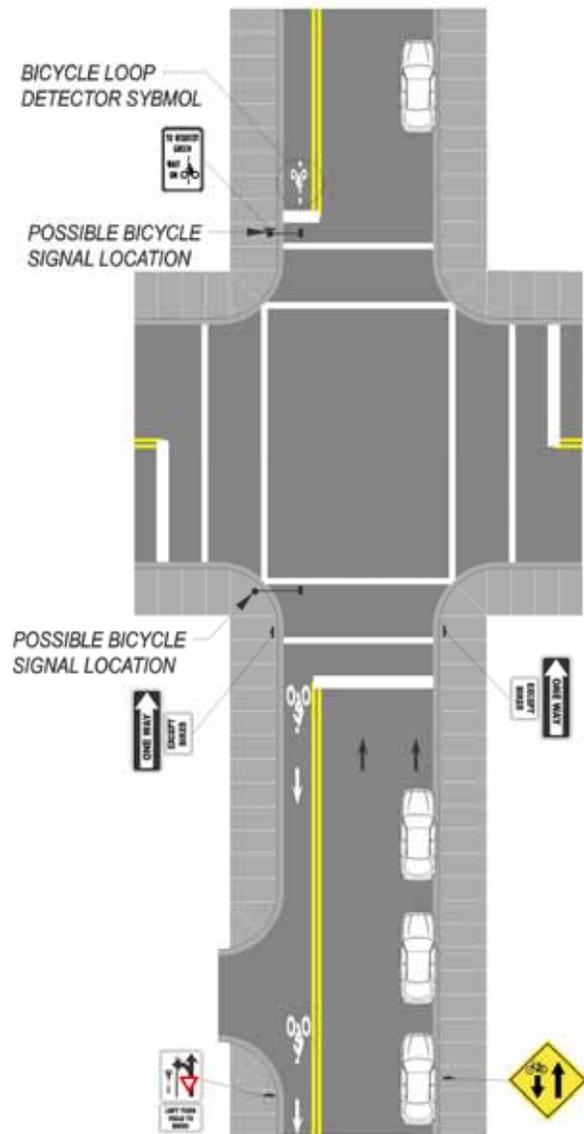


Figure 17: Example Contra-Flow Bicycle Lane with Bicycle Signal



Figure 18: Bicycle Signal Head

Exclusive Bus and Bicycle Lanes

Issue

At times bicycle lanes are needed on streets that already have (or need) exclusive bus lanes as well, yet the street may not have sufficient width to support an exclusive lane for each mode. Many communities have found it possible to combine bicycle and bus lanes, thus providing improved service for both of these modes while minimizing space requirements.

Strategies

Exclusive transit lanes may be needed for a variety of reasons:

- To better accommodate busses where stops are frequent.
- To address the need for extended curbside passenger loading space for a mix of bus, shuttle and van services.
- To improve efficiency of the bus service in a congested corridor.
- To accommodate a large volume of transit vehicles using a corridor such as in a downtown transit mall.

Exclusive bicycle accommodations may be needed for a variety of reasons:

- To provide greater safety for bicyclists in heavy urban traffic.
- To maintain continuity of facilities between bike lanes that are present on one or both ends of the area with the exclusive bus lane.

The strategies presented here are geared toward bus operations in an urban street grid with relatively frequent stops and lower speeds. Combining buses and bicycles in an exclusive transit lane is not recommended when bus speeds exceed 35 mph or in congested transit conditions where headways are two minutes or less, throughout most of the daytime hours.

However, in many situations an exclusive bus lane can significantly improve transit service even when typical headways may be up to five or ten minutes.



Figure 19: Example Bus and Bicycle Lane Sign

Note

Shared Bus/Bicycle lanes are currently in use in Washington DC, Philadelphia, Madison-WI, and Toronto. Their use in Baltimore should be based upon an engineering study. There are no standard MUTCD signs for use in shared bus/bicycle lanes, so it is recommended that the City follow the MUTCD experimentation process when implementing new signs such as one shown in Figure 19.

Exclusive Bus and Bicycle Lanes (Continued)

In these situations combining bus and bicycle use in a single shared lane can improve level of service for both modes with the least amount of space dedicated to non-auto travel. For example a combined bicycle and bus lane of 15 feet in width can accommodate both modes similar to a dedicated 13-foot bus lane and 5-foot bike lane, which requires three additional feet to be taken from general service travel lanes.

Shared bicycle/bus lanes may be a minimum of 14 – 16 feet wide, depending on the size of the biggest transit vehicle expected to use the lane and amount of space available in the overall cross-section. Fifteen feet is typically the most desirable width.

Typically, exclusive bus lanes are provided on the right hand side of the street to increase the bus's unrestricted access to the curb for passenger pick-up and drop-off. When bicycles are sharing a bus lane, the shared lane pavement marking may be applied on the left hand side of the shared lane to indicate that bicyclists may use the left side rather than the traditional right hand side of the lane. This will reduce the potential for bike/bus conflicts, especially leapfrogging, which may be eliminated because the bus can pass a slower moving bicycle on the right and a bicycle can pass a slower moving or stopped bus on the left.

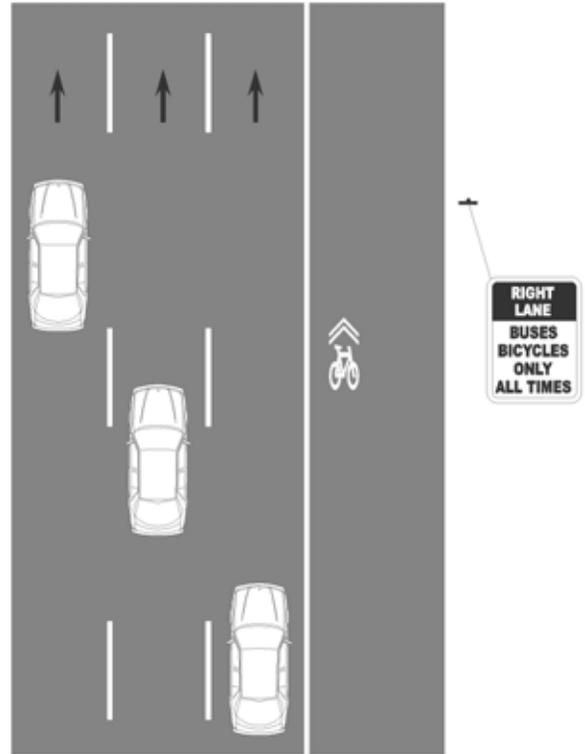


Figure 20: Example Bus/Bicycle Lane

Restricted Street Entries for Motor Vehicles

Issue

In the City of Baltimore, one-way streets have been created to eliminate cut through traffic. However, this can create problems when establishing bicycle routes. To keep bike routes simple and direct, it is best to route each direction of bike travel on the same street. One-way streets disrupt the bike route network unless they exist in adjacent pairs. This is not always the case in Baltimore's residential areas.

Strategy

Restricting motor vehicle entry with a curb extension can allow conversion of a one-way street to two-way operations while accomplishing the following goals:

- Maintaining a barrier against cut through traffic
- Reducing traffic speeds
- Avoiding the use of a contra-flow bicycle facility.

To restrict motor vehicle entry, the curb is extended into the street blocking one direction of travel. This prohibits vehicular traffic from entering this section of the street. A pathway cut through is provided to allow bicycles to pass through the curb extension. The other end of the block would be open to two-way traffic. This actually provides better access than a one-way street by allowing residents to exit the block at both ends.

There are a handful of other design options that accomplish similar goals by restricting particular movements. For example, flared medians can be installed that only allow right turns in and out of a particular block. This also allows access to a two-way street while prohibiting or reducing cut through traffic.

The appropriate solution for a particular location can be determined by meeting with the residents and businesses in the neighborhood and evaluating other design considerations such as geometrics, pedestrian interaction, storm drainage, traffic operations, etc.

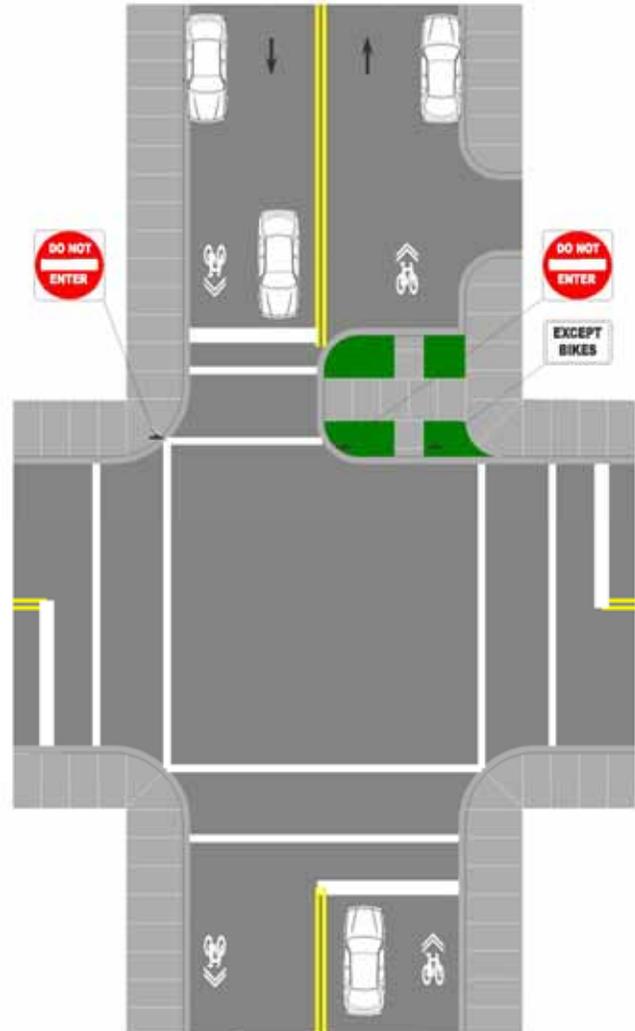


Figure 21: Example Restricted Street Entry/Curb Extension on a Shared Roadway



Figure 22: Example Restricted Street Entry

Note

The designer is encouraged to reference the ITE Traffic Calming: State of the Practice or the Innovative Bicycle Treatments guidelines listed in the bibliography for additional guidance on accommodating bicyclists through traffic calming devices.

Advanced Bicycle Boxes at Intersections

Issue

Periodically, in urban settings, bicyclists need to make a left turn to continue on a designated bicycle route, or to make a transition to a shared use path or left side bicycle lane. Because bicyclists are normally located on the right side of the road, or are in a bike lane on the right side, such situations create direct conflicts between the dominant motor vehicle traffic flow and the bicyclist desire line.

A similar situation arises when the dominant motor vehicle flow bears right, but the primary bicycle flow continues straight, such as at a “Y” in arterial roads or at a location where an arterial road transitions to a limited access, high speed highway via a right exit ramp. These situations pose particular threats to bicyclists, but can be improved by using special treatments for bicyclists at intersections called the Advanced Bicycle Box (ABB).

This treatment is best utilized in locations with heavy volumes of left-turning bicyclists, particularly on roads with high volumes of motor vehicle traffic which limit merging opportunities for bicyclists.

This treatment may also be utilized in locations where bicyclists frequently block high volume pedestrian crosswalks.

Strategy

If a traffic signal is present (or can be installed) at a location where conflicting bicycle/motor vehicle flows cross paths, the Advance Bicycle Box (ABB) can be used to reduce conflicts and enhance the safety of bicyclists needing to make through or left turn maneuvers. An ABB allows bicyclists to move in front of cars waiting at an intersection for the purposes of getting in the proper position for a left turn or to avoid being cut off by right turning traffic.

Using an ABB increases a bicyclist’s visibility to motor vehicle drivers, and allows them to get into the upcoming roadway segment first, before motorists have fully occupied the travel lanes.



Figure 23: Advanced Bicycle Box

Note

The advanced bicycle box is equivalent to an advanced stop line allowed for in the MUTCD (Section 3B.16). The use of the bicycle symbols to designate the bicycle box space is not a standard treatment in the MUTCD. It is recommended that the City follow the MUTCD experimentation process symbols are utilized to designate a bicycle box.

The use of colored pavements is strictly controlled by the MUTCD. Recently Portland Oregon experimented with blue pavement in conflict zones and Burlington, Vermont experimented with green. It is recommended that the City follow the MUTCD experimentation process when implementing colored pavement markings until a final determination is made on this issue and incorporated into the MUTCD.

Advanced Bicycle Boxes at Intersections (Continued)

An ABB is created by pulling the stop bar back from the crosswalk to create a 10-15 foot area between the stop bar and crosswalk where bicyclists can queue at the traffic light (see Figure 22). The ABB may be at the head of one, two or three travel lanes, which ever is appropriate to facilitate the necessary bicycle movements. Bicycle signal heads may be used in conjunction with an ABB to allow programming of an independent, advanced green phase for cyclists. A countdown signal can be added to alert bicyclists of the amount of time available to get into the ABB before the parallel traffic is given a green light.

During a red signal phase, bicyclists are able to better position themselves for a left turn by moving left across the bike box. ABBs are most effective when a bicycle lane is present on the street. The geometric key is that there is sufficient space on the right for a bicyclist to safely make one's way along a queue of vehicles stopped at the signal to the front of the line.

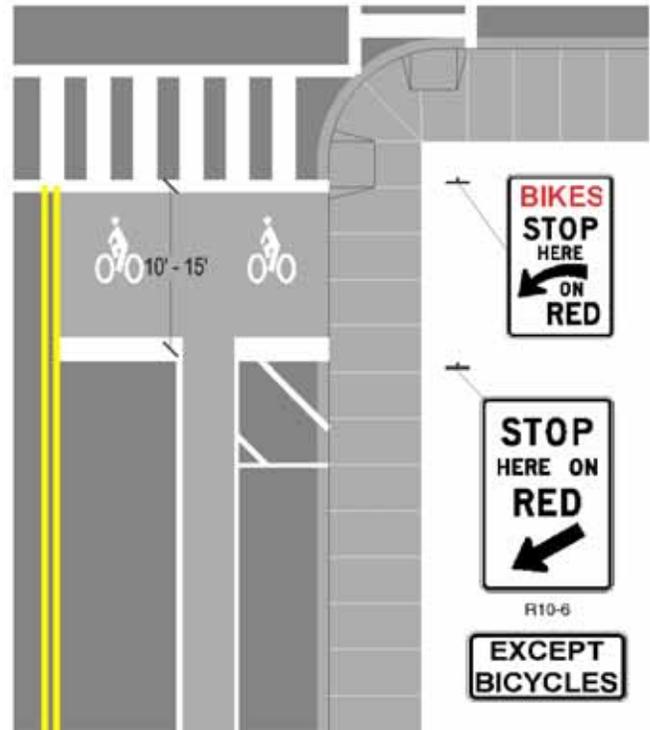


Figure 24: Example Advanced Bicycle Box Layout

Note

The signs shown for this treatment are a variation on the developed R10-6 and R10-6a, Stop Here on Red Signs. There are no standard MUTCD signs for use with an advanced bicycle box situations, so it is recommended that the City follow the MUTCD experimentation process when implementing new signs such as one shown in Figure 24.

Optimized Use of Right-of-Way Width

Issue

Many urban streets in Baltimore have expansive right-of-way widths. In some instances this width is primarily in pavement and is used to serve only motor vehicles at high speeds and peak hour volumes. In some cases very wide sidewalks are provided. In other instances the right-of-way width is used for large lawn or tree planted medians. A variety of solutions may be available to re-allocate some of this right-of-way width to improve conditions for bicycling.

Strategies

The City can evaluate the corridors with expansive right-of-way widths and adopt standards and policies to guide the redesign of these roads when restriping, resurfacing, rehabilitation or reconstruction is undertaken.

Strategy One – On-Street Facilities:

Following are strategies for gaining extra space that can be redistributed for bicycle use in the roadway as wide outside lanes, striped shoulders or bike lanes. Table 2 shows possible uses depending on the amount of extra width obtained:

- On multi-lane roadways travel lanes can be narrowed to 10 or 11 feet.
- On streets with raised medians, the median could be narrowed providing more pavement width.
- Road diets can be employed, if appropriate, to eliminate one or two travel lanes.
- If parking supply exceeds demand, parking can be consolidated and limited to one side of the street, or eliminated altogether if it is truly unnecessary.

References

American Association of State Highway and Transportation Officials. “Guide for the Development of Bicycle Facilities.” Washington, D.C.: AASHTO, 1999.

Strategy Two – Off-Street Facilities:

Following are strategies for converting extra off road right-of-way width for use by bicycles:

- On roadways with generously wide sidewalks, one-way sidewalk bicycling (8’ minimum width) can be implemented or a curb separated bike lane can be created between the right travel lane and sidewalk/tree buffer.
- Sometimes unique roadway configurations, topography and/or adjacent land uses create imbalanced traffic flow patterns and bicycle desire lines over relatively long distances. It may be safer and more effective to design different bicycle accommodations for each side of the road.

Example Redistribution of Extra On-Street Width for Bicycle Use (One Direction of Travel)		
<u>Extra Width Obtained</u>	<u>*Resulting Outside Lane Width</u>	<u>Use of Extra Width</u>
5' or more	15' or more	Install a dedicated bicycle lane.
3' to 4'	13' to 14'	Install a wide outside lane the "Shared Lane" (Sharrow) pavement marking, or a striped shoulder.
2'	12'	Install a wide outside lane, with possible "Shared Lane" (Sharrow) pavement marking.
1'	11'	Make the outside lane wider than other lanes.

* Assuming minimum beginning lane width of 10'

Table 2: Example Redistribution of Extra On-Street Width

Note

The designer is encouraged to utilize engineering judgment when developing retrofit solutions to accommodate bicyclists within the road environment and to follow the MUTCD experimentation process when traffic control strategies other than those currently in use in the MUTCD are utilized.

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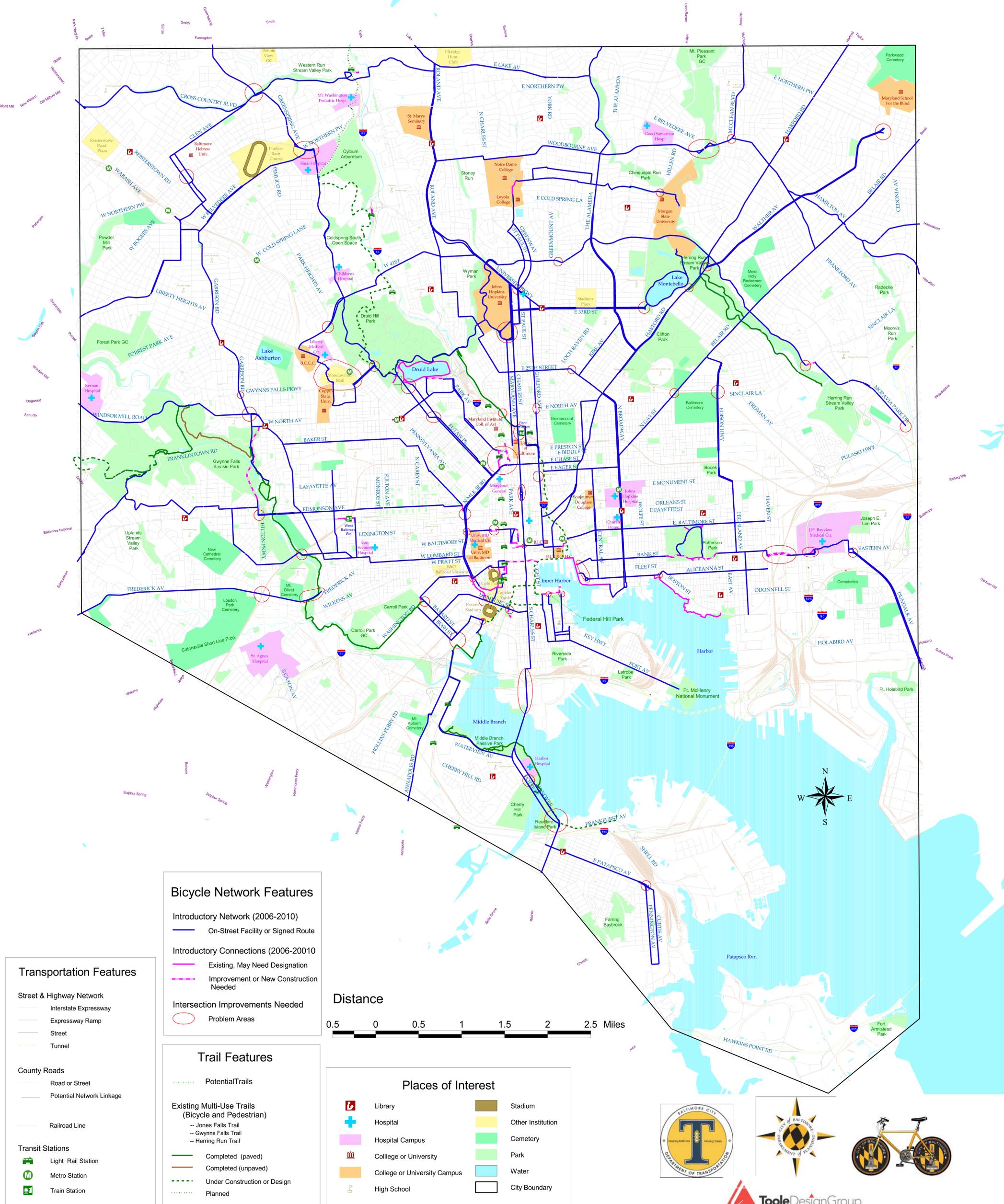
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Introductory Bicycle Network Baltimore Bicycle Master Plan

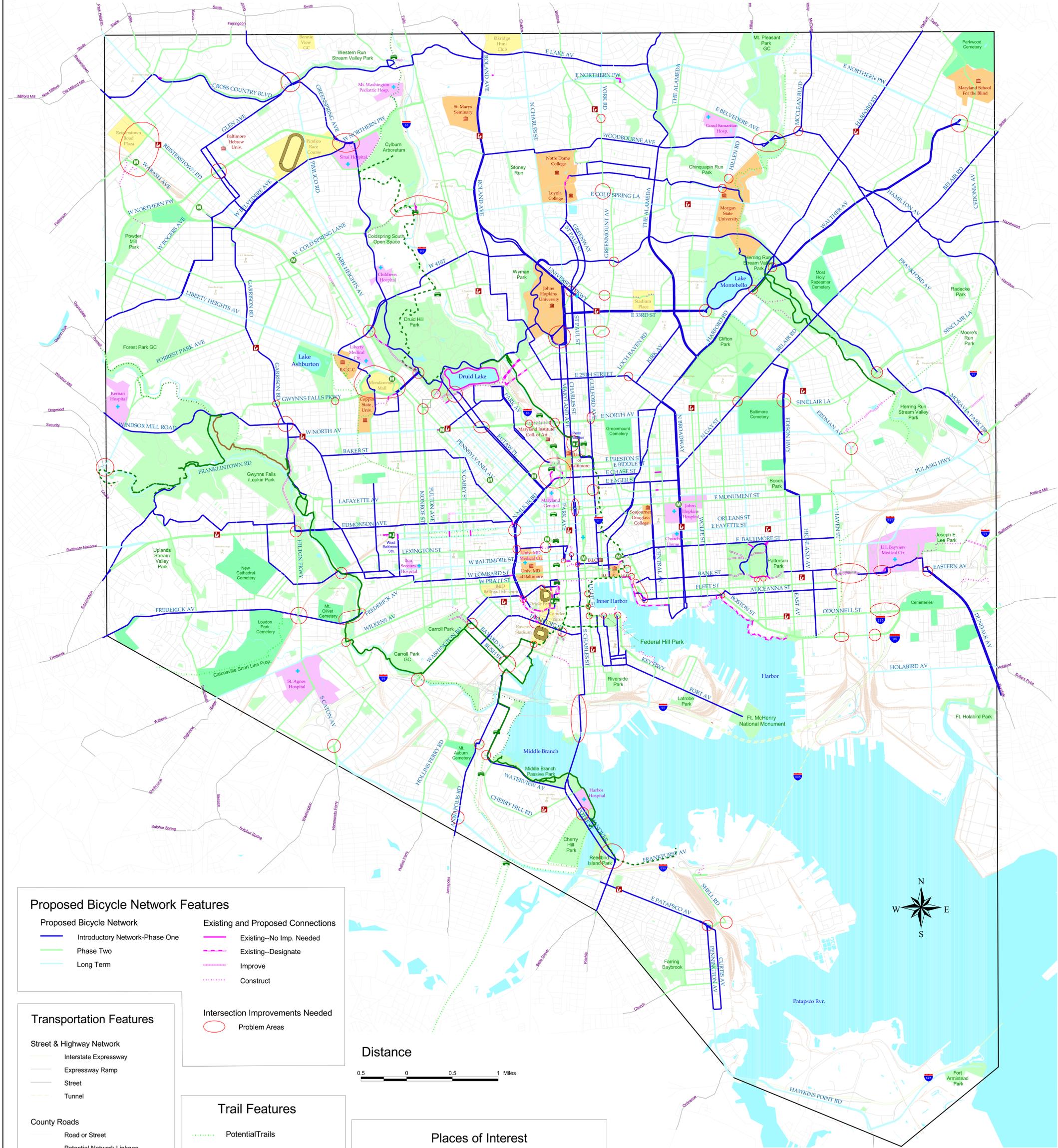
Map A May 2006



Full Bicycle Network -- Phases 1-3

Baltimore Bicycle Master Plan

Map B
May 2006



Proposed Bicycle Network Features

Proposed Bicycle Network

- Introductory Network-Phase One
- Phase Two
- Long Term

Existing and Proposed Connections

- Existing--No Imp. Needed
- Existing--Designate
- Improve
- Construct

Intersection Improvements Needed

- Problem Areas

Transportation Features

Street & Highway Network

- Interstate Expressway
- Expressway Ramp
- Street
- Tunnel

County Roads

- Road or Street
- Potential Network Linkage

Transit Stations

- Light Rail Station
- Metro Station
- Train Station

Trail Features

Existing Multi-Use Trails (Bicycle and Pedestrian)

- Jones Falls Trail
- Gwynns Falls Trail
- Herring Run Trail

- Completed (paved)
- Completed (unpaved)
- Under Construction or Design
- Planned

Distance



Places of Interest

- Library
- Hospital
- Hospital Campus
- College or University
- College or University Campus
- High School
- Stadium
- Other Institution
- Cemetery
- Park
- Water
- City Boundary

