Baltimore Regional Transportation Board

Access to Rail Stations in the Baltimore Region

BRTB
Baltimore Regional Transportation Board

KCI TECHNOLOGIES

CROSSROADS TRANSPORTATION

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EXECUTIVE SUMMARY

The Baltimore Region Transportation Board (BRTB) sought consultant services for an inventory of conditions and an analysis of the bicycle and pedestrian accommodations around the Baltimore Region's rail stations. The inventory to be completed in six months was to lead to the development of recommendations and costs for improvements proximate to the region's sixty stations.

The project required the compilation of a large amount of base data most of which was to be provided by the Baltimore Metropolitan Council (BMC) or through local jurisdictions and state agencies in coordination with BMC. Most, but not all desired data was made available to the consultant team.

The BMC sought a 3 mile radius of coverage for bicyclists and a 0.6 mile radius for pedestrians at each station. Due to rail station locations in the region, there was considerable overlap between the areas of coverage for stations. An ArcGIS geodatabase was created. Field data collection focused on bicycle and pedestrian network deficiencies. Data collected was geo-coded for mapping and analysis purposes.

For each station area planners documented the land use, character, population, transit services and plans for transit oriented development. Engineers consulted standard industry guidelines for bicycle and pedestrian facilities and local jurisdiction and State design manuals and plans to determine the type of facility recommendations to be made in addressing deficiencies.

Costs for the recommended improvements were estimated by making certain assumptions and applying unit costs to estimated quantities and lengths. For cost estimating purposes each improvement was associated only with the nearest station. The cost of the recommended improvements have been summarized by jurisdiction as well as by responsible party (city, county or state)

Recent bicycle and pedestrian crash data was provided by the Maryland State Highway Administration's (SHA) Office of Highway Safety (OHS). For most jurisdictions 3 year data was provided, however for Baltimore City only two year data was available in usable format. The crash data was provided after the field work had been completed. Due to the limited schedule and budget for the project, an analysis of the data was not possible, but crash locations have been mapped for each station.

Maps were prepared to show the bicycle and pedestrian accommodation deficiencies found and the recommended improvements for each station.

As a result of this analysis the BRTB has been provided with a snapshot of conditions at the region's rail stations. BMC and local jurisdiction staff can refer to the report, the maps and the database provided, to understand the existing conditions for bicyclists and pedestrians near rail stations.

A determination can be made about whether the recommended improvements for a given station area are compatible with the local jurisdiction and regional objectives and policies in place for the area. For the station areas where the recommendations are compatible with the objectives for area, the region's planners could highlight the area as a demonstration of rail, bicycle, pedestrian and land use policies working together successfully. Means should be established to implement the recommendations in such areas. For station areas where the recommendations may be inconsistent with local or regional objectives for the area, attention should be paid. Limited financial resources should not be spent on improvements that would be inconsistent with local intent nor should bicyclist or pedestrian activity be further encouraged in areas where it may not be intended.

In any event the recommendations can be used as the basis for determining regional priorities for program funding and more detailed studies.

PROJECT OVERVIEW

The Baltimore Regional Transportation Board (BRTB) is interested in access to transit and connectivity and the impact it has on the livability and economic vitality of the region. For this reason the BRTB sought consultant services to complete an updated station inventory for the region.

Through BMC's technical staff, the BRTB requested an updated inventory as well as an assessment of bicycle and pedestrian accommodations for the Metro, Light Rail and MARC stations within the Baltimore Region. The report was to include mapping, as well as transit ridership and parking information, and other related planning information. The area around each station to be included for review was increased, and the report was to present analysis, recommendations and planning level estimates of costs for the recommended improvements. The work was to be completed within six months.

A statewide rail station inventory was completed for MDOT in 1997 as part of the Access 2000 Report. Table 1 lists the sixty stations included in this inventory.

The team led by KCI Technologies and supported by Crossroads Transportation was selected for the project. The KCI team's approach was to utilize modern technology for efficient data collection and analysis.

PROJECT APPROACH:

The project required that information be provided by BMC, local jurisdictions and State agency staff. The following describes the meetings held as part of the project coordination.

BMC COORDINATION

12/17/10 Project Kick-Off Meeting

The KCI Team met with BMC staff to discuss impressions of the previous report, key consultant and agency staff to be involved, the desired level of project coordination and the anticipated schedule. There was a review of items to be inventoried, information needs and potential sources of data. The desired content for the jurisdiction profiles was confirmed. The list of stations was also confirmed.

01/28/11 Meeting on Security

KCI Project Manager met with BMC and MTA staff to review police and homeland security considerations for field personnel. Notification of all local police agencies was requested. Letters of notification were subsequently sent to police in each jurisdiction as well as to security at the MTA and the MD Aviation Administration.

02/17/11 Meeting on Approach to Cost Estimating

KCI engineering staff met with BMC staff to review the proposed approach to cost estimating

03/09/11 Progress Meeting

The KCI Team met with BMC staff to review progress to date. The discussion focused on of the status of information requests; review of field work completed and anticipated; and mapping format and content.

05/04/11 Bicycle Pedestrian Advisory Group Meeting

KCI's Project Manager provided an overview of the work and analysis to be completed to BMC staff and the local jurisdiction representatives on the Advisory Group.

06/27/11 Progress Meeting

The KCI Team meeting with BMC staff to review recommendations and draft report

LOCAL JURISDICTION COORDINATION

KCI staff made initial requests for local jurisdiction and state agency data through BMC's project manager. A matrix of desired GIS and other data was submitted to the BMC GIS coordinator. The matrix was updated several times as data was provided. Some follow up occurred directly with local jurisdiction staff.

AGENCY COORDINATION

KCI's initial requests for information and data from MTA and SHA were discussed with BMC staff. Follow up with each respective agency occurred as needed.

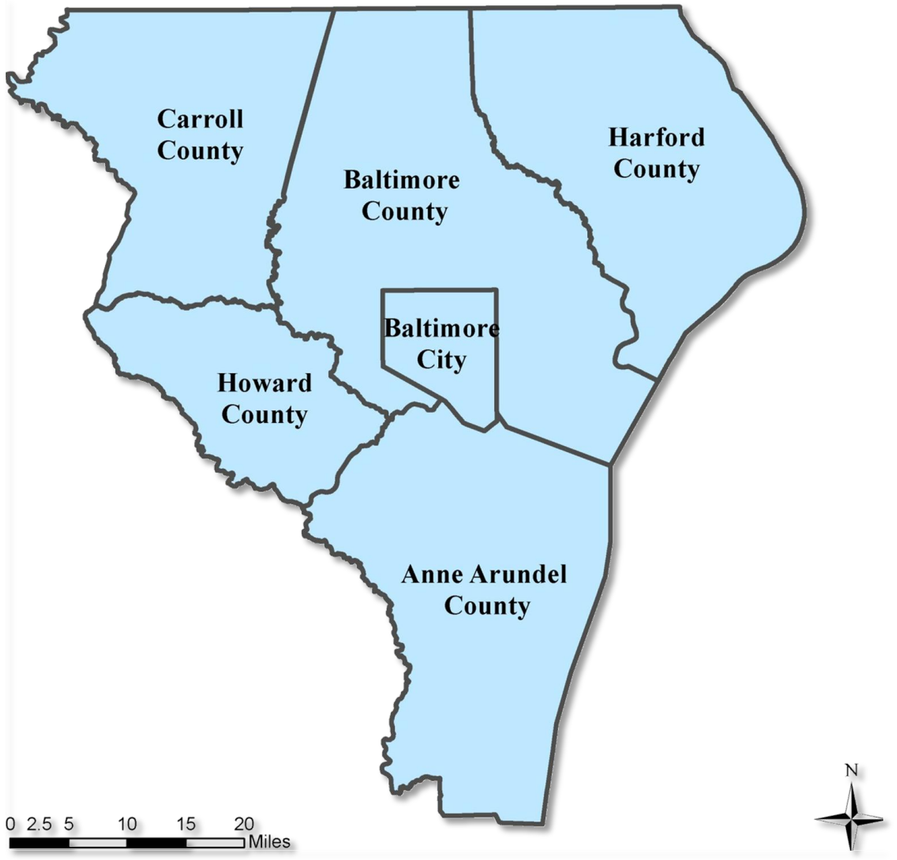
TABLE # 1 STATIONS INVENTORIED

Station Name	Rail Line	Jurisdiction	Address
Owings Mills	Metro	Balto.Co.	5018 Painters Mill Road
Old Court	Metro	Balto.Co.	4300 Old Court Road
Milford Mill	Metro	Balto.Co.	4401 Milford Mill Road
Reisterstown Plaza	Metro	Balto.City	6301Wabash Avenue
Rogers Ave	Metro	Balto.City	4300 Hayward Avenue
West Cold Spring	Metro	Balto.City	4301 Wabash Avenue
Mondawmin	Metro	Balto.City	2307 Liberty Heights
Penn North	Metro	Balto.City	1601 North Avenue/ 2501 Pennsylvania Avenue
Upton /Ave Market	Metro	Balto.City	1702 Pennsylvania Avenue
State Center/Cultural Center	Metro	Balto.City	302 W. Preston Street
Lexington Market	Metro	Balto.City	301 W. Lexington Street
Charles Center	Metro	Balto.City	31 W. Baltimore Street/ 110 E. Baltimore Street
Shot Tower/Market Place	Metro	Balto.City	729 E. Baltimore Street
Johns Hopkins Hospital	Metro	Balto.City	706 N. Broadway Street/ 600 N. Broadway Street
Hunt Valley	LRT	Balto.Co.	98 Shawan Road
Pepper Road	LRT	Balto.Co.	1101 Schilling Road
McCormick Road	LRT	Balto.Co.	265 Schilling Road
Gilroy Road	LRT	Balto.Co	10903 Gilroy Road
Warren Road	LRT	Balto.Co.	300 W Warren Road
Timonium Fairgrounds	LRT	Balto.Co.	2335 Greenspring Road
Timonium Business Park	LRT	Balto.Co.	60 Business Park Drive
Lutherville	LRT	Balto.Co.	150 W Ridgely Road
Falls Road	LRT	Balto.Co.	Falls Road @ Railroad Ave
Mount Washington	LRT	Balto.City	Smith Ave @ Newberry Street
Cold Spring Lane	LRT	Balto.City	1700 W Cold Spring Lane
Woodberry	LRT	Balto.City	Clipper Road @ Union Ave
North Avenue	LRT	Balto.City	500 W North Ave
Penn Station	LRT/MARC	Balto.City	1500 N Charles Street
University of Baltimore/M	LRT	Balto.City	Mt Royal Ave @ Dolphin St.
Cultural Center	LRT	Balto.City	Howard @Preston Street
Centre Street	LRT	Balto.City	Howard @ Centre Street
Lexington Market	LRT	Balto.City	Howard @ Lexington Sts.
University Center/Balto St.	LRT	Balto.City	Howard @ Baltimore Sts.
Convention Center/Pratt St	LRT	Balto.City	Howard @ Pratt Sts.
Camden Yards	LRT	Balto.City	Howard & Conway Sts.
Hamburg St.	LRT	Balto.City	S Howard & Hamburg Sts.
Westport	LRT	Balto.City	2400 Kloman St.
Cherry Hill	LRT	Balto.City	1700 Cherry Hill Road
Patapsco	LRT	Balto.Co.	800 Patapsco Ave.
Baltimore Highlands	LRT	Balto.Co.	4200 Baltimore St.
Nursery Road	LRT	Anne Arundel	3825 Baltimore Annapolis Blvd.
North Linthicum	LRT	Anne Arundel	450 N Camp Meade Rd.
Linthicum	LRT	Anne Arundel	200 Hawthorne Rd.
Ferndale	LRT	Anne Arundel	10 Broadview Rd.
Cromwell /Glen Burnie	LRT	Anne Arundel	7350 Baltimore Annapolis Blvd.
BWI Business District	LRT	Anne Arundel	678 Elkridge Landing Rd.
BWI Marshall Airport	LRT	Anne Arundel	International Pier BWI
Aberdeen	MARC Penn	Harford Co.	18 E Belair Avenue
Edgewood	MARC Penn	Harford Co.	2127 Old Edgewood Road
Martin Airport	MARC Penn	Balto.Co.	2710 Eastern Blvd.
Penn Station	MARC Penn	Balto.City	1500 N. Charles Street
West Baltimore	MARC Penn	Balto.City	401 Smallwood Street
Halethorpe	MARC Penn	Balto.Co.	5833 Southwestern Blvd.
BWI	MARC Penn	Anne Arundel	2 Amtrak Way
Odenton	MARC Penn	Anne Arundel	1400 Odenton Road
Camden	MARC Camden	Balto.City	301 West Camden Street
St Denis	MARC Camden	Balto.Co.	1734 Arlington Avenue
Dorsey	MARC Camden	How./AA Co	7000 Route 100
Jessup	MARC Camden	AA Co. /How.	8 Old Jessup Road
Savage	MARC Camden	How./AA Co	9009 Dorsey Run Road
Laurel Park	MARC Camden	How./AA Co	Laurel Racetrack Rd.

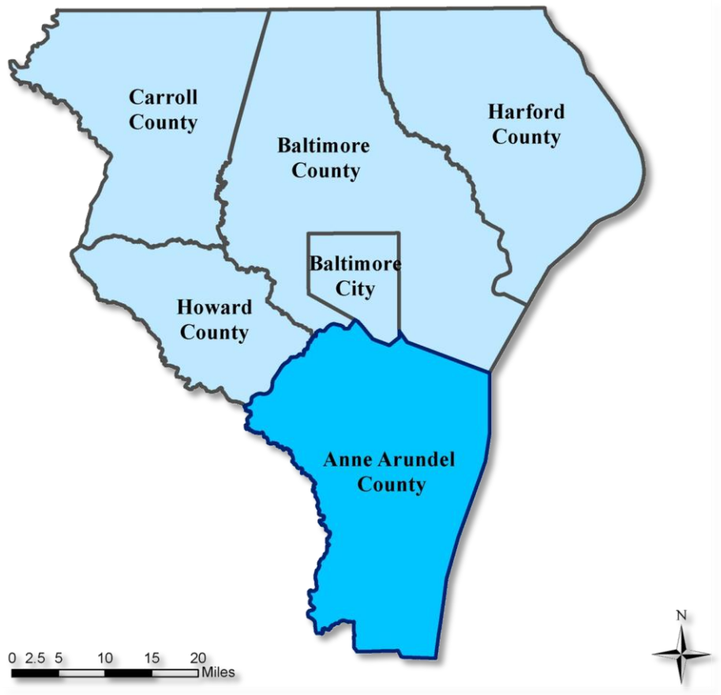
JURISDICTION PROFILES

RAIL TRANSIT IN THE BALTIMORE REGION

In the Baltimore Metropolitan Region, there are five jurisdictions that are served by passenger rail lines. A brief overview of those jurisdictions and the rail lines serving them follows. The next section of this document provides individual station profiles.



COUNTY NAME: Anne Arundel County



OVERVIEW

Anne Arundel County is served by two rail transit lines: the Central Light Rail Line and the Maryland Rail Commuter Service (MARC).

The Light Rail Line provides service 7 days per week and stretches for 29.5 mile beginning in Baltimore County, and extending south through Baltimore City to terminate in Anne Arundel County. There are seven stations located in northern Anne Arundel County: Nursery Road, North Linthicum, Linthicum, Ferndale, Cromwell/Glen Burnie, BWI Business District, and BWI Thurgood Marshall Airport. The line extends to the Linthicum station and then splits to travel to the BWI Thurgood Marshall Airport Station and to the Cromwell/Glen Burnie Station

The MARC Camden and Penn commuter rail lines serve the Baltimore region including Anne Arundel County. The Penn Line provides service only on weekdays and begins in Cecil County and travels through Harford County, Baltimore County, Baltimore City, Anne Arundel County, and Prince George's County with a terminus in Washington, DC at Union Station. The Penn Line stations located in Anne Arundel County are the BWI Rail Station and Odenton. The Camden Line provides service only on weekdays and begins at Camden Station in Baltimore City and travels through Baltimore County, Howard County and Prince George's County also terminating at Union Station in Washington, DC. There are four stations on the Camden Line that border both Anne Arundel County and Howard County: Dorsey, Jessup, Savage and Laurel Park.

The Light Rail and MARC lines provide opportunities for area residents to commute to employment throughout the region and to also take advantage of the many amenities the area has to offer including the Central Business Districts of Baltimore and Washington, DC. With connections to Amtrak's Northeast Corridor and the BWI Thurgood Marshall Airport, the rail lines essentially allow residents of Anne Arundel County and the Baltimore region to travel throughout the east coast, United States, and internationally.

Rail Line	Station	Population w/in 3 Miles of Station (2000)	Average Weekday Passengers (2010)
Light Rail	Nursery Road	87,422	547
	North Linthicum	81,324	741
	Linthicum	56,819	567
	Ferndale	62,048	119
	Cromwell/Glen Burnie	73,755	1,380
	BWI Business District	37,038	262
	BWI Marshall Airport	41,909	1,273
MARC Penn /Amtrak	BWI	27,887	1,660
MARC Penn Line	Odenton	39,235	2,191
MARC Camden Line	Dorsey	35,249	606
	Jessup	37,184	2
	Savage	46,567	586
	Laurel Park	70,736	14

Anne Arundel County completed a Pedestrian and Bicycle Master Plan in 2008. In 2009, the County completed a Transit Development Plan for its local transit services.

For more information about transportation plans and transit services in Anne Arundel County:

Anne Arundel County Department of Planning and Zoning Transportation Division
44 Calvert Street
Annapolis, MD 21401
Phone: 410-222-7450
www.aacounty.org/PlanZone/Transportation/Index.cfm

Maryland Transit Administration (MARC and Light Rail)
6 St. Paul Street
Baltimore, MD 21202-1614
Transit Information Call Center
Phone: 410-539-5000
www.mta.maryland.gov/index.cfm

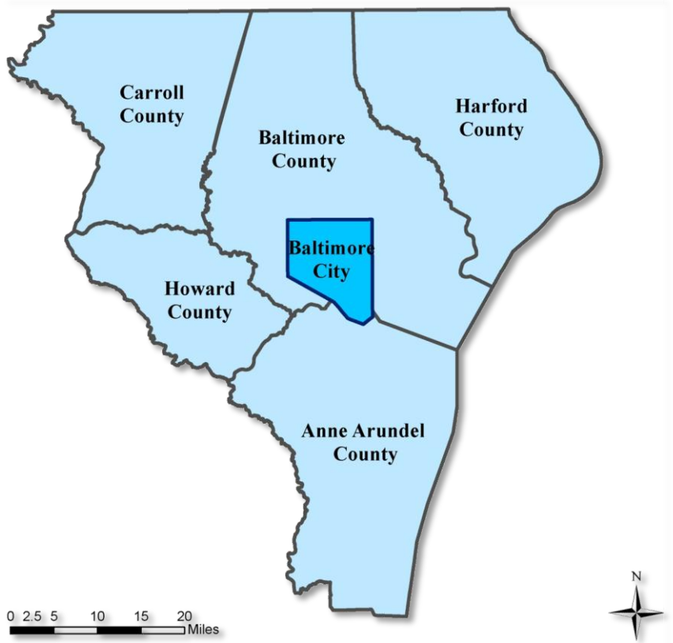
TRAILS

The Baltimore & Annapolis Hiker Biker Trail (B&A) extends 13.3 miles from Glen Burnie to Annapolis along the Old Baltimore Annapolis Railroad. Where the B&A Trail ends in Glen Burnie, the BWI Trail begins and circles BWI Airport for an additional 12.5 miles. Both trails are accessible from the Cromwell Light Rail Station. The WB&A Trail Park follows the old Washington, Baltimore & Annapolis Railway for 3.8 miles in Odenton and is accessible from the Odenton MARC Station.

For more information on the County's recreational and transportation trails:

Anne Arundel County Department of Recreation and Parks
Trails Headquarters
1003 Cecil Avenue
Millersville, MD 21108
Office (410) 222-8820
www.aacounty.org/RecParks/parks/trails/index.cfm

COUNTY NAME: Baltimore City



OVERVIEW

Baltimore City is served by three rail transit lines: the Central Light Rail, the Baltimore Metro (Subway), and the Maryland Rail Commuter Service (MARC).

The Baltimore Metro operates seven days/ week and travels for 15.5 miles beginning in northwest Baltimore County and extending to the southeast into Baltimore City. There are 11 stations serving the City: Reisterstown Plaza, Rogers Avenue, West Cold Spring, Mondawmin, Penn North, Upton/Avenue Market, State Center/Cultural Center, Lexington Market, Charles Center, Shot Tower/Market Place, and Johns Hopkins Hospital.

The Light Rail line operates seven days/ week and extends for 29 miles beginning in Baltimore County, traveling through Baltimore City and terminating in Anne Arundel County. In Baltimore City there are 15 light rail stations: Mount Washington, Cold Spring Lane, Woodberry, North Avenue, Penn Station, University of Baltimore/Mount Royal, Cultural Center, Centre Street, Lexington Market, University Center/Baltimore Street, Convention Center/Pratt Street, Camden Yards, Hamburg Street, Westport and Cherry Hill.

The MARC Camden and Penn commuter rail lines provide service on weekdays in Baltimore City. The Penn Line service extends from Cecil County, through Harford to Baltimore County, Baltimore City, Anne Arundel County, and Prince George's County then terminates in Washington, DC at Union Station. The two stations of the Penn line serving Baltimore City are Penn Station and West Baltimore. Penn Station is also served by Amtrak along the Northeast Corridor Line, and by the Light Rail Line.

The Camden Line service begins just south of downtown Baltimore City, at the Camden Station extends through Baltimore County, to Howard County and Prince George's County terminates at Union Station in Washington, DC. The only Camden line station in Baltimore City is the Camden Station.

The three rail transit lines in Baltimore City provide access to the Baltimore metropolitan region as well as the Washington metropolitan region increasing employment opportunities for area residents and access to cultural, retail and major health centers such as John Hopkins Hospital.

All three rail lines serve the Central Business District of Baltimore City. The Inner Harbor is accessible from the Pratt Street and Convention Center Light Rail stations, Charles Center and Shot Tower/Market Place Metro stations, the Camden Yards MARC station. Oriole Park at Camden Yards and M&T Bank stadium, home of the Baltimore Ravens, are accessible from the Camden Yards light rail station and the Camden MARC station. Area hospitals, including Johns Hopkins Hospital, University of Maryland Hospital, and local colleges the University of Baltimore and University of Maryland are also easily accessible from e stops on the Metro rail and light rail lines.

Rail Line	Station	Population within in 3 Miles of Station (2000)	Average Weekday Passengers (2010)
Light Rail	Mount Washington	154,243	539
	Cold Spring Lane	237,995	753
	Woodberry	289,969	492
	North Avenue	334,379	1,193
	Penn Station	333,003	365
	University of Baltimore/Mt Royal	328,578	900
	Cultural Center	321,577	936
	Centre Street	308,287	579
	Lexington Market	298,902	3,901
	University Center/Balto. St.	292,767	2,831
	Convention Center/Pratt St	284,419	1,292
	Camden Yards	272,024	789
	Hamburg St.	261,830	301
	Westport	173,461	773
	Cherry Hill	141,856	848
Baltimore Metro	Reisterstown Plaza	158,588	2,429
	Rogers Ave	164,667	3,165
	West Cold Spring	215,899	1,967
	Mondawmin	293,879	6,175
	Penn North	307,316	3,547
	Upton /Ave Market	316,900	1,967
	State Center/Cultural Center	319,205	2,192
	Lexington Market	299,555	7,173
	Charles Center	288,501	6,102
	Shot Tower/Market Place	281,025	2,223
	Johns Hopkins Hospital	284,088	4,365
MARC Penn Line /Amtrak	Penn Station	332,999	2470
MARC Penn Line	West Baltimore	263,107	745
MARC Camden Line	Camden	272,024	468

In addition to the existing light rail line and stations, the MTA has been conducting project planning and engineering studies for a 14 mile, Red Line project. This rail line would provide an east-west rail transit connection from Woodlawn, in Baltimore County to Edmondson Village, West Baltimore, downtown Baltimore, Inner Harbor East, Fells Point, Canton and the Johns Hopkins Bay View Medical Center Campus in Baltimore City. For more information on Baltimore Red Line:
http://www.baltimoreredline.com/

In 2006 Baltimore City completed a Bicycle Plan. The plan is quite detailed and identifies a network of bicycle facilities throughout the City some of which have already been put in place. There are now 42 miles of bike lanes within Baltimore City. The City is adding lanes and facilities on a regular basis.

For more information about transportation plans and transit services in Baltimore City:

Baltimore City Planning Department
417 E. Fayette Street
8th Floor
Baltimore, MD 21202
(410) 396-7526 (PLAN)
www.baltimorecity.gov/Government/AgenciesDepartments/Planning.aspx

Maryland Transit Administration (MARC, Metro, and Light Rail)
6 St. Paul Street
Baltimore, MD 21202-1614
Transit Information Call Center
Phone: 410-539-5000
www.mta.maryland.gov/index.cfm

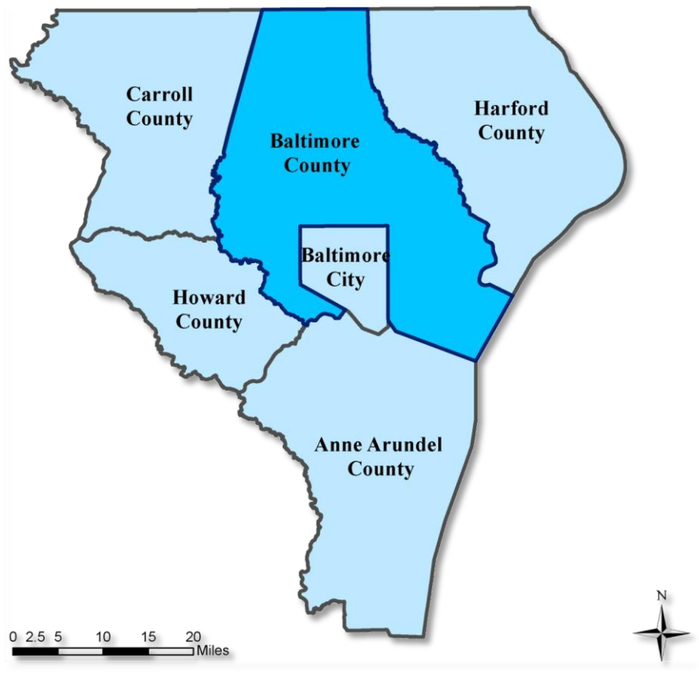
TRAILS

The Gwynns Falls Trail is a 15 mile multi use trail which connects more than 30 neighborhoods in west and southwest Baltimore is accessible from the Camden Yards Light Rail Station. Druid Hill Park, home of the Maryland Zoo and a system of trails within the park, can be accessed from the Mondawmin Metro Station. The Jones Falls Trail links central Baltimore communities to Penn Station.

For more information on the City's trails:

Baltimore City Department of Recreation and Parks
3001 East Drive
Baltimore, MD 21217
Phone: (410) 396-7900
www.baltimorecity.gov/Government/AgenciesDepartments/RecreationandParks.aspx

COUNTY NAME: Baltimore County



OVERVIEW

Baltimore County is served by three rail lines: the Central Light Rail, the Metro (Subway), and the Penn Line of the Maryland Rail Commuter Service (MARC).

The Central Light Rail line operates seven days /week and extends from Hunt Valley in Baltimore County, south through Baltimore City into Anne Arundel County for a total length of 29.5 miles. Starting in the north, the Light Rail Line serves nine stations in northern Baltimore County- Hunt Valley, Pepper Road, McCormick Road, Gilroy Road, Warren Road, Conrail, Timonium Business Park, Lutherville, and Falls Road. In southwestern Baltimore County, the Light Rail Line serves two additional stations- Patapsco Avenue and Baltimore Highlands.

The Metro Subway Line operates seven days /week and serves three stations in Baltimore County - Owings Mills Station, Old Court Station, and Milford Mill Metro Station. All of these stations are elevated rather than underground like some other stations along this line. The Baltimore Metro begins service in the north at the Owings Mills Town Center and extends southward into Baltimore City terminating at the Johns Hopkins Hospital for a total length of 15 miles. In Baltimore County, the Metro corridor is located in the median of Interstate 795 and parallel to the CSX railroad tracks.

The MARC Camden and Penn Commuter rail lines provide weekday only service in the Baltimore/Washington region including Baltimore County. The Camden line to Union Station originates at Camden Station in Downtown Baltimore and serves the St. Denis station in southwestern Baltimore County. The Penn line which originates in Cecil County and travels through Harford County, serves the Martin Airport station in eastern Baltimore County then travels through Baltimore City before making an additional stop at the Halethorpe Station in southwestern Baltimore County before terminating at Union Station in Washington DC

The three rail lines provide p the opportunity for Baltimore County residents to travel employment throughout the Baltimore Washington region and to take advantage of the many amenities the Baltimore region has to offer. These rail lines also provide connections to the Owings Mills Town Center, and the Hunt Valley Town Centre which are major employment centers in Baltimore County. The County seat in Towson is accessible by a combination of Light Rail and bus connections.

The Robert E. Lee Park is located near the Falls Road Light Rail Station and the Patapsco Valley State Park is accessible from the St. Denis MARC Station. The Owings Mills Metro Station is within walking distance to the Owings Mills Town Center and the light rail terminates at the Hunt Valley Town Centre, two of the county's largest shopping areas. Baltimore County is also home to the Maryland State Fairgrounds. The State fair and other major festivals and events are held throughout the year at the fairgrounds site which is adjacent to the Timonium Fairgrounds Light Rail Station.

Rail Line	Station	Population w/in 3 Miles of Station (2000)	Average Weekday Passengers (2010)
Light Rail	Hunt Valley	22,562	932
	Pepper Road	24,861	202
	McCormick Road	25,535	555
	Gilroy Road	29,147	285
	Warren Road	37,925	353
	Timonium Fairgrounds	56,998	1,229
Light Rail	Timonium Business Park	67,920	396
	Lutherville	69,034	1,011
	Falls Road	134,824	527
Baltimore Metro	Owings Mills	65,331	4,551
	Old Court	100,490	1,508
	Milford Mill	136,646	1,963
MARC Penn Line	Martin Airport	55,842	412
	Halethorpe	80,849	1047
MARC Camden Line	St. Denis	50,841	8

In addition to the existing light rail line and stations, there is a proposal for a 14 mile, Red Line that would serve portions of Baltimore County. This rail line would provide an east-west rail transit connection from Woodlawn, in Baltimore County to Edmondson Village, West Baltimore, downtown Baltimore, Inner Harbor East, Fells Point, Canton and the Johns Hopkins Bay View Medical Center Campus in Baltimore City. Four stations are proposed in Baltimore County: Security Boulevard at CMS (Medicare and Medical Services), Security Square Mall, I-70 over Woodlawn Drive (Social Security Administration), and the I-70 Park and Ride. For more information on Baltimore Red Line: http://www.baltimoreredline.com/

For more information about transportation plans and transit services in Baltimore County:

Baltimore County Department of Planning
The Jefferson Building, Suite 101
105 W. Chesapeake Avenue
Towson, MD 21204
Phone: 410-887-3211
Email: planning@balitmorecountymd.gov

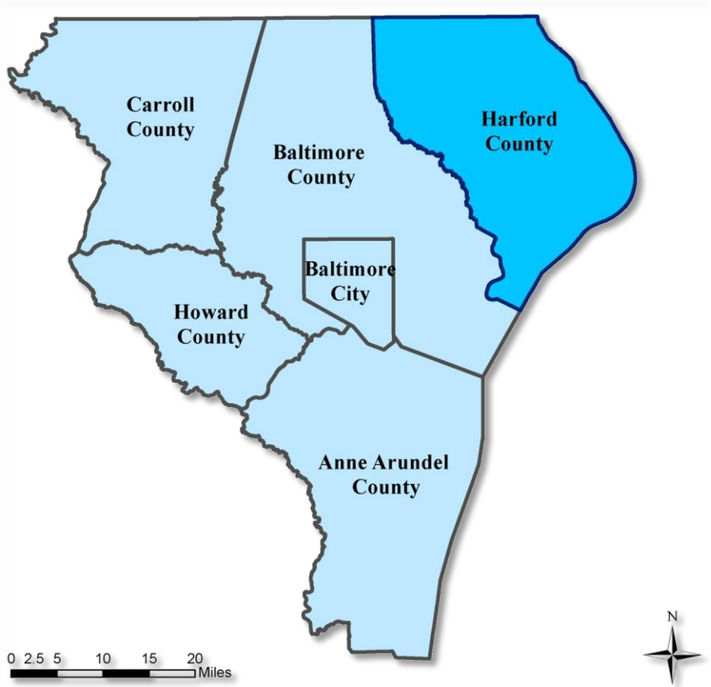
Maryland Transit Administration (MARC, Metro, and Light Rail)
6 St. Paul Street
Baltimore, MD 21202-1614
Transit Information Call Center
Phone: 410-539-5000
http://mta.maryland.gov/index.cfm

TRAILS

The western trail head of the Gwynns Falls Trail in Woodlawn is in Baltimore County. The Gwynns Falls Trail is a 15 mile recreational hiker biker trail that connects Woodlawn and Western Baltimore to the Inner Harbor. The trail provides access to LRT and MARC stations in downtown.

For more information on recreational trails:
Baltimore County Department of Recreation and Parks
Phone: 410-887-3806
Email: recparks@baltimorecountymd.gov

COUNTY NAME: Harford County



Rail Line	Station	Population w/in 3 Miles of Station (2000)	Average Weekday Passengers (2010)
MARC Penn Line /Amtrak	Aberdeen	19,790	248
MARC Penn Line	Edgewood	27,374	307

Harford County completed its most recent Transportation Element Plan in 2010 as part of the Harford County Master Plan. The County also has a 2008 Transportation Development Plan for its Harford Transit System.

For more information about Harford County transportation plans and services:

Harford Transit LINK
1131 Abingdon Road
Abingdon, MD 21009
Phone: 410-838-2562
Email: hcts@harfordcountymd.gov
http://www.harfordcountymd.gov/services/transportatio

Harford County Department of Planning and Zoning
220 South Main Street, 2nd Floor
Bel Air, MD 21014
Phone: 410.638.3103
Email: zoning@harfordcountymd.gov
http://www.harfordcountymd.gov/PlanningZoning/

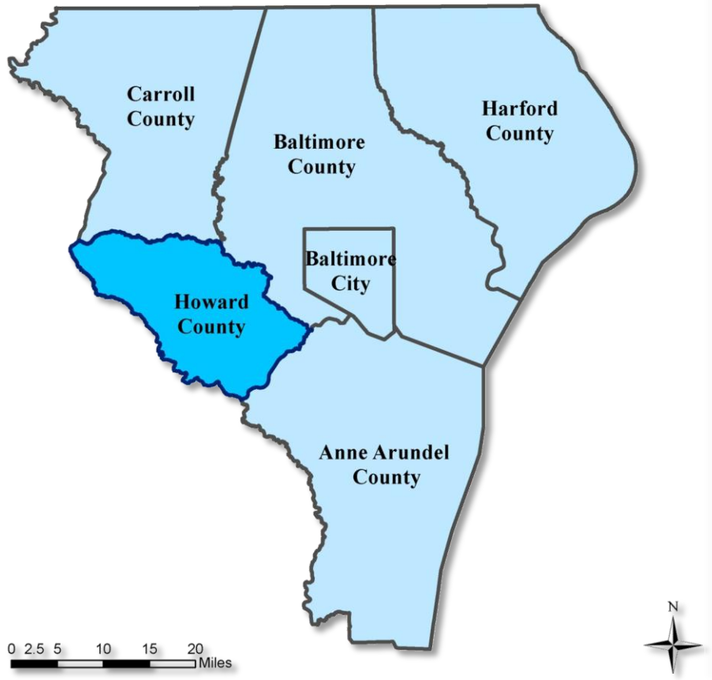
Maryland Transit Administration (MARC)
6 St. Paul Street
Baltimore, MD 21202-1614
Transit Information Call Center
Phone: 410-539-5000
http://mta.maryland.gov/index.cfm

OVERVIEW

The MARC Penn Commuter rail line serves the Baltimore- Washington region including Harford County. The Penn Line starts service outside the Baltimore Region in Cecil County to the north and then extends south into Harford County through Baltimore region and on into Washington DC. The Penn Line has two stations in Harford County- Aberdeen and Edgewood. The Aberdeen MARC Station also serves as one of Amtrak's Northeast Corridor stations.

The MARC Penn line provides weekday only service to access to employment opportunities cultural, retail and health centers in the Baltimore Region and beyond. The Aberdeen Rail Station is located near the Aberdeen Proving Ground (APG) which is a main employment center in Harford County. APG is undergoing large expansion due to the 2005 Defense Base Closure and Realignment Plan (BRAC). The Aberdeen station is situated in the downtown area of the City of Aberdeen. The Edgewood Station is located further south near the Edgewood section of the APG and is surrounded by suburban residential and small scale commercial development. Both stations are easily accessible by car to the I-95 corridor.

COUNTY NAME: Howard County



OVERVIEW

Howard County is served by the Maryland Rail Commuter Service, on the Camden Line. Weekday train service operates north to Baltimore and South to Washington. The Camden Line which starts at Camden Station in Downtown Baltimore serves the Dorsey, Jessup, Savage, and Laurel Racetrack stations on the border of Howard County and Anne Arundel County. The line then extends into Prince George's County and terminates at Union Station in Washington DC.

The MARC rail service offers residents of Howard County access to employment centers in the Baltimore and Washington metropolitan regions. The Camden line also provides access to cultural, retail and health centers throughout the region.

Rail Line	Station	Population w/in 3 Miles of Station (2000)	Average Weekday Passengers (2010)
MARC – Camden Line	Dorsey	35,249	606
	Jessup	37,184	2
	Savage	46,567	586
	Laurel Park	70,736	14

A guide for commuters and transit services in Howard County is available at the Howard County Commuter Services website: http://www.howardcommutersolutions.com.

Howard County completed a Pedestrian Master Plan in 2007. The County also completed a Transit Development Plan for local bus services in 2009.

For more information about transportation plans and transit services in Howard County:

Howard County Department of Planning and Zoning
3430 Court House Drive
Ellicott City, MD 21043
Phone: 410-313-2350
Email: Planning@howardcountymd.gov
www.co.ho.md.us/DPZ/DPZ_Homepage.htm

Maryland Transit Administration (MARC)
6 St. Paul Street
Baltimore, MD 21202-1614
Transit Information Call Center
Phone: 410-539-5000
mta.maryland.gov/index.cfm

TRAILS

Howard County has an extensive network of parks, trails and greenways for recreational use. Savage Park is accessible from the Savage MARC station.

For more specific information on trails:

Howard County Department of Recreation and Parks
7120 Oakland Mills Road
Columbia, MD 21046-1677
Phone: 410-313-4700
www.co.ho.md.us/rap/rap_homepage.htm

PROJECT METHODOLOGY

STATION AREA IDENTIFICATION/MAPPING

The geographic area included in the inventory at each station was prescribed at 3 miles for bicycle accommodations and 0.6 miles for pedestrian accommodations. KCI prepared GIS buffer maps showing the bicycle and pedestrian zones for each of the 60 stations. There was considerable overlap between station buffers because many rail stations were less than 3 miles apart.

Since the project schedule and budget would not allow for field inventory of every road within the station buffers, the following parameters were identified for inventory coverage:

- Within the pedestrian buffer zone, public roads leading directly to the station
- Within the bicycling buffer zone field inventory of existing, planned or recommended bicycling routes as shown in local jurisdiction plans that had been provided in GIS format (In the absence of that information, roads for inventory were identified in the Technical Appendix of MDOT's 20 Year Bicycle and Pedestrian Access Master Plan (2002)

KCI staff created a basic map format depicting the existing conditions for individual stations. After review of the format, base map, vicinity map, pedestrian zone enlargement area and legend, BMC staff, requested revisions. The format was revised and it was agreed that the same format would be used for individual recommendations maps.

In preparation for project field work, KCI's GIS staff obtained data sets and compiled an ARCGIS geodatabase. This data allowed the display of map layers depicting various features of relevance including street names, bus stops and bus routes. Aerial imagery was also linked to the data to enable staff to view existing conditions. All known local jurisdiction GIS data sets for existing and planned bicycle routes and planned pedestrian improvements were requested through BMC but not all data was received before field work was undertaken.

TABLE #2: EXISTING DATA COMPILED

Type of Data	Data Source
Station Parking Information (# spaces and occupancy)	MTA website and MTA staff
Customer Boardings by Station (LRT/Metro/MARC)	MTA staff
MTA Bus Routes Serving Stations	MTA website
Other Buses, Shuttles Serving Stations	Various website resources
Bicycle /Pedestrian Crash Data	BMC/SHA
Local Land Use/Zoning	Local Jurisdiction plans and websites
Plans for Transit Oriented Development (TOD)	MDOT/Local Jurisdiction Plans
Bike Locker/Bike Rack Locations	MTA staff
BLOC Desk Top Tool/ 2004 Data	BMC
GIS Data Layers Obtained	
Regional Ortho-photography	BMC
Station/Rail Line Coordinates	BMC/MTA
Local Jurisdiction Bicycle, Pedestrian Facilities and Planned Routes	BMC and Local Jurisdictions
Other layers as available	Local Jurisdictions

OTHER INFORMATION REVIEWED /OBTAINED

BMC staff provided KCI with information on recent cost experience for the provision of bicycle racks.

MDOT's 20 Year Bicycle and Pedestrian Facility Needs Assessment (2002) were reviewed. When local bicycle plans were not available, the consultant staff referred to the roadways in the Needs Assessment as primary routes for the inventory update.

The 2010 and 2011 (draft) Regional Transportation Improvement Programs (TIP) were reviewed to identify bicycle and pedestrian projects already funded within the region. Where improvement needs were identified in the field and the project was already included in the TIP, they were assumed to be completed and cost estimates were not included in this report.

Off-road trails in proximity to stations areas were noted but not consistently available in GIS format. Access to stations using these trails was addressed in the individual station profile. The available websites for off-road trails are listed in Appendix 6.

FIELD METHODOLOGY

Two teams consisting of a planner and an engineer were assigned to collect data in the field on weekdays. Additional observations were made on weekends at selected stations. The project schedule required that field work be completed in winter in order to complete the data compilation, analysis and development of recommendations by the June deadline.

A sequencing of field work allowed peak period data collection for selected stations and minimized travel time. Each person was assigned a hand-held Trimble Yuma tablet computer with GPS capability. Each Trimble device was loaded with custom GIS data features obtained for the study and data input forms that were created for the project. The Trimbles allowed staff to record the condition findings for each feature while they were in the field, whether on foot or riding in a car.

Since the 3 mile bicycle buffers between stations overlap with one another, a method had to be devised to prevent duplication of field work in the overlap areas. Daily procedures were established for field staff to upload collected data and download new data sets. As a result, each team could determine the data points already collected by the other team for nearby stations.

Data collection and observations were to be made at all of the region's 60 rail stations. Based on boarding data, parking lot size and bus service levels, a determination was made that that 28 stations should be visited during week day peak periods, from 6 am- 9 am or 4 pm- 6 pm. The intent was to have field staff observe the highest level of pedestrian and bicycle activity and interaction with cars and busses at and near the stations. Weekday non-peak period field visits were conducted at the remaining thirty-two stations. Field observations were also made at 12 rail stations that have weekend service. (There is no weekend rail service provided at the 13 MARC stations.)

After the initial round of data collection, draft maps were produced which enabled the project manager to see all the data points that had been collected within the buffer for each station. The draft maps were compared with local bicycle route plans that were available and the MDOT Facility Needs Inventory in order to identify roads that had not yet been visited by field staff. Both Teams were re-deployed for additional field work to cover gaps and roads that may have been omitted.

IDENTIFICATION OF DEFICIENCIES

For pedestrians, this project identifies deficiencies such as sidewalk gaps, and lack of crosswalks near transit stations but does not include an evaluation for compliance with standards associated with the Americans with Disabilities Act (ADA). There are State and local policies that guide the provision of pedestrian accommodations along roadways. The existing accommodations for pedestrians vary considerably throughout the region and are largely dependent on the surrounding land uses. Stations located in urbanized areas generally have basic accommodations, while older suburban communities may or may not have pedestrian accommodations. Stations located in more recently developed suburban areas generally have some pedestrian accommodations.

The accommodations for bicyclists vary considerably in the region. The State and some local jurisdictions have bicycle plans in place. There are some bicycle facilities in place, and improvements are being made currently. This project focused on identifying deficiencies that would improve access to rail stations.

The GIS data sets that were made available to the consultant team were used to establish base conditions for the inventory of features. Using the Trimble device and a custom data form, staff was able to view GIS data while in the field. Referring to these data allowed the staff to observe a range of factors and document deficiencies as encountered.

The field teams walked or travelled in a car using the Trimble and the data form to observe and document the following features:

At stations:

Presence of bike racks
Station Parking - % of parking spaces occupied
Desire lines to the station (as evidenced by a worn path)
Mobility issues and conflicts between pedestrians/bicyclists and cars/buses within the station

Along roadways within the bicycle buffer:

Whether the road is an existing or planned bike route
Existence of a marked Bike Lane
If a planned or existing bike route, verify conditions:
Paved shoulder yes/no
Wide outside lane (>= 12 feet) yes/no
Parallel (incompatible) drainage grates yes/no

Along roads within the pedestrian buffer:

Location and length of missing sidewalk segment yes/no
Location and length of damaged sidewalk segment yes/no
Note if sidewalk < 3 feet wide

Lighting

Location of missing lighting along roadway
Location of missing lighting at intersection
Location of missing lighting at bus stop

At intersections within the pedestrian buffer:

Location of missing/damaged curb ramps
Location of missing or faded crosswalks
Location of missing or needed pedestrian crossing signs

Signage

Location of needed directional/station wayfinding signs
Bike route sign or markings needed
“Share the Road” sign needed
Pedestrian warning sign needed

Other

Placement of bike racks/lockers
Potential opportunities for shared parking or electric vehicle charging stations

ANALYSIS

Planning Analysis

To determine the general character and land use context for each station area, planners have considered existing conditions such as the year 2000 population within the 3 mile buffer for each station, the bus lines and other shuttle services operating to each station, the weekday and weekend rail ridership by station, and the number and occupancy of parking spaces. They have reviewed local comprehensive or master plans and adopted small area or special plans that cover station areas such as Baltimore City plans for the West Baltimore MARC station area but not approved or pending development proposals that have not been constructed.

Engineering Analysis

During the post-processing of the collected data, additional information/data was gathered and incorporated in the database. Each collected feature was assigned to one of the 60 stations based on geographic proximity or roadway network proximity. In addition, for each feature the jurisdiction within which it was located was determined, as well as the roadway jurisdiction under which it fell, e.g., City, County, State. All features within the station site were assumed to be State. All features were grouped based on the corresponding roadway name and if applicable each roadway was segmented based on changes in the roadway characteristics. For each segment the cross streets defining the segment were determined and recorded in the database.

Engineers defined the preliminary list improvements for each station based on the identified deficiency and the applicable standards. A review was conducted of the preliminary list of recommendations to eliminate projects already identified as funded in the Transportation Improvement Program (TIP) and projects that did not appear warranted based on anticipated near term development.(i.e.: when a TOD project is pending.) A table showing the improvements not retained is shown in Appendix 7. The final list of recommended improvements for each station was prepared and costs were calculated for the final list.

Analysis of Pedestrian Improvement Needs

The recommended improvements are based on numerous State, City, and County design guidelines, including:

- Anne Arundel County Design Manual, January 2001
- Anne Arundel County Standard Details, January 2001
- Baltimore County Department of Public Works Design Manual, August 2, 2010

- Baltimore County Standard Specifications and Details, 2007
- City of Baltimore Book of Standards, August 2010
- Harford County Road Code, Book II, Roadway and Storm Drain Design Standards, December 2, 2008
- Harford County Book of Standard Details, December 2, 2008
- Howard County Design Manual, Volume III - Roads and Bridges, October 2006
- Howard County, Volume IV Design Manual, Standard Specifications and Details for Construction, 2007
- Maryland State Highway Administration Bicycle and Pedestrian Design Guidelines

Analysis of Bicycle Improvement Needs

The data collection on existing and planned bike routes, or streets with existing accommodations or signing for bicyclists consists of identifying the following parameters or features for each identified roadway:

- Bike route
- Bike lane
- Wide outside lane (≥ 12 feet)
- Paved shoulder
- Parallel drainage grates
- Route signing
- Share the road signing

The following three guidelines are used to further assess recorded deficiencies:

- Guide for the Development of Bicycle Facilities, 1999 (AASHTO),
- Bicycle and Pedestrian Design Guidelines 2007[1] (Maryland SHA),
- Bicycle Master Plan 2006, Toolkit (Baltimore City).

PEDESTRIAN IMPROVEMENT RECOMMENDATIONS

Pedestrian improvement recommendations are considered in context:

- Missing crosswalks, missing curb ramps and/or pedestrian warning signs
- Desire line improvements based on observations and pertinent notes taken during the field work
- Missing lighting based on the type of roadway, spacing requirements according to State, City or County guidelines
- Lighting (at least one light pole) at each bus stop
- Missing lighting at intersections based on the minimum required number of light poles for each signalized intersection
- Sidewalk widening or installations based on feasibility of providing the missing segment or widening and avoidance of obstacles (utility poles, etc.) that would prevent a continuous path.

BICYCLE IMPROVEMENT RECOMMENDATIONS

The study includes recommendations for improvements on roadways designated or planned as bike routes. In order assign the improvement type, i.e., bike lane, wide lane, shoulder , a set of queries was defined to filter all recorded field data and recommend improvement types for each feature. These steps were followed:

1. All bike lane related improvement types were identified,
2. Shoulder related improvement types were identified,
3. Wide lane improvement types were identified,
4. The recommended improvement types were verified against the established guidelines and one or more improvement items were assigned to each feature.

Bike lanes improvements are recommended where there is a gap or deficiency in an bike lane. Shoulder improvements are recommended in locations where a there is no existing bike lane. Recommendations for wide lanes are based on the posted speed. According to the Maryland State Highway's Bicycle and Pedestrian Design Guidelines, "the shared lane pavement marking should not be placed on roadways with speed limits posted above 35 miles per hour."[2] Typically, the minimum travel lane width for wide lanes (shared by bicyclists and vehicles) is 12 feet; however, within Baltimore City travel lanes of 9 to 11 feet are common. For these instances, bicyclists may operate toward the center of the travel lane, rather than side-by-side with vehicular traffic. In all cases the recommended is the least cost option that meets established guidelines and standards.

BIKE RACK RECOMMENDATIONS

There are no broadly accepted standards for the provision of bike racks at rail and transit stations, although some agencies in other regions have begun to develop their own practices. In the Baltimore Region demand for bike storage varies widely by community and some stations may not have space for an appropriate bike rack location. In the absence of adopted industry or regional standards, this study does not formulate specific recommendations for bike racks at each station. Nevertheless, BMC, MTA and the local transit providers should look for opportunities to provide bike racks and storage at as many stations as possible. Where the station property is not suited to bike racks, partnerships with neighboring property owners should be explored. If a specific need for bike racks was observed by the field teams, a note is included in the station profile.

CONSIDERATIONS

Crash Data

The original project approach included obtaining crash data prior to field work so that teams could note deficiencies at crash locations. BMC staff intended to provide bicycle and pedestrian crash data from the data set for the Exploring and Visualizing Crash Data. As it turned out, data from this system could not readily be used for this project. Once this was determined, BMC staff assisted the KCI Team in coordinating with the Maryland SHA Highway Safety Office (HSO). After the field work had been completed, staff at the HSO provided pedestrian and bicycle-related crash data for the Study. For Anne Arundel, Baltimore, Harford, and Howard Counties, crash data was provided for the three-year period from January 1, 2007 to December 31, 2009. Crash data for Baltimore City covered the two-year period from January 1, 2007 to December 31, 2008, because 2009 crash data was not available in a mapping format usable for this project.

[1] On June 29, 2011, SHA released new policy on marked bicycle lanes along state highways. The requirements of this new policy are not incorporated into the recommendations and cost estimates in this report.

[2] Maryland State Highway Administration, Bicycle and Pedestrian Design Guidelines, Page 4-2, http://www.roads.maryland.gov/OOTS/Chapter%204%20-%20Other%20On-Road.pdf

The bicycle and pedestrian crash locations are shown on the Existing Conditions Map for each station and Appendix 2 provides the number of crashes by station. Each crash is associated with a given station, based on the distances measured from where a crash occurred to all stations. The nearest distance value is used to associate a crash to a specific rail station. Any crash that occurs within the radius of more than one station is counted only once and is associated with the nearest rail station. Since the crash data was not received in advance of the field work conducted for this project the team was not able to specifically assess field conditions associated with incident locations. Inasmuch as the data for Baltimore City covers a two year period and data for other jurisdictions covers a three year period care has to be exercised when comparing the crash frequency around the stations covered.

Overall, a total of 1,224 pedestrian and bicycle-related crashes occurred within the respective buffers of the 60 rail stations. Pedestrian crashes comprised 61% of the crashes (741) and bicycle crashes comprised 39% of the total (483). A low incidence of crashes in an area may indicate that either good conditions for walking or biking or a lack of bicycle or pedestrian activity. Additionally, the documented crashes may not have been associated with a trip to or from the nearest rail station.

The data shows that the station area with the highest number of pedestrian crashes is the Shot Tower /Market Place Station. Charles Center has the second largest number of pedestrian crashes and Penn North is third. The following station areas have no pedestrian crashes within 0.6 miles: McCormick Road, Gilroy Road, Warren Road, Timonium Fairgrounds, Linthicum, BWI Business District, Martin Airport, Halethorpe, Dorsey and Savage.

The data shows that the station area with the highest number of bicycle crashes is the Johns Hopkins Hospital Metro Station. The Cromwell/Glen Burnie LRT station and the West Baltimore MARC station areas have the next largest numbers for bicycle crashes. The station areas with no bicycle crashes on record include: Hunt Valley, Pepper Road, Gilroy Road, University of Baltimore/Mt Royal; Convention Center; and BWI Business District LRT stations and the BWI Marshall MARC station.

BMC BICYCLE/PEDESTRIAN LEVEL OF COMFORT DESK TOP TOOL

The BMC's Bicycle Level of Comfort Desktop Tool (BLOC Tool) can be used to analyze the level of service improvement that would be derived from a proposed improvement. The tool was provided to the KCI Team for use on the project. Since the model relies on data from 2004, the data would have to be updated for overall application on this Access Study. The budget for this project did not include a task to update the regional database. Therefore the intent of the KCI Team was to obtain updated traffic data for selected locations in order to use the model for the analysis. After the deficiencies were identified and reviewed there were only a few recommendations that appeared to have costs so high as to warrant use of the BLOC/PLOC analysis to help to judge the feasibility.

The Team identified four deficiencies for which the BLOC/PLOC analysis appears warranted and on which the benefit derived would have to be significant to justify making a recommendation for the improvement. The deficiencies that met the criteria were:

- A 200' length of bridge along Coca Cola Drive between Dorsey Road and the Anne Arundel County Line where the width is inadequate to accommodate bicycle improvements;
- A 310' length of bridge along Coca Cola Drive Park Circle Drive and the Howard County Line where the width is inadequate to accommodate bicycle improvements;
- A 3,000' length of Greenspring Avenue between Green Summit Road and Valley Park Drive in Baltimore County (County Road);
- A 17,045' length of Old Court Road, between Stevenson Road and Falls Road in Baltimore County.

Engineers reviewed that BMC's 2004 base network and found that Coca Cola Drive was not already included in the BLOC model. In the absence of the basic roadway characteristics for Coca Cola Drive, it was not possible to complete the BLOC analysis.

Baltimore County staff had completed a Bicycle Level of Service (BLOS) analysis as part of the planning analysis for the Western Baltimore County Pedestrian and Bicycle Access Plan (July 30, 2010). The County's analysis indicated that a segment from Greenspring Avenue between Old Court Road and Smith Ave has an existing bicycle level of service "A" and would have the same level of service once improvements were made. The County's draft Plan proposes a bike boulevard[3] for Greenspring Avenue. The KCI analysis has included planning level cost estimates for improvements based on specific segment lengths shown in the station profile table for the Mount Washington Light Rail Station.

The County's analysis indicated that segments of Old Court Road from Park Heights to Greenspring Avenue and from Greenspring to Falls Road could be improved from a BLOS E to BLOS D with a bike lane. The KCI analysis has included planning level cost estimates for improvements based on specific segment lengths shown in the station profile table for the Old Court Metro Station.

While the County could consider the planning level cost estimates in this study and the results of the BLOS analysis when determining funding priorities, some caution needs to be exercised. The analyses were based on different levels of information and different analyses techniques. The County Plan includes a higher level of refinement for proposed improvement types than was feasible for this region wide study of all rail station areas.

STATION AREA PROJECTS AND PLANS

The consultant team obtained the list of stations that MDOT has designated for transit oriented development (TOD). Information on the status of those TOD projects is referenced in the corresponding station profile. MDOT has also identified properties at transit stations where joint development opportunities are available and on which development proposals are being sought. The station profiles identify where such opportunities are advertised.

Some local land use plans identify stations as having potential for transit oriented development. The method of identification varies from a symbol on a map to a mention in the local area plan. Where such references were found, they have been noted in the station profile. Developer proposed TOD projects that are not shown in adopted local land use plans are not included in the station profiles.

TIP PROJECTS

The Region's 2010- 2013 Transportation Improvement Program (TIP) and the draft 2011-2014 TIP were reviewed to identify the bicycle and pedestrian improvements programmed for funding near transit stations. The preliminary list of improvements developed

[3] A bike boulevard is a bicycle route on a low speed, low volume local street that has been optimized for bicycle travel through treatments such as traffic calming and traffic reduction, pavement markings and intersection crossing treatments. Typical traffic calming protocols are congruent with bike boulevards (with the exception of steep speed bumps). Special signage should be developed to mark these routes as a subset of the bikeway network. Bike boulevards are intended to serve as bicyclist preferred routes and as alternatives to major roads. (Western Baltimore County Pedestrian and Bicycle Access Plan draft) July 2010.

for this study was reviewed against the bicycle and pedestrian projects listed in the TIP. When the TIP already showed a project as funded, it was removed from the list of recommendations for this study. (For example: a bike lane on Central Ave from Aliceanna to Baltimore Street was removed since TIP shows major reconstruction of Central Ave between Monument and Lancaster by 2012 and some segments of the bike lane have already been installed on Central Ave.) Bicycle and pedestrian projects included in the TIP documents were assumed to be in place.

PREPARATION OF COST ESTIMATES

Planning level cost estimates were developed by making a number of assumptions and applying unit costs to the length or quantities of a recommended improvement. (Refer to Appendix for assumptions and unit costs.)
The pedestrian improvement items that have been estimated include:

- Sidewalks = new sidewalk where gaps exist; replacement of damaged segments
- Curb Ramp = new curb ramp associated with crossing
- Lighting = lighting along roadway segments; lighting at intersections; lighting at bus stops
- Crosswalks = new or replacement pavement markings in association with intersections; may include costs for pedestrian crossing signs and advance warning signs
- Pedestrian Signal = at intersection locations where recommended
- Desire Line = provision of sidewalks where worn path or crossing activity was observed
- Other items are also included such as removing sidewalk obstructions like trees or utility poles.

For bicycle-related improvements, a cost per mile was established for each of the eight identified improvement items. The improvement items include:

- Route = signing for a bike route
- Bridge Widening
- Widening of an existing roadway
- Repaving = resurfacing of existing roadway or parts
- Restriping = removing/re-applying pavement markings
- Signing = signing for bike lane, Share the Road, etc…
- Marking = pavement marking lines and symbols
- Drainage = bicycle safe grate

The cost per mile estimate was based on recommended spacing of signs and pavement marking symbols from the above referenced documents, estimated spacing for storm grates, the number of lanes for roadway segments, and repaving and widening costs. Costs and unit prices were determined based on information obtained from the Maryland SHA's 2010 Highway Construction Cost Estimating Manual and Price Index (January 2011). For each collected feature the different improvement item unit costs have been totaled and multiplied by the measured distance assigned to each feature.

The estimated costs do not include the costs for bike rack or lockers. The current price for a two-bike rack is $125 not including the installation.

A sum of the total costs for the recommended bicycle and pedestrian improvements at each station has been calculated and is provided in the Station Profile section.

It is important to note that all costs are planning level costs and are based on assumptions about right of way and other factors. Cost estimations for each improvement were associated only with the nearest station even though the improvement may have been located within the buffer of more than one station.

COSTS BY JURISDICTION

For each station, costs have been allocated according to the assumed responsibility for the improvement. The appropriate county or the City was assumed to be responsible on local roads, the State of Maryland was assumed to be responsible for improvements along State roads and within MTA station sites. This allocation of costs is shown in the recommendations table for each station. For stations located at or near jurisdiction boundaries, costs have been allocated to the applicable local jurisdictions.

The total costs for recommended projects within each jurisdiction in the Baltimore Region are shown in Table 3 below:

TABLE 3: TOTAL COST BY RESPONSIBLE JURISDICTION

Jurisdiction	Cost ($)
Anne Arundel	$24,973,915
Baltimore City	$11,236,710
Baltimore County	$65,028,170
Howard County	$ 9,453,730
Harford County	$ 9,112,615
Prince George's County	$ 182,770
State of Maryland	$42,015,280

Note that some costs have also been calculated for Prince George's County since the 3 mile buffer for the Laurel Park MARC Station extends into that county. These costs are shown for that station.

RANKING OF COSTS BY STATION

Costs for all recommended improvements have been totaled for each station area.

Table #4 below shows the ranking of stations by cost with the highest cost station area being the Dorsey Road MARC station and the least cost station area being the BWI/Marshall Airport LRT station.

TABLE #4: RANKING OF COSTS BY STATION (HIGHEST TO LOWEST)

Rank	Station Name	Rail Line	Total Cost Station ($)
1	Dorsey	MARC Camden	$ 20,855,000
2	Owings Mills	Metro	$ 14,281,385
3	Old Court	Metro	$ 9,203,940
4	Falls Road	LRT	$ 7,850,590
5	Aberdeen	MARC Penn/Amtrak	$ 5,349,520
6	Martin Airport	MARC Penn	$ 5,072,605
7	Milford Mill	Metro	$ 4,898,065
8	Edgewood	MARC Penn	$ 3,763,095
9	Nursery Road	LRT	$ 3,602,245
10	Odenton	MARC Penn	$ 3,312,380
11	Mt Washington	LRT	$ 3,175,940
12	Baltimore Highlands	LRT	$ 3,061,840
13	Warren Road	LRT	$ 2,837,080
14	Patapsco	LRT	$ 2,334,135
15	Halethorpe	MARC Penn	$ 2,333,465
16	Timonium Business Park	LRT	$ 2,114,595
17	St Denis	MARC Camden	$ 2,031,935
18	Timonium Fairgrounds	LRT	$ 1,930,390
19	North Linthicum	LRT	$ 1,824,720
20	Cromwell /Glen Burnie	LRT	$ 1,550,075
21	Gilroy Road	LRT	$ 1,364,715
22	Savage	MARC Camden	$ 1,240,615
23	Ferndale	LRT	$ 1,199,835
24	Cold Spring Lane	LRT	$ 982,550
25	Laurel Park	MARC Camden	$ 980,445
26	Westport	LRT	$ 949,885
27	Rogers Avenue	Metro	$ 933,575
28	Woodberry	LRT	$ 826,870
29	Lutherville	LRT	$ 799,100
30	Jessup	MARC Camden	$ 720,105
31	Pepper Road	LRT	$ 719,100
32	Centre Street	LRT	$ 678,115
33	West Cold Spring	Metro	$ 662,510
34	Reisterstown Plaza	Metro	$ 629,690
35	University of Baltimore/Mt Royal	LRT	$ 604,090
36	Cherry Hill	LRT	$ 589,410
37	Shot Tower/Market Place	Metro	$ 572,635
38	Camden Yards	LRT	$ 520,265
38	Camden	MARC Camden	$ 520,265
39	Upton /Ave Market	Metro	$ 424,000
40	McCormick Road	LRT	$ 362,325
41	Johns Hopkins	Metro	$ 313,715
42	Hamburg Street	LRT	$ 305,700
43	North Avenue	LRT	$ 299,605
44	Hunt Valley	LRT	$ 279,205
45	Convention Center/Pratt Street	LRT	$ 267,910
46	Linthicum	LRT	$ 249,555
47	Penn Station	LRT	$ 202,870
47	Penn Station	MARC Penn	$ 202,870
48	West Baltimore	MARC Penn	$ 176,525
49	Mondawmin	Metro	$ 168,200
50	Penn North	Metro	$ 144,140
51	BWI Business District	LRT	$ 113,040
52	State Center/Cultural Center	Metro	$ 100,760
53	Lexington Market	LRT	$ 61,230
54	Cultural Center	LRT	$ 56,105
55	University Center/Baltimore Street	LRT	$ 39,935
56	Lexington Market	Metro	$ 32,465
57	Charles Center	Metro	$ 19,035
58	BWI	MARC Penn/Amtrak	$ 13,100
59	BWI Marshall Airport	LRT	$ 1,980