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# Off-Street Bikeway Study

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## Milwaukee's Best Opportunities for Trail Expansion



## Foreword and Acknowledgements

Invaluable information and support was provided by City Engineer Jeffrey Polenske, PE; Chief Planning and Development Engineer Mike Loughran, PE; Bicycle and Pedestrian Coordinator Dave Schlabowske; the City's Bicycle and Pedestrian Task Force; and all attendees of public input meetings. The graphic renderings provided by Anthony Schrautnagel and Arek Miaskowski and the photographs provided by Arthur Ross, City of Madison Bicycle and Pedestrian Coordinator, are also greatly appreciated.

Further, we would like to thank Mayor Tom Barrett and the Common Council for promoting this study and supporting bicycling as a viable, safe, and healthy transportation choice.

The Off-Street Bikeway Study was authored by Jack E. Hirt and Jessica K. Wineberg of The Bicycle Federation of Wisconsin. This study was funded by the City of Milwaukee with the Wisconsin Department of Transportation's STP-D program.

The Bicycle Federation of Wisconsin is a statewide nonprofit bicycle education and advocacy organization with over 2,500 members. Bicycle Federation's mission, to make Wisconsin a better place to bicycle, embraces the basic vision behind the organization; that bicycling is a viable, healthy, and environmentally sustainable means of transportation, recreation, and sport. Bicycle Federation provides bicyclists of all ages with information on recreational rides, safety tips, and commuting skills while educating decision makers about the importance of bicycling to our communities. Learn more at [www.bfw.org](http://www.bfw.org).

Contact information:

Jack E. Hirt & Jessica K. Wineberg, Project Coordinators  
The Bicycle Federation of Wisconsin  
1845 N Farwell Ave, Suite 100  
Milwaukee, WI 53202  
Office: 414-271-9685  
[mkeinfo@bfw.org](mailto:mkeinfo@bfw.org)

## Table of Contents

<b><i>Section</i></b>	<b><i>Page Number</i></b>
<b>Foreword and Acknowledgements</b>	
<b>Introduction</b>	<b>1</b>
<b>Process</b>	<b>2</b>
<b>Corridor Evaluation and Inventory</b>	
<b>Intro to Corridors</b>	<b>3</b>
<b>Study Corridor Map</b>	<b>4</b>
<b>Existing Trail Inventory and Recommendations</b>	<b>5</b>
<b>Hank Aaron State Trail</b>	<b>6</b>
<b>Proposed Top 3 New Trail Priorities</b>	<b>8</b>
<b>Other Proposed Corridors</b>	<b>12</b>
<b>Special Case Corridors</b>	<b>15</b>
<b>Development Details</b>	
<b>Design Guidelines</b>	<b>17</b>
<b>Acquisition</b>	<b>27</b>
<b>Construction</b>	<b>28</b>
<b>Maintenance</b>	<b>30</b>
<b>Best Practices</b>	<b>31</b>
<b>Implementation Plan</b>	
<b>Funding Sources</b>	<b>33</b>
<b>Concluding Vision</b>	<b>37</b>
<b>Sources</b>	<b>39</b>
<b>Appendix</b> CD, Existing Conditions and Recommendations, Rubric, Trail Counts, Trail Development in Riparian Environments Information, SEWRPC Maps, Side-path Suitability Algorithm, Public Meeting Input Form and Summary	<b>40</b>

## Off-Street Bikeways Study

### Milwaukee's Best Opportunities for Trail Expansion

#### Introduction

Bicycle facilities, including multiuse trails, are an essential part of the transportation system. According to WI state statute, the transportation network must meet the needs of all users, including bicyclists. Bicyclists can be served by a number of facilities including low volume, low speed streets with no special bicycle facilities; larger roads with bike lanes or wide outside lanes; bicycle boulevards; and well designed multiuse paths. Multiuse paths are especially effective at serving the needs of untrained cyclists and children who may have a lower understanding and tolerance of automobile traffic. Multiuse paths also serve cyclists of all abilities, runners, dog walkers, roller bladers, and people who want to go for a pleasant walk.

Public opinion studies done throughout the 1990's document that the public supports increased funding and construction of multiuse trails (FHWA Bicycle and Pedestrian Design Guidance). Fear of traffic is often cited by cyclists as a reason for not bicycling more. In 2003, 20% of people who took a Bike to Work Week survey created by the Bicycle Federation of WI (BFW), listed fear of traffic as what was keeping them from commuting by bike or that they would be more likely to bike to work if there were more bike trails. Studies also show that property values increase for homes adjacent to trails. Further, the recreational opportunities trails provide address the current obesity and inactivity epidemics mentioned so frequently in health studies.



**Lincoln Creek: Current and Envisioned**

With the formation of the Green Team and Office of Sustainability, Milwaukee is making a commitment to improving the environment for the economic benefit for city residents. Expanding the trail network and supporting bicycle and pedestrian transportation are explicit goals of Mayor Barrett's Green Team Report. The recommendations laid out in the Off-Street Bikeways Study support the Mayor's green vision and specific goal of creating a balanced transportation network and point the way to a more livable and attractive Milwaukee.

The purpose of this study is to:

- Inventory, evaluate, and summarize conditions of existing trails
- Provide an update on the development of the Hank Aaron State Trail
- Recommend additional neighborhood connections for existing trails
- Develop and apply corridor evaluation methodology
- Coordinate efforts and solicit input from Milwaukee County Parks, the Bicycle and Pedestrian Task Force, local bicycle clubs, and the bicycling public
- Develop an implementation plan and final report

This study does not include final engineering, surveying, soil or water sampling, permits, or design. It inventories and compares several possible corridor development areas.

## Process

The initial phase of this project involved developing a grading system for existing trail conditions. This grading system was used to inventory existing trail and identify gaps in the off-street network.

Geographic Information Systems (GIS) Technology was employed to identify suitable areas for future trail development. The goal was to identify strips of land (corridors) that meet the geographic criteria for trail development. These criteria include: linear shape, continuity of ownership, no existing structures, connectivity with other trails, and sufficient width. Through this analysis, it was discovered that power line rights-of-way, railroad rights-of-way (ROW), and river corridors often provide the best and most economical opportunity for trail development in Milwaukee. This GIS is provided on the CD in the back of the report.

Abandoned railroads provide a unique and perhaps the best opportunity for new trails. Railroad corridors are graded for the lowest change in incline possible, are separated from the roadway system, and often have grade separated crossings at major roads and rivers. In fact, portions of the Oak Leaf Trail (OLT) are located on former railroad rights-of-way. Some trails in the United States have even been constructed along active urban spur or branch lines after a portion of the rail corridor had been sold to the local community by the rail line owner. For instance, the City of Madison purchased and constructed a bike trail along an active rail line in the eastern portion of the city. Typically, rail line owners and operators have major concerns about joint uses within the corridor because of liability reasons and fear of increased trespassing. These concerns are mollified if an actual land transaction takes place between the rail line owner and community (bike path sponsor). If local communities are unable or unwilling to purchase rail corridor property for shared corridor use, like Madison has done, co-use through an agreement with the rail line owner/operator is unlikely and could result in lengthy negotiations and agreements.

After initial selection based on GIS, each corridor was field inspected and evaluated using the trail development methodology. The evaluation criteria included topographical features, economic factors, geographic location, connectivity to existing facilities, ability to obtain ownership or easement rights, ability to meet AASHTO guideline, cost of acquisition, potential partnerships, and trail/path access.

Field inspections were carried out on-bicycle to provide the most accurate understanding of the corridor and how it might function as a multiuse trail. All data was collected through field notes, digital photographs, and Global Positioning Systems (GPS) coordinates where geographical location was

critical. The data was then transferred into electronic formats, specifically Microsoft PowerPoint, Excel, and GIS files.

A rubric was developed to measure the suitability of the corridors for trail development and to facilitate comparisons between corridors. The goal of the rubric was to standardize the evaluation criteria. Current trail design standards and safety information were incorporated into the rubric to deal with difficult issues. For example, it is well documented that minimizing street crossings maximizes the operational safety of the facility. However, on-street trail crossings also provide easy access for users. Corridor attributes, such as ability to meet AASHTO guidelines and evidence of current use, were graded on a scale of 1-3. Rates for certain attributes such as dangerous street crossings per mile were also included. The sum of the scores provides an overall score that was used to initially rank the corridors.

The rubric was developed to sort out the negatives and positives of each corridor, consider general costs, and provide a sound quantitative base to inform recommendations and future policy. However, the rubric is not advanced enough to deal with all the complexities of the real world. Therefore, a second ranked list was created to take into account concepts beyond the scope of the rubric. Therefore, the consultant rankings differ slightly from the rubric's ranking.

Throughout the course of this study, the Bicycle Federation of WI (BFW) has sought input from members of the public and met with relevant government bodies. A formal public meeting and presentation of the field work was held in December of 2005. Members of the bicycling community, including club representatives, commuters, mountain bikers, and elected officials, provided input and ideas. The meeting attendees indicated that the We Energies North Corridor, the West Allis Line, the Southside Power Line, and the Union Pacific Line were the most desired segments. These corridor preferences were considered when determining the final corridor rankings. A summary of the feedback from the public meeting is provided in the Appendix. Numerous meetings were also held with the City of Milwaukee's Bicycle and Pedestrian Task Force, the City of Milwaukee Bicycle and Pedestrian Coordinator, and the County Parks Trail Coordinator.

## **Corridor Evaluation**

This section of the report describes the areas studied in the form of a geographic and written inventory. The inserted map (Figure 1) depicts all of the corridors studied, both existing trails and corridors with potential for future development. As described in the legend, the corridors are identified with dark blue and each one is labeled with its designated name.

A key recommendation of the study is to ultimately have an integrated and complete network of bicycle facilities. Building any one of the corridors would benefit cyclists but building the complete network of trails would be ideal and have the most significant effects on mode share and ridership. Connectivity of off-street trails to the rest of the transportation system and to each other is central to a practical bicycle transportation network. Please note, that although this study was funded by the City of Milwaukee, some research was conducted outside the City boundary because of the issue of connectivity. Although the City may not have the authority or interest to construct trails outside of the city boundary, the City should work with surrounding municipalities to assure connectivity to other major trail systems.

The written portion of the inventory includes notes and a summary of recommendations for improvements to the existing trail network, descriptions of each proposed corridor, and the grading rubric used to rank new trail development priorities. For the three highest prioritized corridors, a detailed description and individual corridor map is included. All other corridor descriptions will be brief summaries of findings and recommendations including two special case corridors that are outside the theme of this report but are extremely important. The corridor summaries in the body of the report are supplemented by a PowerPoint presentation (with additional notes and pictures of all corridors) included on the report CD. The CD also provides all the GIS layers and a PDF file of the report.

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## **Existing Trail Inventory**

The Oak Leaf Trail, the partially completed Hank Aaron State Trail, Beer Line Trail, and the planned South Side Trail demonstrate that the Milwaukee trail network is growing. In addition to adding new trails, it is important to maintain and improve existing trails. Thus, before exploring new trail options, the BFW inventoried and rated the conditions of existing trails and counted trail users. Trail segments were graded on the following factors: width, pavement condition, drainage, encroachment, sightlines, signs, safety, and connections. Trail counts occurred on the OLT at Cupertino Park, where 39,225 users were counted over the course of a month and at Brady Street, where 8647 were counted over a week (projected monthly count: 34,588). Detailed tables included in the appendix provide information on specific improvement recommendations and trail user counts.

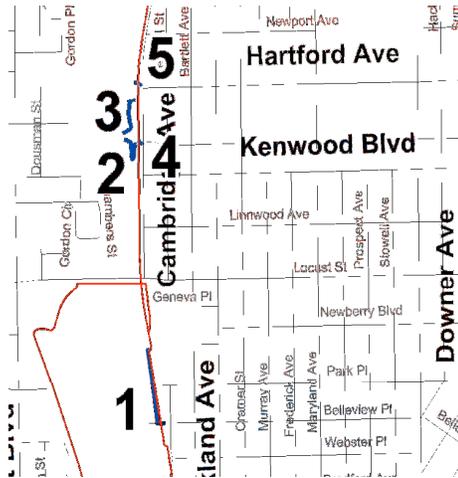
## **General Recommendations for Existing Trail System**

Milwaukee is fortunate to have an emerald necklace of parks and trails surrounding it. While many existing trails are in good condition, there are numerous spot and segment improvements that should be made. County parkways, which provide essential connections between trail segments, need to be well maintained to accommodate bicycle traffic. The following general recommendations can be applied to existing, as well as new trails. A detailed account of location specific recommendations is included in the appendix.

- Formalize all major desire line trails
- Sign trail access points on both the trail and city streets
- Plow well-used trails throughout the winter
- Install additional Oak Leaf Trail signs, especially at intersections where the continuation of the trail is not clear (example, Hampton Ave.)
- Do not allow flying right turn lanes at intersections that cross trails
- Construct informational kiosks with permanent maps and maps for distribution
- Sign park amenities, especially bathrooms and water fountains
- Install signs to alert bicyclists if an access trail leads to a bike route (bike route sign with arrow)
- Consider extra pedestrian and bicycle facilities and signage when schools are located near trails
- Always install curb cuts and paint crosswalks when trail is interrupted by a street, especially for mid-block crossings
- Redesign Oak Leaf Trail signage to be more clear and visible
- Maintain all pavement to a high level
- Consider lighting underpasses and areas prone to crime
- Install “Bicyclists Yield to Pedestrians” signs when trails are routed on city sidewalks (i.e. the Beerline Trail along the Commerce St sidewalk)

The Cambridge Woods neighborhood portion of the OLT has the most desire line trails (see photographs on the included CD). The frequency of well worn desire line trails indicate that current access points are insufficient and more should be constructed. The Cambridge Woods neighborhood association has a preliminary plan that references many of the improved access points below (Figure 2). It is recommended that the City and County of Milwaukee pay close attention to the valuable public input provided in this preliminary plan when formalizing access points in this neighborhood.

- 1) Existing wide ramp from Bellevue PL down to OLT-- This ramp should be officially dedicated
- 2) Desire line trail providing access from Hampshire St to Milwaukee River-- Recommended access point
- 3) Gravel Path at low grade between Hartford and Kenwood-- Possible ADA access to the Milwaukee River
- 4) Desire line trail from Hampton St to OLT-- Recommended access point
- 5) Desire line trail from Hartford Ave to OLT-- Not recommended, steep grade



• Figure 2 Cambridge Woods Desire Trails

### Hank Aaron State Trail

The Hank Aaron State Trail (HAST) is a partially completed project. The finished portion of the trail runs west from 6<sup>th</sup> St along the north side of the newly constructed Canal St and ends at 25<sup>th</sup> St. Both signage and pavement markings are pending and soon to be installed by the City of Milwaukee. The incomplete portion of the HAST, west from 25<sup>th</sup> St to the Miller Park East Lot, will be completed along with the reconstruction of the western portion of Canal St. Although the location of the trail is final, access points and neighborhood connections are still under discussion. The Bicycle Federation of Wisconsin has attended all official meetings relating to this issue.

The topography of the HAST is unique; the trail itself is in the bottom of the river valley and has a very low overall grade change. Access to the trail, however, is difficult because of its location in the Menomonee Valley. Access points from the north currently exist at Ember Lane, 6<sup>th</sup> and 25<sup>th</sup> streets. From the south, 6<sup>th</sup> St provides the only access point. The Menomonee River Valley is surrounded by, but not connected to, multiple residential neighborhoods in need of recreational space.



• Figure 3 Historic Use of Pedestrian Tunnel and Bridge

As a result of official planning meetings, three access points have been identified for trail access from the south. Currently no new access points are planned from the north. All southern access points will connect to multiuse paths in the new Airline Yards Park, a planned component of the Menomonee Valley Development project. All park paths will connect to the HAST.

The design of the connection between the terminus of the Oak Leaf Trail in Doyne Park and the HAST is not yet finalized. The following route is recommended:



• Figure 4 Contra flow Bike Lane in Madison, WI

Leaving Doyne Park, proper signage and pavement markings should be placed to accommodate a mid-block crossing to the south side of Wells St. For approximately 40 feet the connection should run east either on Wells St or the southerly sidewalk. As Wells St crosses over US HWY 41 there is no need for two lanes of traffic since there are no streets to turn right onto. The right travel lane should be replaced by a two-way contra flow bike lane separated from vehicle traffic by a concrete barrier (Figure 4). After crossing US HWY 41 to the east, proper right-of-way should be purchased from the Humane Society building to create an off-street bike path paralleling Wells St and then turning south onto 44th St. At the intersection of 44th St & Blue Mound Rd the trail should cross to the east side of 44th St. Fill should be brought in to create space to continue the trail south, parallel to the street.

### Recommendations

The three recommended southern access points are:

- A new bridge connecting Mitchell Park to the planned Airline Yards Park
- The reconstruction of an existing tunnel at approximately 35<sup>th</sup> St (Figure 5)
- A new bridge at approximately 38<sup>th</sup> St



• Figure 5 Existing Pedestrian Tunnel

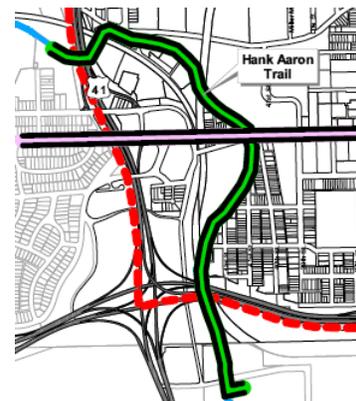
All planned access points from the south should be constructed. A new access point from the north is also described in the Menomonee Valley North Connections Corridor plan. This connection would be a bridge from Valley Park running over the Menomonee River, over the railroad tracks, and under Interstate 94. This concept should be studied further.

Since the bridge over 25<sup>th</sup> St is narrow and carries a lot of traffic, the 32<sup>nd</sup> Street connection at Canal St. will be the only access point attractive to cyclists from the Merrill Park neighborhood. Adding another connection to the Hank Aaron State Trail from the Merrill Park and "Pigsville" neighborhoods should be considered from the Valley Park levee. There is already a very well



• Figure 6 Pigsville soft trail

constructed and maintained unofficial soft trail that runs along the embankment from the I-94 bridge over the river and tracks to about 34<sup>th</sup> St where a railroad access road comes down from 32<sup>nd</sup> St. Benches and artwork are integrated into the trail. This trail could be formalized by negotiating ROW agreements and adding official connections to the HAST over the rail road near 37<sup>th</sup> St and a connection to Valley Park. More photographs of these possible



• Figure 7 DCD recommended connection

connections are included in the report PowerPoint. As shown in figure 7, the Department of City Development's Near West Side Neighborhood plan recommends a connection to the Hank Aaron State Trail in the general area as well.

Finally, the Milwaukee Metropolitan Sewer District is currently acquiring parcels in this corridor near State St from the Valley Park area west to Wauwatosa for flood management purposes. MMSD projects that they will have a design phase in 2007. The City owns an existing bridge over the river at the base of Doyne Park in this area. Wauwatosa is already building a trail in flood management area and has expressed interest in connecting it to a Milwaukee trail at the border. The City should work with the County, MMSD and Wauwatosa to assure that formal bicycle/pedestrian connections are included at all opportune locations.

## Study Corridors

Rankings of Priority Corridors Included in this Study	
<p><i>Rubric Based Corridor Ranking</i></p> <ol style="list-style-type: none"> <li>1. West Allis Line</li> <li>2. North Milwaukee Line</li> <li>3. We Energies North Connection</li> <li>4. South Side Trail Corridor</li> <li>5. Havenwoods Lincoln Creek</li> <li>6. Lincoln Creek Pkwy Extension</li> <li>7. Union Pacific Line</li> <li>8. North Menomonee Valley Connections</li> <li>9. South Side Power Line</li> <li>10. Beer Line Trail</li> <li>11. Kinnickinnic River West</li> <li>12. Kinnickinnic River East</li> <li>13. Wilson Creek</li> <li>14. Noyes Park</li> <li>15. I-894 Power Line</li> <li>16. We Energies Extension</li> <li>17. I-94 West Power Line</li> <li>18. Airport Power Line</li> </ol>	<p><i>Consultant Recommended Ranking</i></p> <ol style="list-style-type: none"> <li>1. West Allis Line</li> <li>2. We Energies North Connection/ Union Pacific</li> <li>3. South Side Power Line</li> <li>4. Lincoln Creek Pkwy Extension</li> <li>5. North Menomonee Valley Connections</li> <li>6. Havenwoods Lincoln Creek</li> <li>7. North Milwaukee Line Wilson Creek</li> <li>8. Wilson Creek</li> <li>9. Beer Line Trail South Side Trail Corridor</li> <li>10. South Side Trail Corridor</li> <li>11. Kinnickinnic River West</li> <li>12. Kinnickinnic River East</li> <li>13. Noyes Park</li> <li>14. We Energies Extension</li> <li>15. I-894 Power Line</li> <li>16. I-94 West Power Line</li> <li>17. Airport Power Line</li> </ol>

Table 1

### West Allis Line

This abandoned railroad right-of-way contains a single set of tracks, which are still present along its entire length. The corridor alternates between above grade, at grade, and below grade with only slight grade changes of no more than 2%. The corridor runs west from the eastern right-of-way of Miller Parkway, over Miller Parkway on an existing bridge, to 124<sup>th</sup> St and the western border of Milwaukee County (Figure 8).

From initial observation on GIS, this corridor has many appealing features: the trail links many popular destinations (Miller Park, the Milwaukee County Zoo, the Hank Aaron State Trail, and the Oak Leaf Trail), existing bridges could be retrofitted to provide a

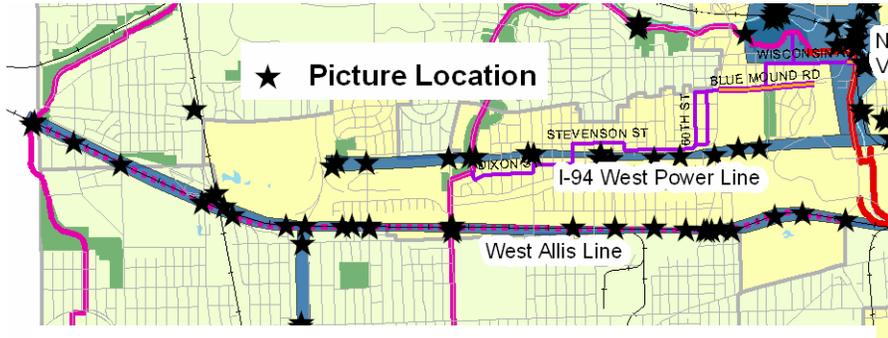
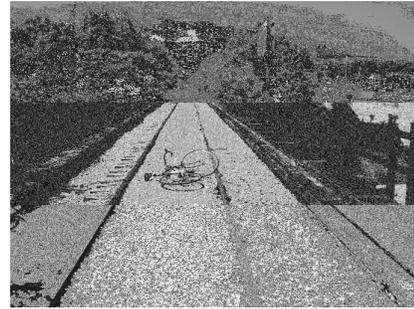


Figure 8 West Allis Line Map

safe trail with very few street crossings, and many desire trails exist throughout the corridor.

The DNR is pursuing this corridor as a westerly extension of the Hank Aaron State Trail, which would serve as a needed east/west bike trail across the entire city and connect to the Oak Leaf Trail System. Combined with the planned HAST, the two trails would link the lakefront, Summerfest grounds, downtown Milwaukee, the Menomonee River Valley, Miller Park, the VA, the State Fair Grounds, OLT, and possibly the Milwaukee County Zoo. The city should continue to work with the DNR to develop this important trail that will provide a missing off-street, east-west link that connects some of the most popular destinations in the city.

This ROW crosses over Miller Parkway using an existing bridge that is in good condition and suitable for retrofit. Heading west, there are at grade access points in the Veterans Hospital campus. As the ROW continues to 60<sup>th</sup> St it is slightly below grade with access points at each street from 56<sup>th</sup> to 60<sup>th</sup>. These crossings do not downgrade the suitability of a trail since they are low volume, neighborhood streets that would provide trail access. Between 60<sup>th</sup> and Hawley Rd, the maximum grade differential is about eight feet, and desire line trails connect only to the south for street connections in West Allis. Access to the north through this section is difficult due to a steep grade. From Hawley Rd to State Fair Park (approximately 83<sup>rd</sup> St) tracks stay at grade with many access points to neighborhood streets.



• Figure 9 Railroad bridge at 84<sup>th</sup> St.

In State Fair Park the ROW runs on a bridge over the main entrance from the parking area. Currently, this bridge is fenced off, but could be opened with an access trail leading back down to grade and the fairgrounds. To 95<sup>th</sup> St the ROW is at grade except for the street crossings at 84<sup>th</sup> and 92<sup>nd</sup> where it is elevated on bridges. These bridges are in good condition and suitable for retrofit (Figure 9). In this portion, access trails could be developed from ROW down to grade at both bridges. 95<sup>th</sup> St is the next at grade street crossing. Continuing west, the ROW heads into an undeveloped corridor that consists of a low lying partially wet land. The ROW passes under Hwy 100. To the west of Hwy 100, a frontage road terminates at the ROW, providing an opportunity for trail-head parking and trail access. The next access point is at 116<sup>th</sup> where a gravel road exists and heads south to Fairview Ave. This is an excellent access point for the City of West Allis. The last at grade street crossing and access point exists at 121<sup>st</sup> St. Neighborhoods from both the north and south could take advantage of the trail at this point.



• Figure 10 Typical Desire Line Trail

The Milwaukee portion of this ROW ends at 124<sup>th</sup> St where it crosses over the OLT. A grade difference of approximately 10 feet separates the ROW and the OLT. A ramp that meets the Americans with Disability Act (ADA) requirements would allow bicyclists to cross the city on an off-street trail and connect to the OLT system.

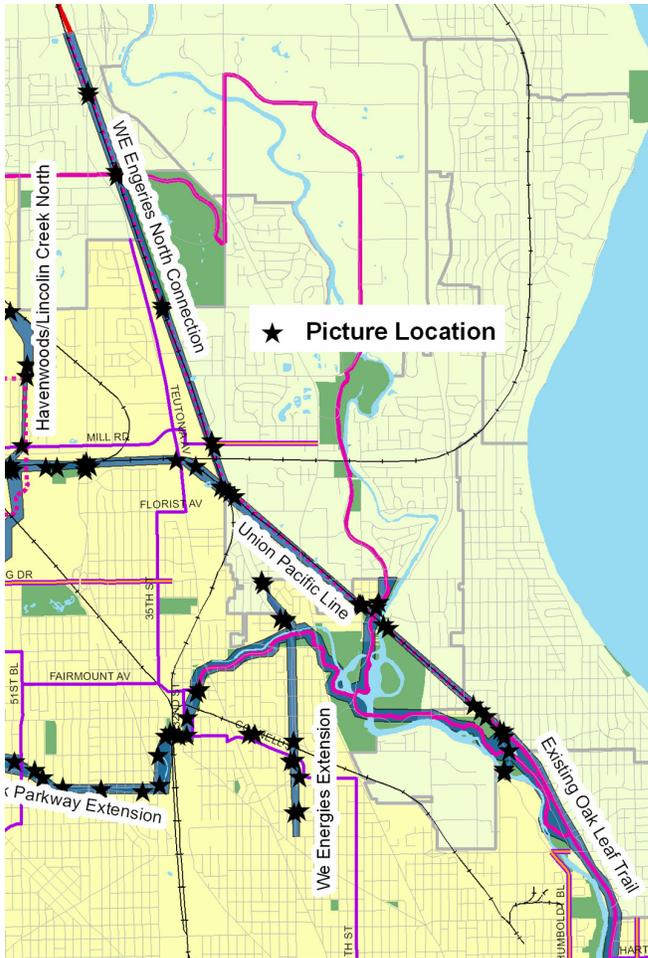
## Recommendations

The City should work with the DNR to develop this abandoned railroad right-of-way into an off-street bike trail. With little grade change over its entire length; many key access points to local streets that enter residential neighborhoods with schools, parks, and retail; key connections with the Hank Aaron State Trail and the Oak Leaf Trail; this western extension of the HAST would complete an east/west bike trail that would transect both the City and County of Milwaukee. All existing bridges are in good condition and could be retrofitted to meet bicycle and pedestrian standards, and all desire line trails should be converted into formal trail connections where suitable (Figure 10). Land acquisition would mainly be from the Union Pacific Railroad Company and a small number of other land owners to assure proper locations for trail access. The DNR is currently reviewing land appraisals and entering

into negotiations with the railroad company. Development of this corridor would provide a safe direct route from the western part of the city and county into downtown Milwaukee.

## Union Pacific Line & We Energies North Connection

The Union Pacific Line & We Energies North Connection together provide a great opportunity to improve the off-street bicycle network. Developing both corridors as one project would create an off-street bike trail that would connect downtown Milwaukee to the Ozaukee Interurban trail (Figure 11).



The Union Pacific Rail Line Corridor consists of an inactive railroad line running from the Milwaukee River in Estabrook Park, east past the OLT terminus on the east side of the park, then turning northwest to Teutonia Ave where it runs into an active railroad line and turns due west to Schoenecker County Park. This corridor would connect the Oak Leaf Trail from Estabrook County Park to the studied WE Energies North Connection Corridor which runs north to the Brown Deer Recreational Trail and eventually the Ozaukee Interurban Trail. A second connection could be made to the Havenwoods / Lincoln Creek North Corridor (also studied). This inactive rail line has bridges at all major street and river crossings. These bridges appear to be in good structural shape and could be retrofit to meet bicycle and pedestrian standards.

The We Energies North Connection corridor runs from the studied Union Pacific Rail Line corridor north to the Brown Deer Recreational Trail and eventually the Ozaukee Interurban Trail. The entire corridor runs on WE Energies owned land containing overhead power transmission lines.

• Figure 11 Union Pacific Line & We Energies North Connection Map

At the southern terminus of the corridor in Estabrook Park there is a well worn desire trail along the inactive rail line north to Hampton Ave. There are additional desire line trails at the at grade street crossings at Lydell Ave and Lexington Ave. The final access point before the intersection of the We Energies North Connection Corridor is a below grade street access where the railroad crosses N 13<sup>th</sup> St on a bridge.

The southern terminus of the We Energies North Connection corridor starts at its intersection with the northern terminus of the Union Pacific Corridor. At this point the railroad tracks are elevated above the existing gravel road running in the corridor (Figure 12). There are desire line trails running from the tracks down the embankment to the We Energies land. Continuing north/northwest, the entire corridor

has a relatively small grade change over its entire length. There are at grade street crossings and access points at Mill Rd, Green Tree Rd, Good Hope Rd, Bradley Rd, Green Bay Rd, and Brown Deer Rd, where the corridor is already a developed and well used trail.



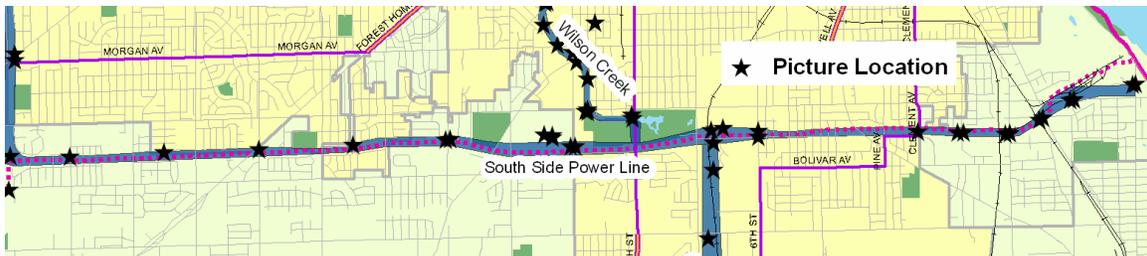
• Figure 12 Union Pacific Line & We Energies North Connection Intersection

### Recommendations

Given the importance of this connection to trails to the north it is highly recommended that these corridors are developed together into a continuous trail. All desire line trails should be formalized and all railroad bridges should be converted to bicycle pedestrian standards. A ramp should be built to connect the Union Pacific Line to the We Energies corridor. All at grade street crossings in both corridors should be studied for safety and special treatments to maximize trail user safety should be considered.

### South Side Power Line ROW

This corridor contains overhead power transmission lines. It runs from Packard Ave, (one block west of Lake Michigan and the Oak Leaf Trail) west to Interstate-894/US HWY 45. This ROW consists mainly of grassy open space that is about 200 feet wide with transmission line towers. Based on a GIS analysis, this corridor is ideal for development given its geographic location. There are no trails in this area and the attributes of the South Side Power Line ROW make it better suited to trail development than other corridors on the south side. It would serve as an east/west connection across the southern section of the City and County. The We Energies owned corridor is fairly continuous, with a low number of private land owners. This corridor is also proposed for trail development as part of the Oak Leaf Trail network plan.



• Figure 13 Southside Power Line Map

The entire ROW consists of frequent slight grade changes in the form of rolling hills. Heading west from Packard Ave, the ROW has a few at grade street crossings. The first issue is at the Union Pacific Railroad tracks that run along the western side of Kinnickinnic Ave. In the power line ROW the tracks are elevated by a mound that is approximately 10 feet high. The at grade street crossing of Norwich St can be used to cross the tracks. Heading west the ROW continues its rolling topography with at grade street crossings up to Interstate-794. The interstate is below the grade of the ROW so either an on street route or a bridge is needed to cross I-794. West of I-794 and east of Kansas St there is an existing building in the ROW owned by We Energies. The ROW continues from Clement Ave to 6<sup>th</sup> St with at grade crossings every block with the exception of I-94. The ROW is free of street crossings from 6<sup>th</sup> to 13<sup>th</sup> streets. However, the Canadian Pacific Railway track transects the power line ROW and is elevated on a 10 foot high mound. Also, in this stretch there is an existing 12 foot wide asphalt road

leading to the base of a cellular phone tower that could possibly be used for the trail. The 13<sup>th</sup> St at grade street crossing leads into Milwaukee County's Wilson Park. In Wilson Park there are many existing multiuse paved paths, as well as an existing bridge over the Kinnickinnic River. The next street crossing west of the Park, at 27<sup>th</sup> St, is problematic. Two retail car dealers lots exist under the power lines on the east and west side of the street. The least expensive and reasonable alternative is to route the trail on-street to avoid this dangerous intersection and private land owners. At 35<sup>th</sup> St, the ROW again becomes ideal for trail development with only a couple of street crossings until the intersection of Forest Home Ave and 68<sup>th</sup> St. Forest Home is a busy street crossing, but with proper signals and pavement markings the safety of the crossing could be improved. Continuing west there are street crossings at 75<sup>th</sup>, 83<sup>rd</sup>, and 92<sup>nd</sup> streets before the ROW turns to the north and parallels I-894. At this location the trail should use an on-street connection running south on 99<sup>th</sup> St and then west on Cold Spring Rd to connect to the OLT.

### **Recommendations**

It is recommended that the Southside Power Line ROW be developed into an off-street trail where feasible and use the following recommendations for locations that inhibit off-street trail development. The eastern terminus of this ROW is within the city limits of St. Francis. Thus, the City and County of Milwaukee should work with St. Francis to develop this off-street section of trail including a pedestrian/bicycle bridge over I-794 and using the at grade railroad track crossing of Norwich St. Heading west, at Clement St the ROW crosses into the City of Milwaukee. Due to the many street crossings of the ROW between Clement and 6<sup>th</sup> St, it is recommended to use the City of Milwaukee's on-street bike route to traverse I-94. The trail should be developed off street from 6<sup>th</sup> St with the existing Waterford Ave Canadian Pacific Railroad crossing just east of 12<sup>th</sup> St, eliminating the need for a new at grade crossing. After the track crossing the trail should continue off-street and use existing paths and bridges in Wilson Park to 22<sup>nd</sup> St. It is recommended to use the following on-street route to avoid crossing 27<sup>th</sup> St. and the retail car lots: Exit Wilson Park onto Plainfield Ave, go south on 22<sup>nd</sup> St to Cold Spring Rd.; Head west on Cold Spring Rd and turn north on 35<sup>th</sup> St to connect back to the Power Line ROW. The trail can remain off-street to the western terminus at I-894. Proper signals, signage, and pavement markings, especially for the Forest Home Ave and 92<sup>nd</sup> St crossings should be installed. Easement rights obtained from We Energies would cover the bulk of the corridor. Obtaining ownership or easements from a small number of private land owners would assure appropriate trail access.

### **Other Corridors**

The **Lincoln Creek Parkway Extension** corridor starts at the Oak Leaf Trail terminus located on Cameron Ave and 30<sup>th</sup> St. It runs south to the Lincoln Creek Parkway, following the entire length of the parkway, and turns north exiting the parkway to the intersection with the studied Havenwoods/Lincoln Creek North Corridor. The trail would serve as an internal loop providing neighborhood access to the Oak Leaf Trail and covering a good portion of the city that currently has no off-street bike facilities.

In the **Lincoln Creek/Havenwoods** corridor, the creek runs north out of Havenwoods State Forest and flows beneath the Union Pacific Rail Line. Adjacent to the river bed there is an existing tunnel that could be retrofitted for bicycle and pedestrian use. From the tunnel to Green Tree Rd, the river channel and open space is approximately 80 feet wide. The river channel runs in the center and the rest of the open space consists of a grassy embankment. There is space for trail development but it may have to be bench cut with retaining wall. This corridor, along with all other river corridors, needs special consideration to determine that a trail would not negatively impact the riparian environment. Please refer to the appendix for more information on trail development in riparian corridors. Between Green Tree Rd and Good Hope Rd the creek runs through a large property owned by the Milwaukee Metropolitan Sewer District (MMSD). This property has ample space for trail development and already has many desire line trails. The trail could connect to Good Hope Rd. There is no open land for further trail development to the north of Good Hope Rd.

Development of this corridor is recommended because it would provide a key connection to the Union Pacific Rail Line corridor featured in this study. There are no significant acquisition costs since the property is in public ownership.

The **North Milwaukee Line** corridor runs along an active railroad starting at Highland Ave and heads northeast to Lisbon Ave then turns north to Auer Ave. It connects to the studied North Menomonee River Valley Connections Corridor at the southerly terminus. Development of this corridor could eventually provide access from neighborhoods to the north to the Hank Aaron State Trail and cover a portion of the city that currently has no off-street bike trail.

The **Wilson Creek** corridor consists of open grassy land that abuts Wilson Creek. The section studied runs from Wilson Park as it extends north and intersects with the Kinnickinnic River. This corridor could serve as another connection from a county park to the OLT and as a connection between the existing OLT and the South Side Power Line ROW included in this study and proposed for OLT development.



• Figure 14 Wilson Creek

There is at grade access to Wilson Creek in many places in Wilson Park including directly off of 20<sup>th</sup> St, a designated bike route. West of the Creek from 20<sup>th</sup> St there is about 150 feet of open space with mowed grass on both sides of the river. As the creek turns north it runs underneath Howard Ave where the open space comes to grade with the street. This landscape continues north by northwest until 27<sup>th</sup> St with neighborhood access points at Tripoli Ave, Wilbur Ave, and Warnimont Ave. A desire line trail connects the retail shopping complexes between Warnimont Ave and 27<sup>th</sup> St. The creek then runs underground as it heads northwest and becomes visible again on the north side of Morgan Ave with open space again present. At Euclid Ave, the river flows underground for two blocks until it intersects with the Kinnickinnic River.

In the first of these two blocks, a 100 foot wide median divides the street. The second block contains the St Luke's Hospital parking ramp with no room for trail development. One block to the west is 31<sup>st</sup> St which dead ends at the Kinnickinnic River, but has an existing pedestrian bridge that connects to the Kinnickinnic River Parkway/OLT.

It is recommended that an off-street trail be built from 20<sup>th</sup> St in Wilson Park to the intersection of Wilson Creek and 27<sup>th</sup> St and then from Morgan Ave to Oklahoma Ave. From Wilson Park to 27<sup>th</sup> St the trail should be developed on the North and East sides of the river. This will allow more neighborhood access points to be developed. An underpass at Howard Ave should be investigated. As there is no effective and safe way to cross the intersection of 27<sup>th</sup> St and Morgan Ave, it is recommended that the trail stop at 27<sup>th</sup> St and restart at Morgan Ave with an alternative on-street route to accommodate through bicycle traffic. Two different on-street connections have been explored due to one way streets: one eastbound, one westbound. Westbound Route: Exit the trail at Warnimont Ave and head east for one block to 25<sup>th</sup> St. Turn to the north for one block to Morgan Ave. Then turn west and use the traffic signals to cross 27<sup>th</sup> St to Wilson Creek. Eastbound Route: Exit the trail at Warnimont Ave and head east for two blocks to 24<sup>th</sup> St. Turn north and go to the intersection of Sunburry Court. A trail should be built through the park to allow bicycle traffic to continue to Oklahoma Ave. Turn east on Oklahoma Ave and then turn north through the KK Sports Complex to the Kinnickinnic River Parkway/Oak Leaf trail. The off-street trail north from Morgan Ave to Euclid Ave should run on the west side of the creek to accommodate more neighborhood access points. From Euclid Ave to Oklahoma Ave the trail could be developed on the existing median. Proper traffic control and signage should be installed at this intersection. This would allow for the on-street connection to run west on Oklahoma for one block and then north on 31<sup>st</sup> St for one block to the Kinnickinnic River pedestrian bridge and the Kinnickinnic River Parkway/Oak Leaf Trail.

The **Beer Line Trail Extension** corridor is located on the west side of the Milwaukee River Valley, from North Ave to Locust St. Currently, there is an existing gravel pathway that is heavily used as a pedestrian and bicycle trail. The River Revitalization Foundation is currently working on obtaining all proper easements to legally develop a trail in this corridor. Additionally, the Urban Ecology Center has recently completed an accessible trail plan with funding from the state's Coastal Management Fund for the east side of this portion of the river. The full plan is quite ambitious and includes improved staircases, erosion control, a fishing pier, a canoe launch and an elegant pedestrian suspension bridge across the Oak Leaf Recreational Trail. The Plan also includes a fully accessible path that will lead to both to the Oak Leaf Trail and the river. The City of Milwaukee should support all efforts in the development of this corridor and insure that proper bicycle access is provided.

The **We Energies Extension** corridor is a We Energies owned strip of land that originates at Fiebrantz Ave & N 20<sup>th</sup> St near Rufus King High School. It continues north to the City's limit around Silver Spring Dr. It is approximately a 50 foot wide grass covered area with high overhead transmission wires. It has a very low grade change overall and would require bridges at two problematic crossings: the active Canadian Pacific railway and Lincoln Creek in Meaux Park. Developing safe crossings for both these situations is warranted by the desire line trails already present.

Development of this corridor is recommended to provide a formalized neighborhood recreational trail where signs of use are already present. It would also serve as a neighborhood connection to the Oak Leaf Trail and a connection to the retail corridor along Silver Spring Dr. It is highly recommended that the City works with the City of Glendale to continue development north to the connection and intersection of this corridor to the We Energies North and Union Pacific Railway corridors.

The **South Side Trail** corridor runs from Washington St to Becher St along the Union Pacific Railroad. This area is already planned for trail development by the City of Milwaukee but further connections and options were explored in this study.

The **Kinnickinnic River – West** corridor is a section of existing Oak Leaf Trail that is mainly inside the city boundary. It runs along the Kinnickinnic River from 84<sup>th</sup> St to 16<sup>th</sup> St. There are many opportunities to move on-street portions of the trail off-street.

The **Kinnickinnic River – East** corridor consists of the publicly owned ROW surrounding the Kinnickinnic River as it runs from Manitoba St, north to Pulaski Park at 16<sup>th</sup> St, and then East to 6<sup>th</sup> St to the planned South Side Trail. Throughout the corridor, the river is encased in a concrete ditch with open green space of varying width flanking both sides. Currently, along much of the corridor, there are dilapidated walking paths on both sides of the river as well as pedestrian bridges connecting neighborhood streets. Development of this corridor would result in a key off-street bicycle trail connection from the planned South Side Trail to the OLT.



• Figure 15 Kinnickinnic River- East

The corridor has a low change in grade from 6<sup>th</sup> to 16<sup>th</sup> streets with open space present on top of the river bank. A significant grade change is present in Pulaski Park to the Manitoba St. crossing. There are street crossings at 9<sup>th</sup> Place, 13<sup>th</sup> St and 16<sup>th</sup> St with all other neighborhood streets ending at the ROW.

Pedestrian bridges exist at 7<sup>th</sup>, 11<sup>th</sup>, and 14<sup>th</sup> streets. Access points to every street can be constructed without interfering with the continuity of the trail. The trail should be located on the south side of the river because there is only one interruption of the corridor by private property (between 13<sup>th</sup> and 14<sup>th</sup> streets).

MMSD has a long term goal of rebuilding this corridor as much of the concrete is in very poor shape. It is recommended that a bicycle trail be developed on the southern bank of the Kinnickinnic River from 6<sup>th</sup> St to 16<sup>th</sup> St, continuing along the river as it bends toward the south in Pulaski Park in cooperation with MMSD. Most land is already owned by Milwaukee County, thus acquisition costs would be low. The three existing pedestrian bridges should be retrofitted to meet ADA and AASHTO pedestrian and bicycle standards. The possibility of connecting the trail to Pulaski Park and avoiding the busy street crossing by going under 16<sup>th</sup> St should be further pursued. Development of this corridor would result in a key off-street bicycle trail connection from the planned South Side Trail to the OLT.

The **I-894 Power Line Right-of-Way** runs along the east side of the interstate under overhead power transmission lines. This corridor runs from Howard Ave north to I-94. Although this corridor is mainly outside the city it connects two peninsulas of the city that jut out to the west along Morgan Ave and I-94. This corridor has a high rate of at grade street crossings and may be slated for future highway expansion. Thus, the corridor is not highly recommended for trail development.

The **Noyes Park** corridor runs along an unnamed creek starting at Lynx Ave to the south. It heads north to a three-legged intersection with one branch of the creek continuing north to Noyes County Park and the other branch turning west and eventually connection the Oak Leaf Trail in the Little Menomonee River Parkway. This corridor would provide neighborhood access to the Oak Leaf Trail in a portion of the city that currently has no off-street bike facilities.

The **I-94 West Power Line** corridor runs from 28<sup>th</sup> St west to 92<sup>nd</sup> St on land containing overhead power transmission lines. This trail development would provide an off-street bike trail running the length of the peninsula of the city that extends west to 108<sup>th</sup> St along I-94.

The **Airport Power Line Right-of-Way** runs from College Ave, paralleling 13<sup>th</sup> St to the west, north and connecting to the South Side Power Line Right-of-Way. This development would cover an area of the city that currently has no off-street bike trail. However, due to the extent of private use of the land in the ROW, this corridor is not highly recommended.

The **North Menomonee River Valley Connections** consists of an area from 68<sup>th</sup> St east to 41<sup>st</sup> St along the Menomonee River. This corridor provides an opportunity for bicycle and pedestrian connections across the Menomonee River and the active Canadian Pacific Railway. The Milwaukee Metropolitan Sewage District (MMSD) has a new Flood Management for Western Milwaukee plan that impacts this area. From details reported by Milwaukee's Department of Community Development and Bicycle and Pedestrian coordinator, MMSD will be purchasing all land between the railroad tracks and the Menomonee River from 60<sup>th</sup> St to the active north/south railroad tracks (around 42<sup>nd</sup> St). With this land becoming a greenway, the City of Milwaukee should work with MMSD to develop trails and connections across the railroad tracks and river. Further, the bridge in Doyne Park should be preserved and retrofitted for proper bicycle and pedestrian access.

## **Special Case Corridors**

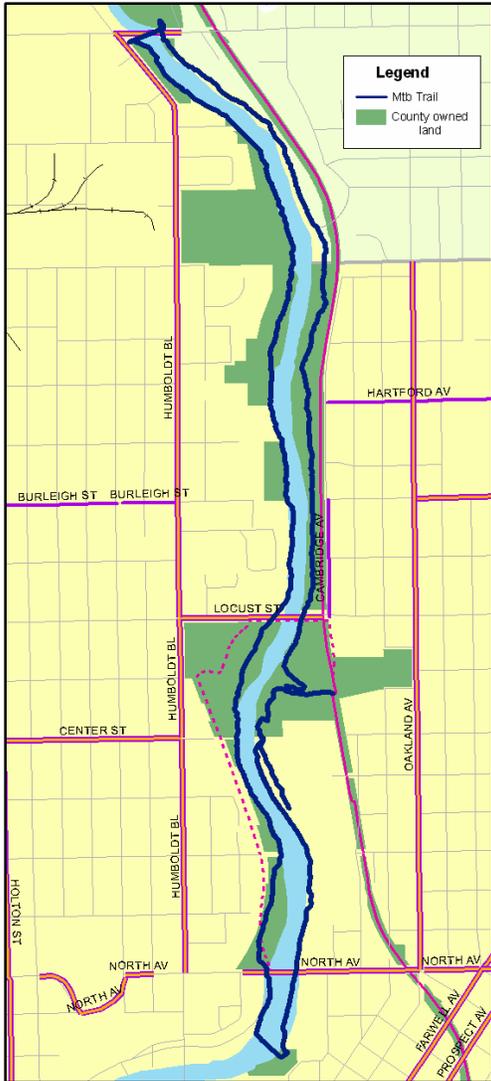
### **Milwaukee River Mountain Bike Trail**

This corridor is unique to this study. Mountain bike trails have a different set of development issues than standard multiuse paths. Thus mountain bike trails will only be discussed in this section and in the implementation plan of this report. Mountain bike trails will not be included in other maps, rankings or tables included in this report.

Currently, an informal dirt trail exists along both sides of the Milwaukee River on the northeast side of the city. As part of this study the trail has been located using GPS technology; the resulting line file is positionally accurate within one meter and shown on the following maps. This trail is heavily used by walkers, trail runners, mountain bikers, anglers, and dog walkers. Most of this trail is located on Milwaukee County owned land, but the trails does cross a few parcels of private property.

Given the fact that there are currently no legalized trails for mountain biking in the City of Milwaukee, it is highly recommended that all portions of trail on public property be legalized and efforts made to pursue proper easements or ownership from private land owners for a fully connected trail. Further, based on the public input meeting, there is significant desire for legal mountain bike trails in the City. Any trail developments should take into account local neighborhood plans for the corridor, including the Urban Ecology Center's plan for the east side and The River Revitalization Foundation's plans for the west side.

The County supports development and expansion of legalized sustainable mountain bike facilities in Milwaukee County. Parks Director Sue Black named the new Franklin Trail the "Alpha" Trail, implying that more trails will be forthcoming (i.e. beta, delta, epsilon). The Alpha trail was built and is maintained by volunteer labor from the area mountain biking community. This effort is headed by the local chapter of the Wisconsin Off Road Bicycle Association, which has a formal trail management agreement with the County. The local group is the Milwaukee Metro Mountain Bikers and they have offered to work on the Milwaukee River Trail development as well. The group has been trained to follow the International Mountain Bike Association's trail building guidelines and participated in IMBA Trail Care Crew seminars on sustainable trail building techniques. Additionally, these seminars have been attended by over 100 area parks managers and citizens.



As previously mentioned, the trails along the Milwaukee River are informal despite heavy use by different groups. Proximity to neighborhoods, private land owners, other official trails, and the riparian corridor make development of sustainable trails with limited user conflicts slightly problematic. However, these problems are routinely overcome in other areas of the county, state, and country. In fact, legalizing designated trails could solve many of the current conflicts. It may be that some sections of the river trails currently under use are not appropriate for all users and would be segregated. This has been done with great success in other trail systems. The Southern Kettle Moraine systems have many miles of trail open to hikers, but closed to mountain bikers. Despite the fact that the trail heads are side by side, the mountain bikers refrain from riding on the hiking-only trails.

• Figure 16 Milwaukee River Mountain Bike Trails

## The Hoan Bridge Connection

The creation of a separated bike trail/path on the Hoan Bridge has long been a desire of Milwaukee cyclists. The City of Milwaukee has officially supported this option and has advocated for this path for some time. The Hoan Bridge is the most direct and attractive option not only as a commuter route from Bay View to Downtown, but for other important reasons:

- It is the most direct and attractive connection between the two most highly used recreational trails in the City. The East Side path and the South Shore path combined serve more than 80,000 cyclists, joggers, roller bladers, walkers and other users groups each month (based on BFW trail counts in October 2004).
- It would be a destination in itself, like the Golden Gate or Brooklyn bridges, adding value to our other Lakefront investments like the Calatrava and Pier Wisconsin. The crown jewel of the Oak Leaf Trail necklace would then be located in the heart of our City.
- Lakeshore State Park could soon be joined by the only other urban state park with a proposed DNR purchase of land adjacent to the end of the Hoan Bridge. Again, the most obvious, direct, attractive, and safe route connecting the proposed park with Lakeshore State Park is the Hoan Bridge.

A study was completed between WisDOT and URS (Project I.D. 1300-06-01 – Bay View to Downtown Milwaukee Bicycle Route Study) to evaluate the different options for a bike/ped connection through this corridor. Alternative 15T in the URS study was ranked highest by all user groups and should be developed whenever the bridge is redecked.

To summarize, Alternative 15T calls for a two-way bicycle travel lane on the east side of the bridge. The study recommended the multiuse path be separated from motorized traffic with a concrete parapet barrier. This provided the most direct off-street route connecting downtown Milwaukee to the southern neighborhoods, as well as a connection between downtown and the Lake Express ferry connecting Milwaukee, WI to Muskegon, MI. This is a key expansion of alternative transportation between the two states.

## Development Details

### Design Guidelines

For trails to serve the recreation and transportation needs of Milwaukee's residents, safety must be the first priority in trail design. Further, adults often cite perception of danger and fear of traffic as reasons that they do not bicycle more. By increasing the trail network and designing for the safety of bicyclists, walkers, joggers, and children, Milwaukee will increase the number of recreational and transportation bicycle trips.

The AASHTO Guide for the Development of Bicycle Facilities and the Wisconsin Bicycle Facility Design Handbook (WBFDH) present current bicycle facilities design standards. WisDOT's own guidelines are based on the AASHTO guide. Meeting the design guidelines of this and other local, state, and federal bicycle publications will ensure that trails in Milwaukee will safely serve the population for years to come. **Guidelines from AASHTO and the Wisconsin Bicycle Facility Design Handbook should be considered minimums.** Many municipalities routinely exceed the recommendations to provide a more enjoyable and safe bicycling experience. Below are the primary minimum trail design guidelines, culled from the Pedestrian and Bicycle Information Center and the WBFDH.

Bicycle facilities, like other transportation facilities, require a high level of engineering. However, as outlined below, path and road design considerations are not identical and the specific needs of bicyclists and other users must be taken into account.

## **Designing Paths and Roads: Differences and Similarities**

There are numerous similarities and differences between the design criteria for shared-use paths and highways. The designer should always be aware of these factors and how they influence the design of shared-use paths.

Similarities include the need for:

- Carefully designed vertical grades
- Routine all-weather maintenance
- Routine maintenance (e.g., joint filling)
- Adequate curve radii
- Adequate sight distance
- Warning, regulatory, and informational signs
- Basic pavement markings

Differences include:

- Vehicle size and clearance requirements
- Wide variety of bicycle user ages and capabilities
- Design speeds used to determine geometrics and grades
- Pavement structure needed to support typical path vs. road traffic

### **Intersections**

Shared use paths function best when they are in their own right of way. Paths along former railroad corridors or canals work well because they are likely to have fewer intersections with roadways, and may even be completely grade separated from roadway intersections (i.e. they cross roadways on underpasses or overpasses). By contrast, paths that have frequent intersections with roadways and/or driveways usually require path users to stop or yield at every crossing, and every crossing creates potential conflicts with turning traffic. Intersections are particularly dangerous for bicyclists since this is where most bicyclist/motorist crashes occur. Thus, a primary goal of bicycle trail design is to minimize the number of at-grade intersections.

The Wisconsin Department of Transportation has not, at this time, developed a warrant process for judging the necessity of urban or suburban grade separated crossings. It does offer the following guidance and graphic on general urban or suburban crossing situations and the general character of the solutions:

- *Crossing low-volume streets* requires little more than basic improvements – stop or yield signs, warning signs, and pavement markings
- *Crossing medium-volume streets* may combine signs and markings with median refuges;
- *Crossing high-volume streets* may require a signalized intersection and/or a median refuge

- *Crossing very-high volume streets* will likely require a grade separation; freeways do require one

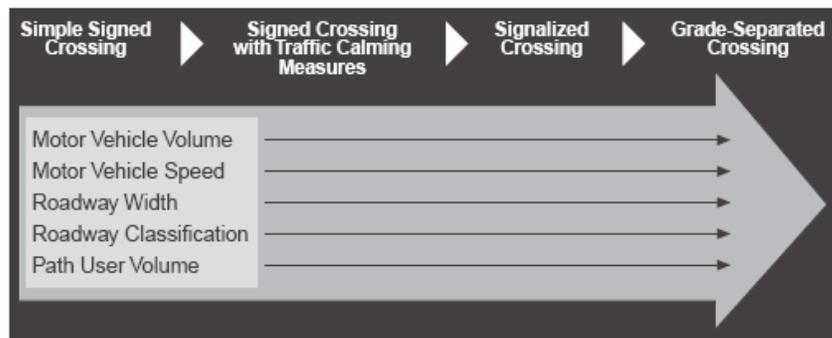


Figure 17 Factors on Crossing Design

The Idaho Department of Transportation bicycle and pedestrian planning manual provides a “suggested analysis of separated multiuse pathways” that recommends on-street facilities, rather than shared use paths, when more than 8 street crossings per mile are present. The guidance also recommends proceeding with extreme caution and perhaps switching to on-street bicycle lanes when there are between 5 and 8 crossings per mile, and with one to four crossings per mile the manual encourages the designer to use special care to treat potential conflicts. An additional tool is the side-path suitability algorithm developed by Ed Barsotti of the League of Illinois Bicyclists which is included in the appendix and available online.

### Width and Clearance

10 feet or 3 meters is the recommended minimum width for a two-way, shared use path on a separate right of way. It is essential to remember that trail width can be affected by poor maintenance as demonstrated on parts of the OLT running in the northwest side of the city along the Little Menomonee River Parkway. According to the WBFDH, if potential use is high enough, width can be increased up to 14’.

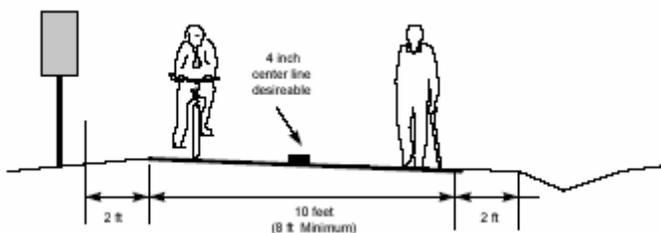


Figure 18 Typical AASHTO Recommended Bicycle and Pedestrian Shared Use Path Cross Section

Other critical measurements include:

- 8 feet (2.4m) may be used where bicycle traffic is expected to be low at all times, pedestrian use is only occasional, sightlines are good, passing opportunities are provided, and maintenance vehicles will not destroy the edge of the trail
- 12 or even 14 feet is recommended where substantial use by bicycles, joggers, skaters, and pedestrians is expected and where grades are steep
- 2 feet of graded area should be maintained adjacent to both sides of the path
- 3 feet of clear distance should be maintained between the edge of the trail and trees, poles, walls, fences, guardrails, or other lateral obstructions
- 8 feet of vertical clearance to obstructions should be maintained; rising to 10 feet in tunnels and where maintenance and emergency vehicles must operate

- Horizontal and vertical alignment etc

The design of a shared use path should take into account the likely speed of users, and the ability of bicyclists to turn corners without falling over, skidding, or hitting their pedal on the ground as they lean over. The AASHTO Guide for the Design of Bicycle Facilities has a number of tables and equations to help designers meet the tolerances of a bicyclist based on the following key design speeds:

- 20 miles per hour (30 km/h ) minimum design speed
- 30 miles per hour (50 km/h) should be used where downgrades exceed 4 percent
- 15 miles per hour (25 km/h) should be used on unpaved paths where bicyclists tend to ride more slowly (and cannot stop as fast without skidding or sliding on a loose surface)

### Grade

Another critical factor in trail design is the grade or slope of the path. Generally, grades greater than 5 percent (one feet of climbing for every 20 feet traveled forward) are undesirable as they are hard for bicyclists to climb and may cause riders to travel downhill at a speed where they cannot control their bicycles. However, recognizing that trails cannot always remain flat, the WBFDH offers the following suggested lengths for certain grades:

Grade Percent	Maximum Recommended Length	
	ft	(m)
5-6	800	(240)
7	400	(120)
8	300	(90)
9	200	(60)
10	100	(30)
≥11	50	(15)

*Note: Min. design speed for grades = 30mph (50km/h).*  
*(after AASHTO Guide for the Development of Bicycle Facilities, 1999)*

Table 2 Suggested Grade Limits for Shared Use Trails

And, suggestions are offered for ways to mitigate the impact of steeper slopes, such as:

- 4-6 feet of additional width to the trail to allow sufficient space for a cyclist to dismount and walk their bicycle without blocking the trail, or to allow cyclists to pass each other
- alerting cyclists to the approaching grade with appropriate signs and markings posting a recommended descent speed or grade
- exceeding the usual minimum stopping sight distances to allow for the higher speeds
- exceeding the usual minimum thresholds for providing recovery areas, railings etc
- using a series of short switchbacks to contain the speed of descending riders



## Sight Distances

The ability of a cyclist to stop or slow down to avoid a collision or crash is affected by many things. The rider must have time to identify a potential problem and react accordingly, which means that they must be able to see approaching intersections or corners in plenty of time even when they are traveling at the design speed of the trail. The bicycle itself must be able to be stopped or brought under control in time, which is affected by the braking ability of the bike, the surface material (a loose surface requires greater stopping distance), and the weather (wet conditions require greater stopping distances than dry). Once again, the AASHTO Guide and state/local manuals have tables and charts to enable the designer to calculate the appropriate sight distances in a range of situations.

## Drainage

In response to a message about trail maintenance posted recently to an e-mail listserve, one trail manager identified the three most important issues as drainage, drainage, and drainage. Poor drainage can ruin a good trail. The AASHTO Guide recommends a minimum cross slope of 2 percent – and the need to make trails accessible to people using wheelchairs argues against a cross slope greater than 3 percent – to provide adequate drainage. The North Avenue OLT underpass is an example of poor



• Figure 19 Ponding on the OLT at North Ave

drainage (Figure 19). The development of the Kenilworth building includes a new trail access point. The City should work with the county and developer to engineer a solution to this drainage problem.

Other considerations to ensure adequate drainage include: slope the trail in one direction rather than having a crown in the middle of the trail, ensure a smooth surface to prevent ponding and ice formation, place a ditch on the upside of a trail constructed on the side of a hill, place drainage grates and utility covers etc out of the travel path of bicyclists, and preserve natural ground cover adjacent to the trail to inhibit erosion.

## Surface

Another important consideration in trail design is the type of surface that will be provided. A hard surface, such as cement or asphalt, will generally see cyclists operating at a faster speed than a soft surface, but may not be as popular with joggers and is more expensive to install. The table summarizes the advantages and disadvantages of each material.

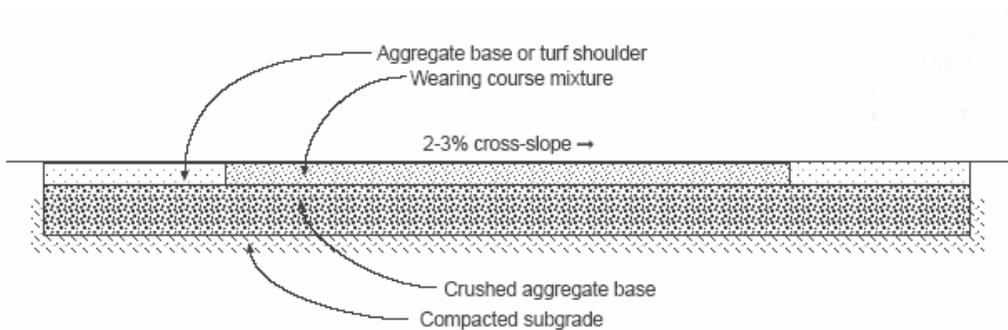
Factors such as weather conditions and soil types can affect the three main material choices of asphalt, concrete, or crushed rock. Asphalt or concrete is necessary for trails to meet urban transportation needs. While most trails, including the OLT are asphalt, some locations use concrete. Denver and Colorado Springs have mostly concrete trails. The Ohio Department of Transportation Manual 2005 includes the following recommendations on concrete use:

- Use concrete where trail will flood annually
- Use concrete on the 25 feet leading into and out of a street crossing. Pavement change is part of warning trail users of entering street. The bollards, detectable warning, etc work better in concrete.

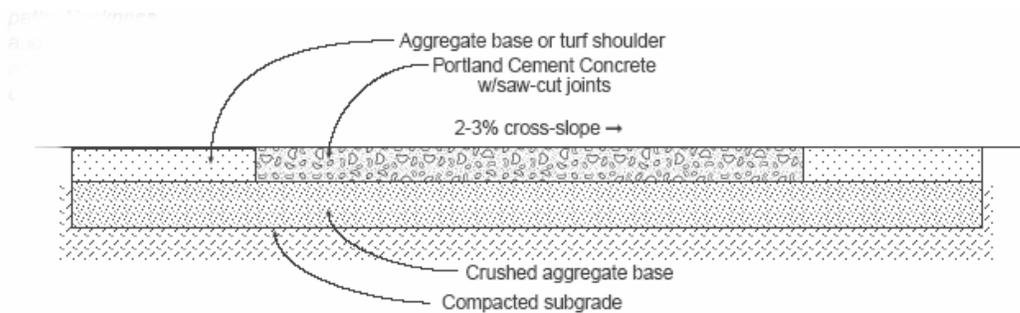
Further information regarding surface and surface maintenance can be found in the maintenance section of this report.

Surface Material	Advantages	Disadvantages
Soil cement	Uses natural materials, more durable than native soils, smoother surface, low cost.	Surface wears unevenly, not a stable all-weather surface, erodes, difficult to achieve correct mix.
Crushed aggregate	Soft but firm surface, natural material, moderate cost (varies regionally), smooth surface, accommodates multiple use.	Surface can rut or erode with heavy rainfall, regular maintenance to keep consistent surface, replenishing stones may be a long-term expense, not for steep slopes.
Asphalt	Hard surface, supports most types of use, all weather, does not erode, accommodates most users simultaneously, low maintenance.	High installation cost, costly to repair, not a natural surface, freeze/thaw can crack surface, heavy construction vehicles need access.
Concrete	Hardest surface, easy to form to site conditions, supports multiple use, lowest maintenance, resists freeze/thaw, best cold weather surface.	High installation cost, joints must be sawn for smooth ride, costly to repair, not natural looking, construction vehicles will need access to the trail corridor.
Native soil	Natural material, lowest cost, low maintenance, can be altered for future improvements, easiest for volunteers to build and maintain.	Dusty, ruts when wet, not an all-weather surface, can be uneven and bumpy, limited use, inappropriate for bicycles and wheelchairs.
Recycled materials	Good use of recyclable materials, surface can vary depending on materials.	High purchase and installation cost, life expectancy unknown.

### Asphalt Cross Section



### Concrete Cross Section



• Figure 20 Pavement cross-sections with slope

## Structures

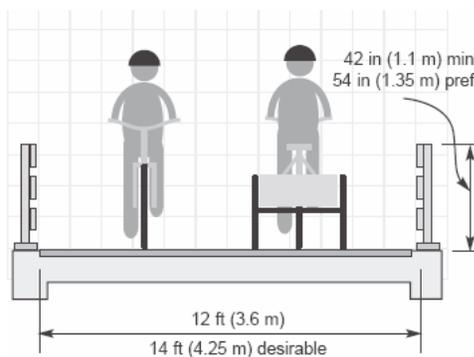
One of the great advantages and unique features of trails along former railroad corridors is that they often have grade separated intersections with the highway system, and have bridges to carry them over river or stream valleys. However, not all corridors have this asset and structures of all kinds are needed to carry trail users under or over obstacles such as streets, highways, rivers, freeways etc. The critical dimensions to use in designing underpasses, bridges, and tunnels, include:

- The minimum width of the trail (usually 10 feet) should be maintained through the structure
- The clear distance of one to two feet on either side of the trail surface should also be maintained through the structure – otherwise, riders will tend to ride in the center of the trail to stay away from the wall or railing of the structure
- An overhead clearance of 10 feet (8 feet with good horizontal and vertical clearance, good sightlines etc) should be maintained through an underpass or tunnel
- Railings, fences, or barriers on both sides of a path on a structure should be at least 42 inches (1.1m) high, and where they are higher than this a rub rail should be provided at the approximate handlebar height of 42 inches
- To meet the Americans with Disabilities Act Accessibility Guidelines (ADAAG), ramps should have a maximum running slope of 8.3%
- Clearances should allow for maintenance and emergency vehicles, as should the strength of the bridge (live loading)

### Retrofitting old bridges

In many cases, a structure that can no longer serve motor vehicle traffic may be quite adequate for path use. Some bridges have been retrofitted in place, while others have been disassembled and moved to a new site. Some designers have even used old railroad flat cars as bridges over small channels.

In general, retrofitted bridges will provide more than adequate clearances and support for a path structure, although a structural analysis should be done. Some modifications to the decking, as well as new railings and additional pedestrian-level lighting, may be appropriate.



• Figure 21 Bridge dimensions

Obstacles such as major highways or rivers are hard to overcome and present the designer with many challenges. However, unless obstacles are overcome, trails have limited value, safety, and use. Among

the issues to consider when determining whether an overpass or an underpass would be more appropriate:

<p><b>Overpasses</b></p> <p>Positive:</p> <ul style="list-style-type: none"><li>• <i>Good visibility from surrounding area</i></li><li>• <i>Light during the day</i></li><li>• <i>Open and airy</i></li></ul> <p>Negative:</p> <ul style="list-style-type: none"><li>• <i>Typically requires greater elevation change than underpass</i></li><li>• <i>Bicyclists use energy to go up, gain it back coming down</i></li><li>• <i>Open to the elements</i></li><li>• <i>Vandals may drop or throw things onto road</i></li><li>• <i>Some users may feel vertigo</i></li><li>• <i>Bicyclists attain higher freewheeling speeds making ramps more difficult to negotiate and design</i></li></ul> <p><b>Underpasses</b></p> <p>Positive:</p> <ul style="list-style-type: none"><li>• <i>Protected from weather</i></li><li>• <i>Bicyclists gain energy going down, lose it going up</i></li><li>• <i>Change in elevation is likely to be less than with overpass</i></li></ul> <p>Negative:</p> <ul style="list-style-type: none"><li>• <i>Can be dark, damp, and intimidating (fig. 4-115)</i></li><li>• <i>Users may not be able to see through to other side</i></li><li>• <i>Some users may feel claustrophobic</i></li><li>• <i>Criminals may hide, waiting for path users</i></li></ul>
---

• Table 4 Overpass and Underpass Comparison

## Lighting

Shared use paths in urban and suburban areas often serve travel needs both day and night. Fixed source lighting improves visibility along trails and at intersections, and is critical for lighting tunnels and underpasses. There are a number of factors to consider when planning lighting for trails including illumination levels, luminaire design, luminaire placement, and security. The AASHTO guide recommends using average maintained illumination levels of between 5 and 22 lux. The WBFDH contains a very detailed discussion of illumination levels, a summary is provided below.

**Luminaire Design:** Typical pole mounted roadway lights are a poor choice for illuminating narrow paths. Standard Type II horizontal lamps create spill light off the path, and require excess wattage and/or more frequent placement to maintain uniformity. If pole mounted lights are specified, Type I horizontal lamps should be used.

**Luminaire Placement:** Uniformity of illumination is particularly important for shared-use paths. Bicyclists moving between “hot spots” from poorly placed luminaires may be unable to see in the interspersed shadows. Providing some overlap allows for a more constant visual environment, and can help prevent crashes.

**Bollards:** Lights mounted below eye level can also be used for illuminating shared-use paths. More frequent spacing, combined with lower wattage bulbs, can meet recommended levels of luminance and uniformity while reducing operating costs. When choosing these fixtures, select a type that eliminates glare, since bicyclists’ eye level will be just above these lights. These fixtures should be placed at least 2 ft (0.6 m) from the path edge.

**Security:** The ability to recognize individuals and threats to security must also be considered when designing path lighting. Good security begins with recommended levels of illumination and uniformity, but also requires consideration of bulb type and light color. For example, low-pressure sodium bulbs, while energy efficient, provide poor color rendition and compromise the

viewer's ability to recognize faces. Paths through high-risk areas may require additional area lighting to provide the user with a wider view for threat detection. Where special security problems exist, higher illumination levels may be considered. Luminaires and standards should be at a scale appropriate for a pedestrian (i.e., no taller than 15 ft (4.5 m)).

**Note: Wisconsin State Statutes require front bicycle lights to be visible from at least 500 ft. There is no requirement for lights to illuminate the path and objects in front of a bicyclist. Many new bicycle lights are good at providing efficient lighting visible from long distances, but are relatively poor at illuminating the bicyclist's path.**

### Motorized Use of Paths

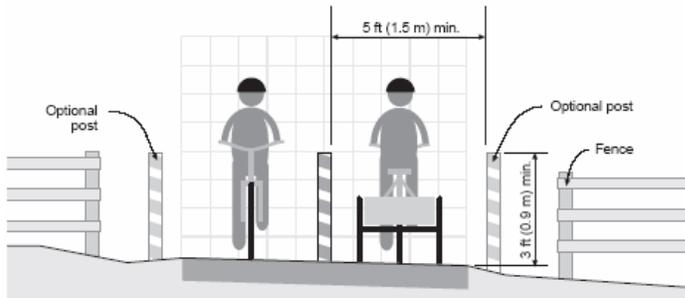
In some locations, shared use paths may be mistaken for motor vehicle roads or may suffer from illegal or unauthorized motorized use. At intersections with roadways, therefore, the path should be clearly signed, marked and/or designed to discourage or prevent unauthorized motorized access. Particularly in the urban environment, all terrain vehicle use is incompatible with multiuse trails for bicyclists and pedestrians. A variety of alternatives exist to discourage non-motorized use are presented in the WBFDH and summarized below:

- *Signing and Marking:* signing and marking are common elements. The most common is the R5-3 No Motor Vehicles sign. Other elements include the W11-1 Bicycle Warning sign, marked crosswalks, D11-1 Bike Route signs with M7-5 directional arrows, and Bike Xing pavement markings.
- *Tight Returns or Curb Ramps:* Simple design features can also help discourage motorists from turning on to a path. For example, curbed entrances with tight return radii of 5 ft (1.5 m) can make path entrances less attractive to drivers. Similarly, curb ramps can discourage motorists. With the latter, it is important to make the transition between the roadway and the ramp smooth with gentle slopes on each side of the gutter pan.
- *Medians:* A raised median with a cut-through can also help discourage motorists from turning into a shared use path.
- *Splitting the Trail in Two:* Split a ten foot trail into two five foot approaches to an intersection, with a planted triangle between them. Low plantings can be placed in the median to discourage drivers from entering but allowing emergency vehicles to enter. This option may increase maintenance costs.
- *Plantings:* An additional measure to discourage motorists is low plantings on either side of the entrance. Low-growing shrubs that attain heights of 2 ft or so can visually narrow the path entrance and make motorists hesitate to try it. Fences that extend from the path area to the property line can also be used.
- *Bollards:* Probably the most common device is the bollard, often lockable, collapsible or removable to allow for authorized access to the trail. However, WBFDH recommends bollards only "as a last resort". Great care should be used in locating the bollard to ensure that they are visible, allow trail users through, and are not placed so as to channel both directions of trail users towards the same point in the trail. If



• Figure 22 Split entry to discourage automobile use

bollards are to be used, they should be retroreflective, brightly colored, illuminated, and have pavement markings around them. On a ten foot trail, one bollard should be used in the center of the trail (Fig 23). If more than one bollard is necessary, there should be five feet between them.



• Figure 23 Dimensions for bollard placement

### Signing, Marking, and Way Finding

Adequate signing and marking are essential on shared use paths, just as they are on streets and highways. Trail users need to know about potential conflicts, regulatory information, destinations, cross streets etc. For example, the Beer Line Trail is routed on the western sidewalk along Commerce Street. Currently, there is no signage alerting bicyclists and pedestrians to share the sidewalk (Figure 24). Bicycle route or share the sidewalk signage should be installed because it is illegal for adults to bicycle on the sidewalk EXCEPT when signage indicates otherwise. With the recent proliferation of dwelling units along Commerce, the potential for conflicts is increasing and should be addressed before a crash occurs. The Manual on Uniform Traffic Control Devices (MUTCD) provides some minimum traffic control measures that should be applied, and proposed revisions to the bicycle chapter of the Manual will offer a much greater range of options. The WBFDH goes into great detail on sign placement and design but also encourages restraint and consideration of the MUTCD.



• Figure 24 Shared sidewalk

Striping: a yellow center line stripe is recommended where trails are busy, where sight distances are restricted, and on unlighted trails where night time riding is expected. The line should be dashed when adequate passing sight distance exists, and solid when no passing is recommended. A solid white line may be used to separate pedestrians from bicycle traffic, and solid white edge stripes may also be useful where nighttime riding is expected. Care should be exercised when choosing pavement marking materials. Products that are skid-resistant are preferred and essential at locations where bicyclists are leaning, turning, or stopping.

Warning Signs: a range of warning signs can be used to inform users that recommended design criteria cannot be met, for example curve radii or grades.

Informational Way Finding Signs: trail users need to know where they are, where they are going, what cross streets they are crossing, distance to destinations, and what services are available close to the trail. The WBFDH has information on the appropriate signs to use in these instances. Although not in the MUTCD or WBFDH, many trails post signs encouraging uniform trail user etiquette (e.g. give audible signal when passing). For way finding, simply posting a “bike route” sign is not enough. Trails users must know their location and the trail destination to be able to effectively use the trail for transportation trips. Madison, WI boasts an innovative bike signage project. In May of 2004 the City of Madison installed 22 signs along its extensive bike path network that included maps and path etiquette. The maps indicate locations of bike paths, bike routes, bike shops, public restrooms, and

water fountains. The project was a partnership between the Bicycle Federation of Wisconsin, Trek Corporation, Boelter Designs, and ACS and was funded entirely by the private sector.

Intersection Markings and Signs: pavement marking and signs at intersections should channel users to cross at clearly defined locations and indicate that crossing traffic is to be expected. Similar, but perhaps smaller, devices than those used on roadways (stop and yield signs, stop bars etc) should be used on trails as appropriate.

The AASHTO Guide and WBFDH note that in addition to traditional warning signs in advance of intersections, motorists can be alerted to the presence of a trail crossing through flashing warning lights, zebra-style or colored pavement crosswalks, raised crosswalks, signals, and neck-downs/curb-bulbs.

In addition to the aforementioned design considerations, the provision of landscaping, trail amenities, access points, public art, and bicycle parking should also be carefully considered.

### Land Acquisition Costs

Estimating cost of land acquisition is difficult due to differences in land uses and values throughout the city. Rather than provide actual dollar estimates, it's more appropriate to discuss how the targeted properties are valued. The properties identified in this study are either owned by the public, We Energies, a railroad company, or in a few cases privately held. Please see Table 5 for a summary of corridor ownership. Publicly owned land is held by a government body, including Milwaukee County, City of Milwaukee, Milwaukee Metropolitan Sewage District (MMSD), State of Wisconsin, or the US Federal Government. Proper easements or title transfers of these properties should have minimal costs.

Many of the corridors in this study are We Energies owned power line corridors. Generally, easements are granted at no cost to municipalities for land access and trail development. For example, most of the Ozaukee County's Interurban Trail is built on We Energies owned land with no acquisition cost as easements were given to the municipality for free. We Energies willingness to continue granting trail easements was further supported through conversations with a We Energies Energy Efficiency Project Strategist.

Railroad company owned land and privately owned land can be summarized in the same way, as both can require outright purchase based on market value if easements are not possible. It is recommended that independent appraisers be hired to determine fair market value of these properties. For railroad corridors, value is often determined by the price of adjacent properties, similar to individual private property appraisal. Thus, where the property is located is a major factor in its value. For example, the cost of railroad land purchased in Washington County by the Wisconsin Department of Natural Resources (WDNR) was approximately \$10,000 per acre, whereas the railroad property purchased for the Canal St development exceeded more than \$50,000 per acre.

A detailed summary of valuation was found for the railroad bed purchased by the City of Milwaukee for the development of the South Side Trail (a.k.a. the KK River Trail). Great Lakes Realty Advisory Group, Inc recorded the final estimate of value to be \$688,000 (\$40,834 per acre), and HNTB found the value to be \$700,000 (\$43,209 per acre). The City of Milwaukee ultimately paid \$648,327 (\$38,317 per acre).

Corridor	Ownership	Cost
West Allis Line	Soo Line Railroad Company	<b>Market value</b>
Union Pacific Line	Chicago & Northwestern Transportation Company	<b>Market Value</b>
We energies North Connection	We Energy	<b>\$0</b>
South Side Power Line	We Energy	<b>\$0</b>
Lincoln Creek Parkway Extension	State of Wisconsin, MMSD, USA, City	

North Menomonee Valley Connections	of Milwaukee	\$0
Havenwoods/Lincoln Creek North	City of Milwaukee, Milwaukee County	\$0
North Milwaukee Line	We Energy, MMSD, City of Milwaukee	\$0
Wilson Creek	Soo Line Railroad Company	<b>Market Value</b>
	Milwaukee County, City of Milwaukee, MMSD	\$0
Beer Line Trail	Private, City of Milwaukee, Milwaukee County	<b>Market Value</b>
We Energies Extension	We Energy	\$0
South Side Trail (a.k.a. Kinnickinnic River Trail)	Milwaukee County, City of Milwaukee	\$0
Kinnickinnic River West	Milwaukee County	\$0
Kinnickinnic River East	Milwaukee County	\$0
I-894 Power Line	We Energy, City of Milwaukee, WI, DO Wisconsin DOT	\$0
Noyes Park	City of Milwaukee, private owners	<b>Market Value</b>
I-94 West Power Line	We Energy, State of Wisconsin	\$0
Airport Power Line	Soo Line Railroad Company, several private owners, We Energy	<b>Market Value</b>

• Table 5

### Construction Costs

The cost of new trail construction is difficult to generalize because of the many variables that are involved. Trail surface, width, location, needed structures, signage, and amenities all affect total construction cost. While it was difficult to find a national average construction cost, the Rails to Trails Conservancy provides a construction cost range from \$40,000 per mile for a soft surface trail to more than \$125,000 per mile for an asphalt trail. Geographic location is also a big factor in cost. Costs of labor and materials vary greatly across the country. For this reason, construction costs were estimated for the Milwaukee area and are detailed in the following tables. Cost estimates include construction only costs, with planning and administration costs considered separately.

\*\*Descriptions detailing thickness and width are based on proper design guidelines.

<b>Base Construction Costs for a 10 foot wide, granular surfaced, non-motorized multiuse trail</b>		
Activity	Description	Cost per mile
Clearing & Grubbing	Initial clearing for trail way	\$2,900
Grading	Includes grading for a 14 foot wide trail bed	\$3,600
Granular Surface	3 inch thick surface, usually crushed gravel or limestone	\$18,090
General Landscaping	Base landscaping such as seeding/mulching	\$27,200
Construction Contingency	10% of total costs	\$7,029
<b>Total Construction Costs</b>		<b>\$51,790</b>
Administration	6% of total construction cost	\$3,107
Planning	2% of total construction cost	\$1,036
Design/Engineering	10% of total construction cost	\$5,179
Field Inspection	2% of total construction cost	\$1,036
<b>Total Costs</b>		<b>\$62,148</b>

• Table 6

<b>Base Construction Costs for a 10 foot wide, asphalt surfaced, non-motorized multiuse trail</b>		
Activity	Description	Cost per mile
Clearing & Grubbing	Initial clearing for trail way	\$2,900
Grading	Includes grading for a 14 foot wide trail bed	\$3,600
Aggregate Base	4 inches thick needed for hard surface	\$18,500
Asphalt Surface	3 inch thick surface	\$66,000
General Landscaping	Base landscaping such as seeding/mulching	\$27,200
Construction Contingency	10% of total costs	\$11,820
<b>Total Construction Costs</b>		<b>\$130,020</b>
Administration	6% of total construction cost	\$7,801
Planning	2% of total construction cost	\$2,600
Design/Engineering	10% of total construction cost	\$13,002
Field Inspection	2% of total construction cost	\$2,600
<b>Total Costs</b>		<b>\$ 156,023</b>

• Table 7

<b>Base Construction Costs for a 10 foot wide, concrete surfaced, non-motorized multiuse trail</b>		
Activity	Description	Cost per mile
Clearing & Grubbing	Initial clearing for trail way	\$2,900
Grading	Includes grading for a 14 foot wide trail bed	\$3,600
Aggregate Base	4 inches thick needed for hard surface	\$18,500
Concrete Surface	5 inch thick surface	\$115,700
General Landscaping	Base landscaping such as seeding/mulching	\$27,200
Construction Contingency	10% of total costs	\$16,790
<b>Total Construction Costs</b>		<b>\$184,690</b>
Administration	6% of total construction cost	\$11,081
Planning	2% of total construction cost	\$3,639
Design/Engineering	10% of total construction cost	\$18,694
Field Inspection	2% of total construction cost	\$3,639
<b>Total Costs</b>		<b>\$ 221,743</b>

• Table 8

It is important to note that the above estimates include only base construction costs. No trail amenities, signage, bridges, etc. are included. For a more realistic trail construction estimate that does include trail amenities, bridges, signage and drainage issues, four summaries with data from the County and the City are provided here:

- Honey Creek Parkway Construction of bike trail from Portland Ave to 70<sup>th</sup> St, not including bridge construction, is \$149,206 per mile for 10 foot wide asphalt trail
- Root River, from 60<sup>th</sup> St. under Hwy 100 to Rainbow Airport, not including boardwalk is \$301,014 per mile for 10 foot wide asphalt trail\*
- South Side Trail (a.k.a. Kinnickinnic River Bicycle Trail) for base construction including trail amenities, signage, and drainage issues is \$176,470 per mile for a 10 foot wide asphalt trail

- Milwaukee County's estimate for construction of the 6.5 mile Hank Aaron State Trail (West Allis Line) is \$224,307 per mile for a 10 foot wide asphalt trail (including retrofit of bridges)

\*The major increase in the Root River project is due to drainage culverts and railings

Iowa Trails 2000, by the Iowa Department of Transportation, summarizes trail construction cost estimates.

- Estimated cost for non-motorized multiuse trails (single treadway), granular surface, 10-foot width- \$67,000 per mile
- Estimated cost for non-motorized multiuse trails (single treadway), asphalt surface, 10-foot width- \$106,700
- Estimated cost for non-motorized multiuse trails (single treadway), concrete surface, 10-foot width - \$189,200

### **Maintenance Costs**

Currently, almost all trails in Milwaukee County are asphalt trails, but with the development of trail corridors included in this study, there is a possibility of more crushed gravel or concrete trails in the future. Thus figures for asphalt, crushed gravel, and concrete maintenance costs are included.

Maintenance of asphalt, concrete, and crushed gravel trails differs due to the different properties of the materials. Periodic maintenance of a crushed gravel trail is greater since it is more susceptible to adverse weather conditions such as rain storms and run-off. Heavy amounts of water running on the trail can cause ruts to form and soften the trail as a whole. More use on a soft trail will cause greater damage to the overall smooth surface and require grading. One advantage to a crushed gravel trail is that it is not affected much by the freeze/thaw cycle that exists in the Milwaukee area. Although asphalt and concrete trails are generally not affected by rain and water erosion, freeze/thaw cycles can cause buckling, creating potholes and cracks which can be dangerous and costly to repair.

Regardless of trail surface type, there are many other factors that can affect cost of maintenance. The main factor affecting cost is the difference in agencies that maintain and operate trails. Each agency will have different labor costs, access to different machinery and equipment and may or may not have a volunteer base to offer assistance.

Maintenance and operation costs can also have a broad definition. For the purpose of this report, maintenance and operation costs will be classified as routine maintenance. Routine maintenance can be defined as maintenance that is needed to keep the trail operating in a safe and usable condition, not involving major trail development for reconstruction. Below is a list of routine maintenance activities:

- Yearly facility evaluation to determine the need for minor repairs
- Removing encroaching vegetation
- Mowing
- Map/signage updates
- Trash removal/litter clean-up
- Flood or rain damage repair: silt clean-up, culvert clean-out, etc.

- Patching, minor regrading, or concrete panel replacement
- Planting, pruning, and general landscaping

\*\* snowplowing is also a routine maintenance activity but will be broken out into a separate cost listed below.

Research was conducted to determine a per mile maintenance cost for off-street trails. Some estimates found were specific to a trail surface type and others were not. Interestingly, maintenance and operation costs are very similar whether a surface is crushed gravel or asphalt. Due to the low amount of concrete bike trails, a routine maintenance figure could not be found. Below is a list of maintenance costs from various sources:

\$1500 per mile provided in the Iowa Trails 2000 plan by the Iowa Department of Transportation (includes a mixture of different trail surfaces)

\$2525 per mile summarized from the Milwaukee County Trails Network Plan – DRAFT by the Milwaukee County Park System (all asphalt paths)

\$1200 per mile (as an absolute minimal cost) in the Rail Trail Maintenance & Operation Manual provided by the Rails-to-Trails Conservancy.

\$2077 per mile for government run trails provided in the Rail Trail Maintenance & Operation Manual provided by the Rails-to-Trails Conservancy.

\$2042.06 per mile of unpaved trail in the Trail Cost Model – Draft by the Wisconsin Department of Natural Resources.

Snow removal costs range from \$24.13/mile on the Glacial Drumlin Trail – E to \$154.13/mile on the Red Cedar State Trail. Although snow removal does occur on portions of Milwaukee County's Oak Leaf Trail, no cost estimate could be separated out.

## Best Practices

The following examples of trail construction serve as examples of best practices for different situations. They are included to serve as inspiration for any future trail development that might occur as a result of this study. Many of these examples take advantage of special circumstances that may not occur in most trail corridors. They may have an extremely wide ROW, use existing bridges or simply run through extremely high use corridors. Still, they set the bar for other trails in many ways and serve as ideal trails with excellent amenities that should be emulated in Milwaukee.

### Rails WITH Trails

More and more trails are being built alongside active rail lines. For example, a trail in Carboro, NC does not have a fence between the active rail line and the trail despite the relatively narrow ROW (Figure 25). It does have trees and utility poles which serve as a natural barrier. Also note the pedestrian portion of the trail is track-side. This might make it less likely that cyclists would hit the utility poles or ride over the grass and



• Figure 25 Trail along active rail line without a fence  
Photo credit: Arthur Ross

into the tracks. It does, however, place the cyclist closer than desirable to the fence. The directional lane assignment sign is also innovative and non-standard.



- Figure 26 No barrier between trails users and an active rail line on the Blackhawk Trail in Madison, WI. Photo Credit: Arthur Ross



- Figure 27 Wherever possible, the Minneapolis Greenway separates pedestrian and bicycle traffic

- Figure 28 and 29 The Minneapolis Greenway features amenities such as community gardens, decorative lighting, emergency phones and murals



## Implementation

Findings from this study should be incorporated into an officially adopted bicycle plan by the City of Milwaukee. Given the diverse groups of people, nonprofits, and government agencies interested in trail development, concerted coordination is necessary. Coordination between Federal, State, County, and local government is essential. The City can look for funding assistance from the Federal and State Departments of Transportation (DOT) and the State of Wisconsin Department of Natural Resources (DNR). Regional Planning Affiliations and Metropolitan Planning Organizations (MPO), such as the Southeast Wisconsin Regional Planning Commission (SEWRPC), can offer guidance for planning, programming, and funding.

The City and County of Milwaukee should work together to develop bike trails on County owned land that lies within the boundaries of Milwaukee. Specifically, the City should be aware of the current plans to develop trails within the Kohl Park area. Any plans that the County may have for improvement of park land need to be shared with the City to assure proper connection to the City's on and off-street bicycle network. MMSD is often responsible for restabilizing and reconstructing river corridors similar to the ones featured in this study. The city should be involved in the planning process of these revitalizations to determine if bike trail development can be incorporated into river development plans. By being aware of different development and construction plans, the City can make bike trail projects part of larger projects and thus conserve financial resources.

Other private organizations can also aid in implementation. Groups such as The Bicycle Federation of Wisconsin (BFW), local bicycle clubs, and Milwaukee Metro Mountain Bikers, can assist in gaining public support; a key component that drives the ability of local government to implement plans. These groups can also offer support by fundraising and volunteering.

A plan should also be developed, possibly through the City's Bicycle and Pedestrian Task Force, to educate publicly elected officials and the general public on the myriad societal and individual benefits of bicycling. A broad constituency of citizens and their representatives who support and understand bicycling will help ensure adequate funding.

Two different priority rankings for corridor development are included in this study. One is a rubric-based grading and a second being a consultant recommendation. A list of priorities and goals of timeline completion should be established. A good method to set goals is to measure how many miles have been completed in the past few years. Determine what length of trail has been developed per year and use this as a base to develop a "miles per year" goal. Regular trail counts should also be implemented to assist understanding current use patterns and needs. By having accurate count data, the city will be able to best invest its trail development dollars for the benefit of cyclists.

Further, the City should springboard off efforts that have been successful elsewhere. A case in point is We Energies, Ozaukee County, and the Interurban Trail. Ozaukee County should be contacted to determine the process they used to successfully create a trail on We Energies land. A similar process could be used to create trails on the other We Energies owned corridors included in this study.

## **Funding Sources**

Numerous funding sources can be tapped to fund trail development. It is important to determine if the proposed trail will serve primarily as a transportation or recreational facility, since some funds are specifically for recreational or transportation use. The following summary of funding sources for bicycle and pedestrian projects is from the Wisconsin Department of Transportation.

### **Transportation Based Funding Sources**

#### **Transportation Enhancement Program**

Transportation enhancements (TE) are transportation-related activities that are designed to strengthen the cultural, aesthetic and environmental aspects of transportation systems. The transportation enhancements program provides for the implementation of a variety of non-traditional projects, with examples ranging from the restoration of historic transportation facilities, to bike and pedestrian facilities, to landscaping and scenic beautification, and to the mitigation of water pollution from highway runoff. Transportation enhancements are part of the Statewide Multi-modal Improvement Program (SMIP). Most of the requests and projects awarded in Wisconsin have been for bicycle facilities. Examples of bicycle projects include multiuse trails (in greenways, former rail trails, etc.), paved shoulders, bike lanes, bicycle route signage, bicycle parking, overpasses/underpasses/bridges, and sidewalks. Transportation enhancement activities must relate to surface transportation. Federal regulations restrict the use of funds on trails that allow motorized users, except snowmobiles. TEA 21 expanded the definition of transportation enhancements eligibility to specifically include the provision of

safety and educational activities for pedestrians and bicyclists, which had not been clearly eligible under ISTEA.

Contact: WisDOT District Bike & Ped Coordinators

### Surface Transportation Program – Discretionary

The Surface Transportation Program – Discretionary provides grants primarily to local governments, transit or transportation commissions, etc. in areas with a population of greater than 5,000 for projects that promote non-highway use or supplement existing transportation activities. Priority is given to projects that promote alternatives to single-occupancy vehicle trips. These funds also come from the SMIP. Funding has gone evenly to transit and bicycle/pedestrian projects in past years. However, in the last two budgets, no money has been appropriated for this program. Nearly every bicycle project eligible under the Transportation Enhancement program is also eligible for this program, unless the project will clearly not reduce single-occupant vehicle trips. Unlike the Transportation Enhancement program, bicycle and pedestrian planning is eligible.

Contact: WisDOT District Bike & Ped Coordinators, or John Duffe, 608-264-8723

### Congestion Mitigation and Air Quality Program (CMAQ)

The primary purpose of the Congestion Mitigation and Air Quality (CMAQ) Improvement Program is to fund projects and programs that reduce travel and/or emissions in areas that have failed to meet air quality standards for ozone, carbon monoxide (CO), and small particulate matter. Bicycle and pedestrian projects are eligible for CMAQ if they reduce the number of vehicle trips and miles traveled. Almost all bicycle projects eligible for Transportation Enhancements and STP-D are likely to be eligible (see examples above), but a higher burden of proof that the project will reduce air pollution will be required. CMAQ is NOT a statewide program, only bicycle projects in Milwaukee, Kenosha, Racine, Ozaukee, Waukesha, Washington, Sheboygan, Kewaunee, Manitowoc, and Door Counties are eligible.

Contact: Anita Pusch (262-548-8789) with District 2 or Cindy O'Connor (920-492-5679) with District 3.

### Hazard Elimination Program

Bicycle and pedestrian projects are now eligible for this program. This program focuses on projects intended for locations that should have a documented history of previous crashes.

Contact WisDOT District coordinators first for more details.

Contact: Chuck Thiede at 608-266-3341 is the statewide coordinator.

### Surface Transportation Urban Funds

Metropolitan areas receive an allocation of funds annually. These funds can be used on a variety of improvement projects including bicycle and pedestrian projects. Most of the Metropolitan Planning Organizations (MPOs) that administer this program have been using these funds to integrate bicycle and pedestrian projects as larger street reconstruction projects are taken on.

Contact MPOs for more information.

### Incidental Improvements

Bicycle and pedestrian projects are broadly eligible for funding from most of the major federal-aid programs. One of the most cost-effective ways of accommodating bicycle and pedestrian accommodations is to incorporate them as part of larger reconstruction, new construction and some repaving projects. Generally, the same source of funding can be used for the bicycle and pedestrian accommodation as is used for the larger highway improvement, if the bike/ped accommodation is "incidental" in scope and cost to the overall project. Overall, most bicycle and pedestrian accommodations within the state are made as incidental improvements.

## **Recreational Trails Funding Sources**

The following information was culled from the Wisconsin Department of Transportation website. Funding for the Recreational Trails Program (RTP) is provided through federal gas excise taxes paid on fuel used by off-highway vehicles. Towns, villages, cities, counties, tribal governing bodies, school districts, state agencies, federal agencies and incorporated organizations are eligible to receive reimbursement for development and maintenance of recreational trails and trail-related facilities for both motorized and non-motorized recreational trail uses. Eligible sponsors may be reimbursed for up to 50 percent of the total project costs.

Eligible projects include:

- Maintenance and restoration of existing trails
- Development and rehabilitation of trailside and trailhead facilities and trail linkages
- Construction of new trails (with certain restrictions on Federal lands)
- Acquisition of easement or property for trails
- Projects are ranked in order of funding priority
- Rehabilitation of existing trails
- Trail maintenance
- Trail development
- Trail acquisition

Regional DNR staff reviews and ranks eligible projects. Projects are then ranked in a statewide priority listing. The highest ranking projects will be funded to the extent that funds are available.

Following you will find general program information for programs that provide up to 50% funding assistance to acquire land or conservation easements and develop facilities for outdoor recreation purposes – the Stewardship Local Assistance Grant Programs, the Federal Land & Water Conservation Fund Program, and the Federal Recreation Trails Program. Any project application submitted will be considered for each of the following programs that it is eligible for.

Under the Knowles-Nelson Stewardship Local Assistance Grant Program, the following programs provide 50% funding assistance to acquire land and easements and develop trails, facilities, etc. for nature-based outdoor recreation purposes.

### **Aids for the Acquisition and Development of Local Parks (ADLP)**

Helps to buy land or easements and develop or renovate local park and recreation area facilities (e.g. trails, fishing access, and park support facilities). Applicants compete for funds on a regional basis. \$4.0 million available.

### **Urban Green Space Grants (UGS)**

Helps to buy land or easements in urban or urbanizing areas to preserve the scenic and ecological values of natural open spaces for outdoor recreation, including non-commercial gardening. Applicants compete for funds on a statewide basis. \$1.6 million available

### Urban Rivers Grants (UR)

Helps to buy land or easements on or adjacent to rivers flowing through urban or urbanizing areas to preserve or restore the scenic and environmental values of river ways for outdoor recreation. Includes shoreline enhancements such as development of public recreation facilities or habitat restoration that serve public recreation or resource conservation purposes. The Urban Rivers Program has a cap per applicant based on 20% of the total funds allocated to the program each fiscal year. Applicants compete for funds on a statewide basis. \$1.6 million

### Acquisition of Development Rights Grants (ADR)

Helps to buy development rights (easements) for the protection of natural, agricultural, or forestry values, that would enhance outdoor recreation. Applicants compete for funds on a statewide basis. \$800,000.

### Land and Water Conservation Fund (LWCF)

At the time of printing, the federal appropriation had not been confirmed. Congress is currently reviewing several budget options that will have a significant effect on the LWCF appropriation ranging from increasing funding to no funding at all. Provides 50% funding assistance for the acquisition and development of public outdoor recreation areas and facilities. Similar to the Stewardship ADLP program above except that active outdoor recreation facilities are eligible for grant assistance and school districts may be eligible project sponsors. Applicants compete for funds on a statewide basis. Approx. \$250,000.

### Recreational Trails Act (RTA)

Provides 50% funding assistance for the development and maintenance of recreational trails and trail related facilities for both motorized and non-motorized recreational trail uses. Applicants compete for funds on a statewide basis. Approx. \$900,000-\$1 million.

These programs are administered by the Wisconsin Department of Natural Resources. The Stewardship Advisory Council with representatives from local units of government and nonprofit conservation organizations (NCO's) advises the department on matters relating to the Stewardship program. Similarly the State Trails Council advises the department on matters relating to the Recreational Trails Program. The National Park Service plays the major role in working with the Department on the Land & Water Conservation Fund Program and the Department of Transportation plays a role with the Recreational Trails Program. Key components of the programs are cooperation and partnership between the Wisconsin Department of Natural Resources, the federal government, local units of government, and NCOs. The programs recognize the important role each partner plays in meeting the conservation and recreation needs of Wisconsin residents and is designed to assist groups working to meet those needs. The application deadline for all of the programs is May 1 each year. Complete applications should be submitted to the regional Community Services Specialist (CSS) on, or be postmarked by, May 1.

## Concluding Vision



**South Side Power Line: Current and Envisioned**

In addition to health and pollution reduction benefits, bicycle facilities have positive effects on real estate values (and therefore property tax revenues), and nearby businesses. For example, a 1998 study found that lots adjacent to the Mountain Bay Trail in Brown County, IN, sold faster and for an average of 9% more than similar property not located next to the trail. The conclusion that trail facilities generate increased revenue through higher property values is corroborated by the Consumer's Survey on Smart Choices for Home Buyers. In that survey, trails ranked the second most important amenity out of a list of 18 choices. A study of users of the Fox River Trail showed 39% of responding businesses indicated increased business as a result of the Fox River Trail. Supporting an expanded bicycling network can have myriad positive effects, including economic benefits.



**North Milwaukee Line: Current and Envisioned**

The recommendations provided lay the ground work needed to construct a world class urban bicycle trail system. This trail system would promote bicycling as a feasible transportation and recreation choice. Whether used as transportation or recreation, bicycling can help improve the quality of life in Milwaukee by improving, health, the environment, and the economy. The benefits of bicycling are best summed up by the comment of a well known local bicycle commuter: "*bicyclists are an indicator species of a healthy city*".



**West Allis Line: Current and Envisioned**

Creation of this trail system will require coordination between many people, government agencies, and organizations, as well as creativity and motivation. To encourage creativity and motivation, renderings of select corridors have been included. These renderings portray how the transformation of these corridors into trails would be beautiful and increase the quality of life in Milwaukee. Envisioning the off-street trail network is the first step in creating it.

## Sources

- The AASHTO Guide for the Development of Bicycle Facilities, 444 N Capitol St NW — Suite 249  
Washington, DC 20001.
- The Bicycle Federation of Wisconsin, 1845 N Farwell Ave, Suite 100, Milwaukee, WI 53202  
<http://www.bfw.org>.
- Cambridge Woods Neighborhood Association, A Preliminary Neighborhood Plan and Vision for the  
Enhanced Access and Preservation of Cambridge Woods June 2005,  
<http://www.cambridgewoods.org/>.
- Federal Highway Administration, Manual on Uniform Traffic Control Devices, <http://mutcd.fhwa.dot.gov>.
- Florida Department of Transportation, Bicycle Facilities Planning and Design Handbook, 605 Suwannee Street  
Tallahassee, Florida 32399-0450 [http://www.dot.state.fl.us/Safety/ped\\_bike/ped\\_bike\\_standards.htm](http://www.dot.state.fl.us/Safety/ped_bike/ped_bike_standards.htm).
- Idaho Department of Transportation Bike and Pedestrian Planning Manual, 3311 W. State Street · P.O. Box 7129,  
Boise, ID 83707-1129, [http://itd.idaho.gov/bike\\_ped/](http://itd.idaho.gov/bike_ped/).
- IOWA Trails 2000, Iowa Department of Transportation, <http://www.iowabikes.com/trails>.
- Madison Bike Sign Project information is available at <http://www.bfw.org/projects/#signs>.
- City of Milwaukee, Bicycle and Pedestrian Coordinator, 841 N Broadway St, Rm 919 Milwaukee, WI 53202,  
[www.milwaukeebybike.org](http://www.milwaukeebybike.org).
- National Association of Realtors and National Association of Home Builders, Consumer's Survey on Smart Choices  
for Home Buyers, April 2002.
- Pedestrian and Bicycle Information Center, 730 Airport Road, Suite 300, Campus Box 3430, Chapel Hill, NC  
27599-3430 phone - 919.962.2203 fax - 919.962.8710 email - [pbic@pedbikeinfo.org](mailto:pbic@pedbikeinfo.org).
- Phototour of Minneapolis, <http://www.phototour.minneapolis.mn.us/>.
- City of Portland Office of Transportation, Bikeway and Engineering Guidelines, 1120 SW Fifth, Rm 800, Portland,  
OR 97204 <http://www.portlandonline.com/shared/cfm/image.cfm?id=40414>.
- Rails to Trails Conservancy, Economic Benefits of Trails and Greenways, cited in the Ozaukee Interurban Trail  
Enhancement Project.
- The River Revitalization Foundation, 1845 N Farwell Ave, Suite 100, Milwaukee, WI 53202  
[www.riverrevitalizationfoundation.org/](http://www.riverrevitalizationfoundation.org/).
- Runge, Cole. Fox River Trail Study, Prepared for the Brown County Planning Commission, December 2002.
- Urban Ecology Center Riverside Park 1500 E. Park Place Milwaukee, WI 53211 414.964.8505  
[www.urbanecologycenter.org](http://www.urbanecologycenter.org).
- We Energies, Advocacy and Energy Options, 231 W Michigan St., Milwaukee WI 53203.
- Wisconsin Department of Transportation, Wisconsin Bicycle Facilities Design Handbook, 4802 Sheboygan  
Avenue, Room 901 P.O. Box 7913, Madison, WI 53707  
<http://www.dot.wisconsin.gov/projects/state/bike2020.htm>.
- Wisconsin Department of Transportation/URS, Bay View to Downtown Milwaukee Bicycle Route Study,  
Transportation District 2, 141 NW Barstow St, P.O. Box 798, Waukesha, WI 53187 0798.

## Appendix

## Off Street Existing Conditions and Recommendations

SEGMENT	COMMENT	RECOMMENDATION
Oak leaf Trail (OLT) from Lincoln to Ogden	parallel cracks in pavement	Repair parallel cracks in pavement as they are a hazard to bicyclists
OLT at Ogden Ave	*signage OK for peds, not bikes	Improve visibility of signage by increasing size of signs and font.
OLT at Brady St	connection not ADA (steps)	This has already been remedied with the new Brady Street Bridge
OLT at Lafayette Pl (south of bridge)	parallel ped desire trail	Formalize pedestrian desire trails with gravel or other soft surface for walking and running
OLT spur to Lafayette Hill		Widen trail, improve pavement, and reduce grade
OLT from Lafayette Pl to Prospect		
OLT at Farwell		Install better signage on street
OLT at Urban Ecology Center	bathrooms and water available	Install sign alerting trail users to the UEC and availability of water and bathrooms
Riverside Park (off OLT)	gang tags on foot bridge	Paint over or remove graffiti and consider commissioning youth murals as a long term solution
OLT at Providence/Specter Field (Shorewood Village)	good connection, but no signs	Install sign to alert trail users to good street connection
OLT at Kenwood (formal connection needed)	very steep, unsafe desire trail	This desire trail is on a steep grade and should be formalized to prevent erosion and injury
OLT in Lake Park at Kenwood/Lincoln/Lake	standing water at first fork	trail
OLT in Lake Park (clockwise from Kenwood, N of Bradford Beach)	railing, streetlights, vegetation	???
OLT in Lake Park N of Water Tower Rd (& inland)		
OLT in Lake Park along Wahl/Lake Ave N of Belleview		
OLT in Lake Park along Lake Ave at Newberry	very wide crossing& 45d curb cuts:	Extend median island
from ^ North along Lake Ave		
Lake Park interior path north from Belleview to lighthouse		
interior path N of North Point lighthouse bridge	path ends at Lincoln Memorial and Lake Park Rd	At trailheads, install informational kiosks with maps
OLT southbound past Calatrava	connection to below not intuitive	Install signage to help people stay on the trail
OLT southbound past Fest grounds	sometimes closed, even when open, sometimes encroached (picnic tables, fest fencing)	Have formal policy for trail closings and always properly sign alternate routes
8/19/2004		
OLT @ Menominee River Parkway (MRP) & congress		
OLT just south of Hampton/Lover's Lane	river floods	Sweep mud off of trail in spring
OLT underneath HWY100 (Lover's Lane)	Flooding issues	Install a water level indicator, perhaps a sculpture, as water is sometimes >3' deep.
OLT hairpin north of HWY 100	needs better bike racks @ school	Install bike racks at school
OLT Parkview School connection (@Villard)		

## Off Street Existing Conditions and Recommendations

SEGMENT	COMMENT	RECOMMENDATION
OLT just south of Silver Spring	desire trail	Formalize desire trail
OLT @ Silver Spring bridge&107th St crossing		
OLT north of Silver Spring	graffiti	Remove graffiti
OLT @ old RR bridge	gravel will always be on path until grass or retaining wall installed	Install retaining wall or plant grass
OLT north of Leon Terrace	superfund cleanup access road	Improve existing road to make a new trail connection
OLT @ NH connection 2 Green Tree/Park Manor	No signs informing path users of tot lot, NH connection; path condition, width deteriorating because of maintenance vehicle use	Install sign listing park amenities, neighborhood connection, and path condition. Maintain or improve trail so it can handle maintenance vehicle use
OLT @ superfund access road, Good Hope	Good place to create a connection from superfund access road to Good Hope	Add a neighborhood connection by paving and signing Superfund access road and connecting it to Good Hope Road
OLT crossing at Good Hope	No ped call button on south side of Good Hope	Install pedestrian call button on south side of Good Hope.
OLT NH connection at Dogwood St.		
OLT north of Calumet		
OLT @ RR crossing north of Calumet	oblique angle of crossing should be straightened out	Adjust angle of path to encourage bicyclists to cross railroad tracks perpendicularly
OLT @ Bradley St	Bradley bridge is going to be reconstructed.	build side path on south side of Bradley to make connection when
	11/5/2004	
OLT @ Capital	the few connection ramps that are built are wonderful but Poorly signed. Also, between here and Hampton there are many informal access points	Install signage for existing access points (on trail and on the street) and build more
OLT between Capital and Hampton/Port Washington	great river access point but no signs	Install signage this beautiful river access site
OLT @ SE Corner Hampton and Port Washington	flying right turn lane crossing is dangerous and hard to locate trail	Install Bike sign on road for car drivers. Make crosswalk improvements if necessary. If possible, remove flying right turn lane.
OLT @ NW Corner of Hampton and Port Washington	No ped signal to assist in crossing of flying right turn lane with green arrow. Bad sight lines compound the danger. Very dangerous!	Install ped signal to assist people in crossing dangerous flying right turn lane. This intersection is especially dangerous because the right turn is signalized for automobiles but there is no ped signal to inform bicyclists or pedestrians if cars have a red or green light. Also, the angle is very tight and the sight lines are inadequate.

## Off Street Existing Conditions and Recommendations

SEGMENT	COMMENT	RECOMMENDATION
OLT @ Hampton and River	No sign for underpass to river access point and park	Install signage river access point and park
OLT @ South Island Bridge in Lincoln Park OLT between Hampton and Silver Springs	Bridge is in bad shape- drainage and pavement problems. Also, trail and road share grade over bridge. There is no curb.	Improve trail section of bridge and install curb and gutter to improve safety and drainage
OLT @ Villard and Greenbay	Again, a flying right turn lane endangers trail users. A school at this corner might also benefit from removal of flying right turn lanes. Signage is very good. Huge limb blocks trail just north of intersection. Limb has been down for so long that a path around it has been worn into the earth.	Route maintenance such as limb removal should be automatic. Formalize policy if necessary. Remove flying right turn lane from trail/street intersections. Install curb cut and paint crosswalk. Install Ped and Bike warning signs for drivers
OLT@ Tuetonia and Lincoln Creek	Dangerous grade crossing! No curb cut, no crosswalk, no signal. This location is near a hospital.	Install curb cut for ADA accessibility and paint crosswalk

	West Allis Line	North Milwaukee Line	We Energies North	South Shore Trail Corridor	Havenswoods Lincoln Creek	Lincoln Creek Pkwy Extension	Union Pacific Line	North Menomonee Valley Connections	We Energies South	Beer Line Trail	Kinnickinnic River West	Kinnickinnic River East	
<b>Connectivity</b>													
To OLT or HAST	3	3	3	2	3	3	3	3	3	3	1	3	2
To Bike Network	3	3	3	2	3	3	3	3	3	3	2	2	1
To Destinations	3	3	3	2	2	2	2	3	3	2	2	1	1
<b>Population Served</b>													
Access to Neighborhoods	3	3	2	3	3	3	2	3	3	3	3	3	
Serves Previously Underserved Area	2	3	1	2	3	3	1	3	2	1	1	1	
Ability to meet AASHTO guidelines	3	3	3	3	3	3	3	3	3	3	3	2	
Evidence of Current Trail Use (desire trails)	3	2	3	3	2	2	3	2	1	3	3	3	
<b>Crossings and Access</b>													
Ease of Building Access Points	2	2	3	3	3	3	2		3		3	3	
Number of at Grade crossing/segment length in miles	-0.53	0.00	-1.41	0.00	-1.65	-2.23	-0.48	NA	-2.98	0.00	-3.32	-1.14	
Potential for Private Partnerships	3	1	3	2	1	1	1		3	3	3	3	
<b>ROW Details</b>													
Type	RR	RR	Electrical	RR	Water	Water	RR	Electrical	Electrical	Water/RR	River	River	
	Soo Line Railroad Company	Soo Line Railroad Company	We Energies	City	MMSD	State	Chicago Northwestern transportation Company	City	County	County	County	City County	
Owners					City	City of Milwaukee		County	We Energies	1 Private			
Length					We Energies	MMSD	Federal						
# of problem intersections/ mile	-0.18	0.00	-0.28	0.00	0.00	-0.20	0.00	0.00	-0.66	0.00	-0.88	-0.76	
<b>Total</b>	<b>24.30</b>	<b>23.00</b>	<b>22.31</b>	<b>22.00</b>	<b>21.35</b>	<b>20.57</b>	<b>20.52</b>	<b>20.00</b>	<b>19.36</b>	<b>18.00</b>	<b>17.80</b>	<b>17.11</b>	

	Wilson Creek	Noyes Park	I-894 Powerline	We Energies Extension	I-94 West Power Line	Airport Power Line
<b>Connectivity</b>						
To OLT or HAST	2	3	2	2	2	1
To Bike Network	2	1	2	2	2	1
To Destinations	2	2	1	1	2	1
<b>Population Served</b>						
Access to Neighborhoods	3	3	3	2	2	2
Serves Previously Underserved Area	2	2	1	1	2	3
Ability to meet AASHTO guidelines	3	2	3	3	2	2
Evidence of Current Trail Use (desire trails)	2	2	1	3	1	0
<b>Crossings and Access</b>						
Ease of Building Access Points	3	3	3	3		2
Number of at Grade crossing/segment length in miles	-2.81	-3.03	-2.37	-5.33	-4.46	-1.13
Potential for Private Partnerships	2	1		1	3	1
<b>ROW Details</b>						
Type	River	Water	Electrical	Electrical	Electrical	Electrical
City, County, MMSD		City	We Energies	We Energies	We Energies	Soo Line
Owners		2 Private			State of WI	We Energies
Length						9 Private
# of problem intersections/ mile	-1.12	-0.34	-0.79	-1.33	-0.25	-1.13
<b>Total</b>	17.07	15.63	12.83	11.33	11.30	10.74

## Trail User Count: Cupertino Park

From Sept. 20<sup>th</sup> through Oct. 20<sup>th</sup> 39,225 users were counted in Cupertino Park. The daily counts are below with a few notes. Some especially high count days may be attributed to wind and branches in front of the counter. However, this effect was mediated by a few days where the counter was not counting and about 1000 users were lost each day.

The mode splits are based on observations made by staff and volunteers over 3 separate 8 hour periods.

Male: 57%  
Female: 43%  
Bike: 40%  
Ped: 60%

Weds	Oct 20	11 am	39231 (Unit removed)
Tues	Oct 19	10 am	39228
Mon	Oct 18	9:41 am	39227
Sun	Oct 17	3:05 pm	39225
Sat	Oct 16	2:42 pm	37807
Fri	Oct 15	9:20 am	37209
Thurs	Oct 14	10:40 am	33686
Wed	Oct 13	8:48 am	28180
Tue	Oct 12	9:14 am	27343
Mon	Oct 11	7:58 pm	27151
Sun	Oct 10	2:18 pm	23314
Sat	Oct. 9	2:52 pm	22997
Fri	Oct 8	7:40 pm	22715
Thurs	Oct 7	9:07 am	22147
Wed	Oct 6	9:00 am	21909
Tues	Oct 5	9:36 a.m.	21744
Mon	Oct 4	9:21 am	21145
Sun	Oct 3	4:08 pm	20627
Sat	Oct. 2		n/a
Fri	Oct. 1	9:20 am	19754
Thurs	Sept 30	9:18 am	18065
Wed	Sept 29		n/a
Tues	Sept 28	9:35 am	14592
Mon	Sept 27	9:05 am	8476
Sun	Sept 26	11:42 am	8144
Sat	Sept 25	9:58 am	7880
Fri	Sept. 24	9:20 am	7612
Thurs	Sept 23	9:30 am	6782
Wed	Sept 22	9:32 am	6281
Tues	Sept 21	9:20 am	5942

## Trail User Count: East Side Path at Brady St. Bridge

The trail counter was active for less than a week and had to be removed due to the start of the Brady St bicycle and pedestrian bridge construction project.

Male: 67%  
Female: 33%  
Bike: 75%  
Ped: 25%

Weds Aug. 18,			12:30 pm	190
Thurs. Aug 19,	7:30 am	1340	12:30 pm	1610
Fri. Aug 20,	7:30 am	2564	12:30 pm	3102
Sat. Aug 21	7:30 am	3561	12:30 pm	4211
Sun. Aug 22	7:30 am	5315	12:30 pm	7634
Mon. Aug 23	7:30 am	8647		

# Guidelines for Trail Design and Layout in Riparian Corridors

Measures for Avoiding, Minimizing, and Mitigating for the Impacts of Recreational Trails and Visitor Use on Riparian and Stream Ecosystems.

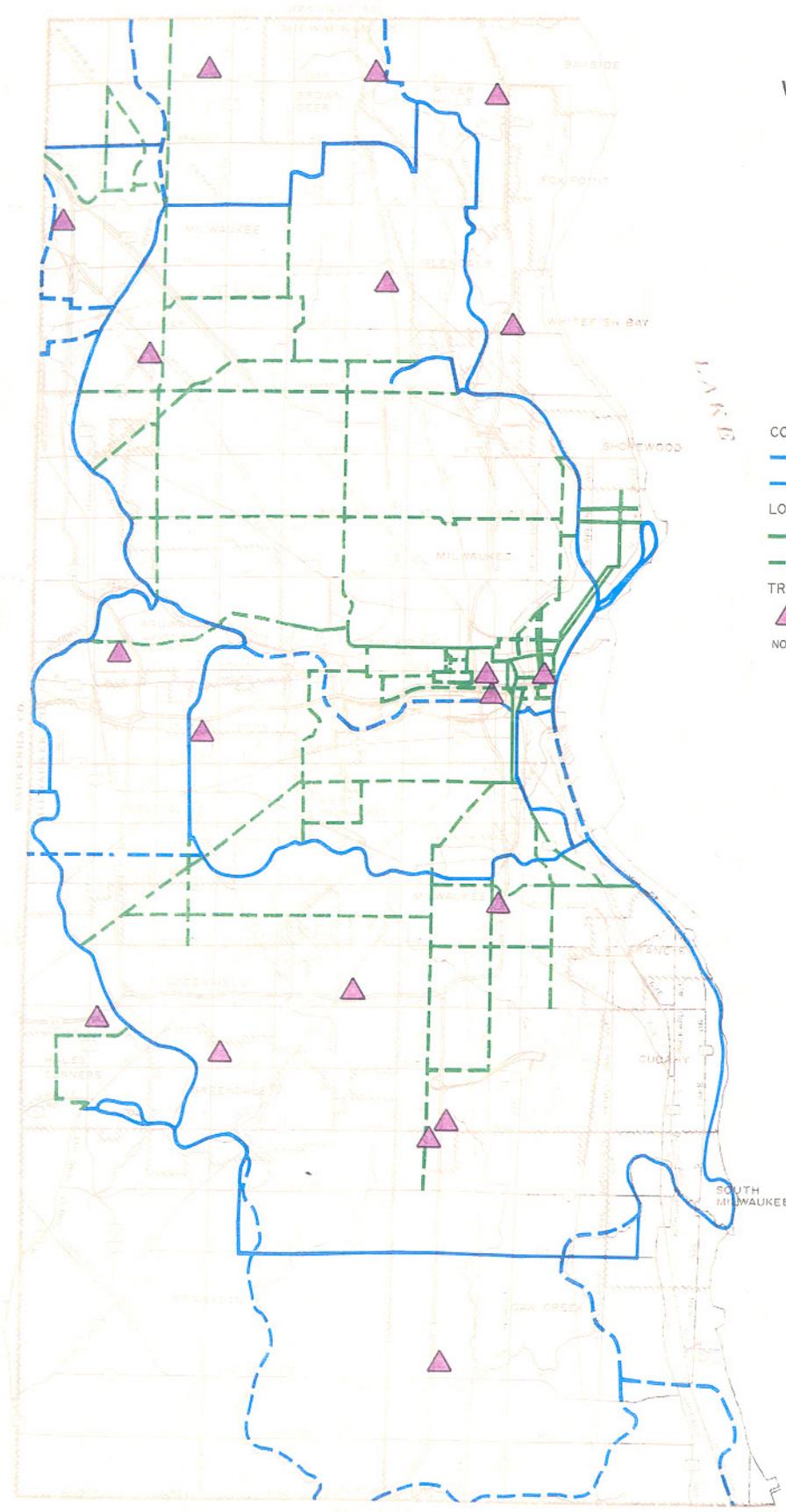
1. Design trail systems so that all trails are up put of the active channel (i.e., bankfull flow channel).
2. Design trail systems so that the main (multi-use) trails are out of the flood prone area.
3. Avoid locating trails where there are obvious depositional features (e.g., debris racks, sediment deposits).
4. Avoid locating trails that require surfacing within the flood prone area.
5. Set back main (multi-use) trails a minimum of 25 feet from the edge of the top-of-bank.
6. Locate main (multi-use) trails far enough back from the top-of-bank to allow for a natural fluvial geomorphic process to continue to occur (e.g., meandering of the active channel [bankfull flow channel] within the floodplain).
7. Locate main trails sufficiently far back from sites of active stream bank erosion so as to allow natural erosion processes to continue to take place.
8. When possible, locate main trails outside of the drip line of top-of-bank riparian vegetation (e.g., setback trails at least 10 feet and preferably 25 feet from the edge of riparian corridor).
9. Limit the construction of the main (multi-use) trails to only one side of the stream corridor (e.g., the side containing the least sensitive botanical and/or wildlife resources).
10. Along streams where the amount of existing riparian vegetation is limited, plant additional riparian vegetation to expand the width of the riparian corridor and locate main trails outside of the revegetation areas.
11. Use existing top-of-bank flood control maintenance roads for multi-use trails where they are available and the uses are compatible (assuming that their placement and use is not in conflict with the protection of sensitive resources).
12. Construct lateral trails (e.g., dead end or loop trails) off of the main trail to give visitors the opportunity to view and get close to the creek.
13. Design trail systems so minor or lateral (lower-use) trails only parallel the edge of the creek (e.g., at the toe of the bank) for a short distance.
14. Conduct a survey of biotic resources within the riparian corridor to identify fragile and environmentally sensitive areas prior to laying out the trail system.
15. Carefully site trails so as to avoid sensitive riparian habitat areas, especially areas that support sensitive wildlife species (e.g., a heron rookery). Exact setback distances should be determined by site-specific analysis in consultation with resource management agencies qualified biologist.
16. Avoid adopting and/or upgrading existing trails if they pass through, or are adjacent to, environmentally sensitive areas.

17. Plant vegetation in buffer zones between and sensitive riparian areas (e.g., plant shrubby dense vegetation capable of screening sensitive areas from trails, plant thorny vegetation that may discourage access to sensitive areas).
18. Construct trails according to standards that are sensitive to the type of riparian resources they are bisecting (e.g., elevated boardwalks across sensitive wetland areas, narrower trail tread on steep side slopes).
19. When possible, route trails directly through low value areas of disturbed habitat and non-native vegetation (e.g., construct trail tread through patches of undesirable invasive, non-native [exotic], plant species, such as giant reed, periwinkle, English ivy). At the same time, undertake a program to eradicate invasive, non-native plants and restore the surrounding area to the native habitat.
20. Design trails so as to minimize cut and fill and vegetation disturbance.
21. Design and construct trails so as to direct drainage away from direct entry to the creek.
22. Avoid the use of fencing within zones that are periodically flooded.
23. Avoid the construction of fencing that might limit wildlife movement within the riparian corridor.
24. Avoid the use of lighting on trails located within the riparian corridor. Set back all lighting a minimum of 50 feet from the outer edge of the riparian corridor.
25. Create interpretive trails and viewpoints that provide controlled opportunities for people to view, experience, and learn about stream and riparian systems (e.g., self-guided natural trails).

*Prepared by:*  
John T Stanley  
The Habitat Restoration Group  
PO Box 4006  
Felton California, 95006  
[www.cruzio.com/~hrg/](http://www.cruzio.com/~hrg/)

Map A-2

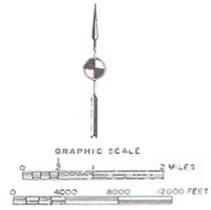
**EXISTING AND PLANNED BICYCLE  
WAYS IN MILWAUKEE COUNTY: 1993**



- LEGEND**
- COUNTY BICYCLE WAYS
    - EXISTING
    - - - PLANNED
  - LOCAL BICYCLE WAYS
    - EXISTING
    - - - PLANNED
  - TRANSIT STATIONS
    - ▲ EXISTING

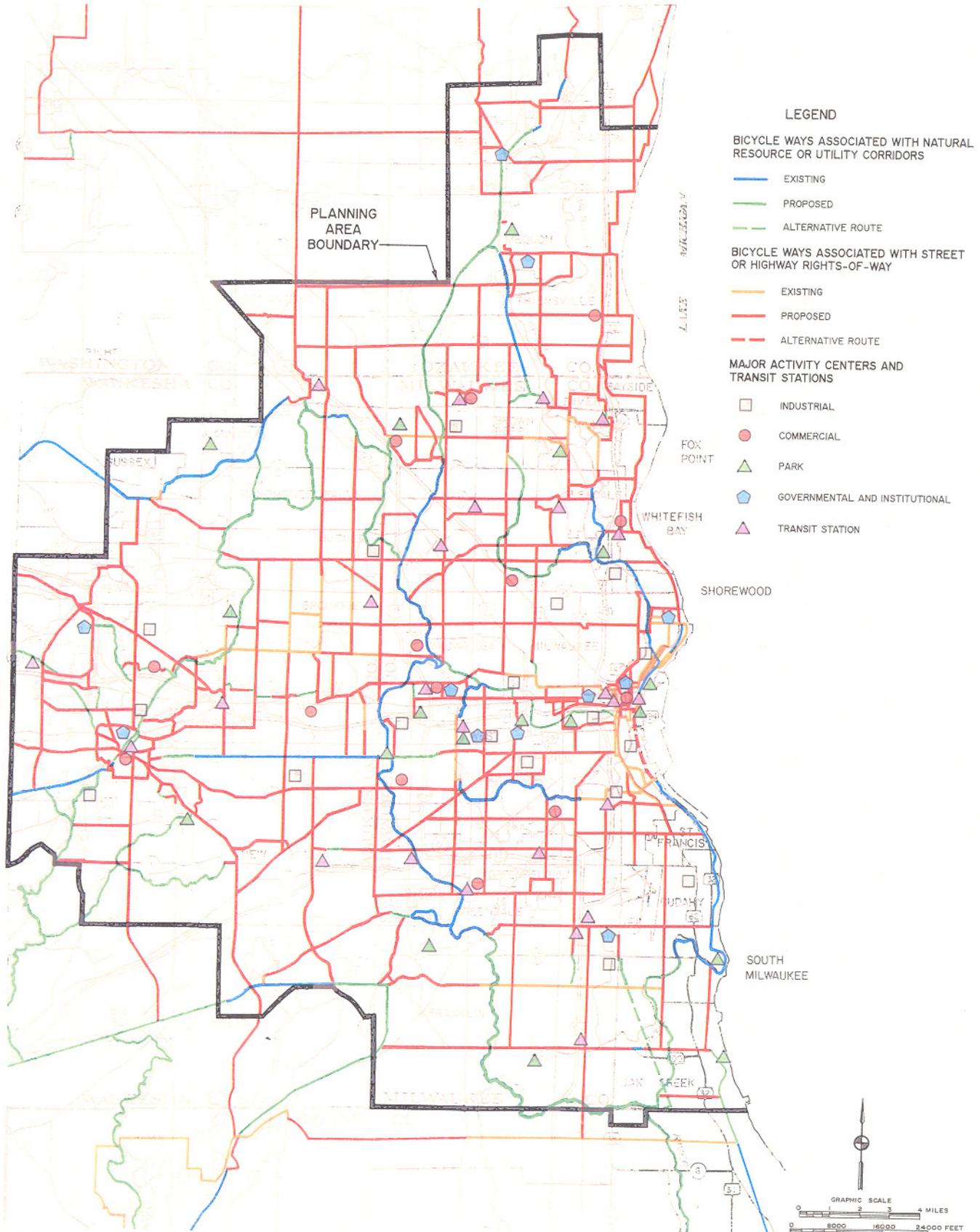
NOTE: THERE ARE NO EXISTING OR PLANNED STATE BICYCLE WAYS IN MILWAUKEE COUNTY

BICYCLE WAYS SHOWN AS PLANNED ON THIS MAP WERE PROPOSED PRIOR TO THE COMPLETION OF THE REGIONAL BICYCLE-WAY SYSTEM PLAN DOCUMENTED IN THIS REPORT. SOME OF THE PLANNED ROUTES WERE MODIFIED THROUGH THIS PLANNING EFFORT. PLEASE CONSULT MAPS 18 AND 20 IN CHAPTER 8 OF THIS REPORT (SEE PAGES 113 AND 115) FOR UPDATED INFORMATION REGARDING EXISTING AND PLANNED BICYCLE WAYS.



Source: SEWRPC.

FINAL RECOMMENDED BICYCLE-WAY SYSTEM PLAN FOR THE MILWAUKEE  
BICYCLE AND PEDESTRIAN FACILITIES PLANNING AREA: 2010



# Sidepath Suitability Algorithm

Ed Barsotti, League of Illinois Bicyclists, April 3, 2001

The following algorithm rates the suitability of a sidewalk or sidepath as a bicycle facility. (A sidepath is a trail parallel to, but separated from, a roadway). The algorithm can be used to:

- Rate existing sidepaths
- Determine whether a new sidepath would be an appropriate option for accommodating bikes
- Suggest safety improvements for existing or planned sidepaths

At present, no such nationally-accepted suitability index exists. The *AASHTO Guide for the Development of Bicycle Facilities* describes some of the problems encountered when using sidewalks or sidepaths as bicycle facilities. I have attempted to combine these and other factors into a quantified suitability score. No field testing, statistical analysis, or calibration has been done - the algorithm is only my estimation of the relative importance of key terms. It was developed for the Non-Motorized Transportation Plan of North Aurora, Illinois.

The factors considered are: intersection traffic, continuity, curb cuts, pedestrian use, crosswalks, and path/road separation at intersections. Assumed is that bicyclists will travel in both directions on the sidepaths.

## 1. Intersection Traffic Score.

The volume and speed of traffic - especially turning traffic - directly affect the risk of collision. Determine the intersection traffic score  $X$  from the following:

$$X = [R + (2 * A) + (4 * B)] / M * [Spd * Vol];$$

Where:

$R$  = Number of residential intersections (driveways) on the segment,

$A$  = Number of minor commercial intersections and streets (<1000 ADT),

$B$  = Number of major commercial intersections and streets (>1000 ADT),

$M$  = Length of segment in miles

$Spd$  = Speed limit factor, for the parallel street: 30 and under = 1, 35-40 = 2, 45 and over = 3.

$Vol$  = Traffic volume factor, parallel street: <2,000 = 1; 2,000-10,000 = 2; >10,000 = 3.

<b>X</b>	<b>Points</b>
0	0
1-40	1
41-80	2
81-120	3
121-160	4
161-200	5
201-240	6
>240	7

## 2. Continuity.

Discontinuities (major gaps, or sidepath ends) may force cyclists to ride through grass, etc., and enter the roadway awkwardly. Often cyclists will avoid sidepaths with these gaps. Add **4 points** if major discontinuities exist.

## 3. Curb cuts.

Uncut curbs compromise cyclist movement and attention at intersections. Add **3 points** if any intersections are lacking curb cuts.

#### 4. Pedestrian use.

Sidewalks and sidepaths are used by both bicyclists and pedestrians. Insufficient width increases user conflict. (However, extra width encourages higher cyclist speeds - which becomes a problem at incorrectly-designed intersections.) Add points according to the following chart:

Low (rare) ped use		Medium (sometimes) ped use		High (often) ped use	
<= 5'	<b>1 point</b>	<= 5'	<b>2 points</b>	<= 5'	<b>4 points;</b>
> 5'	<b>0 points</b>	6-7'	<b>1 point</b>	6-7'	<b>2 points</b>
		>= 8'	<b>0 points</b>	>= 8'	<b>1 point;</b>

#### 5. Crosswalks.

Visible crosswalks can help make motorists more aware of non-motorized traffic. Sometimes 2 parallel painted stripes are sufficient. At busier intersections, ladder crosswalks and other techniques enhance visibility. Add **2 points** if there are no crosswalks. Add **1 point** if there are some crosswalk markings, but more visibility is warranted for that intersection type. Add **0 points** for appropriately marked crossings. Take the average crossing for the segment.

#### 6. Intersection sidepath/road separation.

AASHTO recommends that sidepaths be brought closer to the parallel road at intersections, so motorists more easily see and consider bicyclists during their approaches. The vehicular stop line should be in back of the sidepath crossing - cyclists must not weave through stopped traffic when crossing. Add **5 points** if the crossing goes through stopped traffic. Add **3 points** if the crossing is not brought "close enough" to the parallel road. Add **1 point** when the crossing is brought close to the road. (Paved shoulders and bike lane crossings - 0 points.) Again, take the average crossing for the segment.

Add together all the points for the sidepath suitability score. Ranges of suitability are:

Suitability Score	Suitability
<= 7	Most suitable
8-6	Somewhat suitable
10-11	Least suitable
>= 12	Not suitable

# Off Street Bikeway Study:

## Public Meeting Summary

Feedback questions are in plain text  
**Highly popular responses are in bold**  
*Less popular responses are in italics*

Top 3 priorities for trail development:

**1. We Energies North (7)**

**2. West Allis Line (5)**

**3. South Side Power Line (2) and Union Pacific (2)**

With one vote: *connections to Racine trails, KK River East, 894 Powerline, North Menomonee Valley connections, KK River West, and upgrade and maintain existing.*

What section of the City is most in need of trail development?

**Almost everyone had a different response. Bayview and central city were the only ones to get more than a singular response.**

*NW Side, KK river valley, Menominee valley, Miller Park to Zoo, Bayview, SE side, downtown to lakefront, near South side, E/W trail connector across city.*

Are there any “missing links” to the Bikeway network that you think should be prioritized?

Please explain:

**The Hoan, E/W route, downtown to lake, extension of OLT to Interurban, HAST to lake.**

*Please list any areas of the Oak Leaf Trail system that are most in need of improvement. What kind of improvement is needed (widen trail, improve signage, etc)?* **Signage and pavement improvements.**

**Lincoln-Kletch, Congress-Appleton, trail and road in Grant Park, HWY 100 crossing on Westside, Deer Creek Parkway, downtown to bayview, kk river west (bad pavement).**

*How much (on a scale of 1-10) would you value on parkway or street portions of the OLT getting put off street?* **5.67 Average.**

# Off Street Bikeway Study Public Input

Meeting Date 12/19/2005

Your answers to the following questions will help inform the recommendations made to the city as part of the Off Street Bikeway Study.

Top 3 priorities for trail development:

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_

What section of the City is most in need of trail development?

Are there any “missing links” to the Bikeway network that you think should be prioritized?  
Please explain:

Please list any areas of the Oak Leaf Trail system that are most in need of improvement. What kind of improvement is needed (widen trail, improve signage, etc)?