



# Door County Bicycle, Pedestrian and Recreational Facilities Master Plan Appendices

## January 2014

**PREPARED BY:**

Alta Planning + Design  
Portland, OR / Madison, WI  
(503) 230-9862

Wisconsin Bike Fed  
409 East Main Street, Suite 203  
Madison WI 53703



**WISCONSIN  
BIKE FED**



## Appendix A: Plan and Policy Review

This appendix describes background plans and policy documents relevant to the Door County Bicycle, Pedestrian and Recreational Facilities Master Plan. The narrative summarizes previous and on-going planning efforts affecting biking and walking in Door County. The summary identifies issues that may impact the findings and ultimate recommendations of this project. The review focuses on plans and studies prepared by the Wisconsin Department of Transportation (WisDOT), the Bay-Lake Regional Planning Commission, as well as local plans from Door County cities, towns, and villages.

The following plans were reviewed for this analysis:

### Statewide Documents

- Administrative Code Trans 75: BIKEWAYS AND SIDEWALKS IN HIGHWAY PROJECTS (2009)
- Wisconsin State Bicycle Transportation Plan 2020 (1998)
- Wisconsin Pedestrian Policy Plan 2020 (2002)
- Advisory on Installation of Bicyclist Compatible Rumble Strips (2011)
- Wisconsin Department of Transportation Guide for Path/Street Crossings (2011)
- Developing a Model for Reducing Bicycle/Motor Vehicle Crashes (2006)
- Wisconsin Rural Bicycle Planning Guide (2006)
- Wisconsin County Bicycle Maps (2009)
- Wisconsin Bicycle Planning Guidance (2003)
- Wisconsin Bicycle Facility Design Handbook (2004)
- Wisconsin Guide to Pedestrian Best Practices (2010)

### Regional and County Focused Documents

- Bay Lake Regional Bike Plan (2002)
- Door County Bicycle Transportation Capital Improvement Plan (2003)
- Door County Visitor Bureau Bicycle & Other Silent Sports Map (2008)

### Local City, Town, and Village Planning Documents

- Village of Egg Harbor Bicycle and Pedestrian Plan (2010)
- Town of Gibraltar 2010 Bicycle and Pedestrian Plan (2010)
- Town of Liberty Grove 2010 Bicycle Plan (2011)
- City of Sturgeon Bay Bicycle Master Plan (2011)
- Town of Baileys Harbor 2011 Bicycle Plan (2011)

## Statewide Documents

### **Administrative Code Trans 75: BIKEWAYS AND SIDEWALKS IN HIGHWAY PROJECTS (2009)**

Wisconsin's Pedestrian and Bicycle Accommodations law addressing Complete Streets is called administrative rule Transportation 75 (often referred to as Trans 75). The policy implications of this document are discussed in Appendix B: Complete Streets, Land Use and Design, and Mode Choice.

### **Wisconsin State Bicycle Transportation Plan 2020 (1998)**

This plan provides guidance on the state-owned and state-supported transportation systems in Wisconsin. Policies are divided into *urban* and *intercity* (rural) geographies. Policies from both categories will apply to Door County areas.

#### Urban:

- “Bicycle provisions on urban arterial streets (i.e., wide curb lanes, bicycle lanes or paved shoulders) should be made in accordance with Metropolitan Planning Organization (MPO) and community bicycle plans.”
- “On Urban State Trunk Highways, where suitable accommodations for bicyclists now exist, new highway improvements will be planned to continue an acceptable level of service and safety for bicyclists.”
- “WisDOT will cooperate with local jurisdictions to help develop "stand alone" bikeway projects, including bicycle path facilities, when they are consistent with an approved plan and provide important bicycle transportation improvements.”
- “Safe crossings should be maintained or created when bikeways and streets intersect highways. Crossing controls or grade separations should be considered where there are inadequate gaps in traffic for safe bicycle path crossing.”
- “Intersection design should consider the needs of bicyclists. All intersections should be wide enough for safe bicyclist crossing”

#### Rural:

- On all higher-volume rural roadways (generally with motor vehicle volumes exceeding 1,000 per day), paved shoulders should be provided.
- On higher-volume roadways with a moderate number of bicyclists currently using or anticipated to use the roadway, wider paved shoulders should be provided.
- On lower-volume roadways generally no special improvements are necessary to accommodate bicyclists.
- Multi-use paths should be considered when 1) bicyclists cannot be safely accommodated with on-street facilities; or, 2) an opportunity exists to improve the transportation aspects of bicycling by locating a rural bicycle path within an abandoned rail corridor, utility corridor, or river grade.

**Wisconsin Pedestrian Policy Plan 2020 (2002)**

The Policy Plan encourages local governments, MPOs and Regional Planning Commissions (RPCs) to devote attention to meeting pedestrian needs on roadways in their areas. This guide is WisDOT's primary method to accommodate pedestrians and other interested groups.

Key WisDOT policy statements and actions include:

- WisDOT will review all state trunk highway projects for pedestrian needs using scoping criteria and guidelines.
- WisDOT supports stand-alone sidewalk projects through such programs as the Transportation Enhancement Program for sidewalk retrofit projects to fill in gaps.
- WisDOT commits to minimizing the “barrier effect” to walking. This is sometimes posed by state trunk highways or by joining local sidewalks to state trunk highway sidewalks. Particular attention will be paid to needs near high traffic generators such as schools and commercial areas.

**Advisory on Installation of Bicyclist Compatible Rumble Strips (2011)**

The purpose of this advisory is two-fold: 1) to alert highway officials and engineers in Wisconsin of the potential problems and hazards posed to bicyclists when rumble strips are improperly designed and/or constructed and 2) to act as a limited resource for guidance and standards currently available on rumble strips, especially as they pertain to making rumble strips bicycle compatible. This advisory is intended for all non-interstate and non-freeway rural roadways in Wisconsin regardless of ownership of the roadway or source of funding for highway improvements.

“Shoulder rumble strips should not be used for the sole purpose of improving safety for bicyclists; their presence is more likely to create a hazard for bicyclists.”

Transverse strip “Where state or federal funds are being used for the installation, a rumble free shoulder and passage shall be provided as specified above.” “If a paved shoulder is not present, the passage width should be 3 feet from the right edge of the paved roadway. Where state or federal funds are being used for the installation, this 3’ passage shall be provided.”

**Wisconsin Department of Transportation Guide for Path/Street Crossings (2011)**

This document prepared by WisDOT identifies and clarifies intersection right-of-way rules at the intersection of bicycle multi-use paths with streets and highways. The document differentiates between bicyclists using a mid-block crossing and those using a crosswalk at a traditional intersection. Generally:

- Bicyclists should obey traffic controls as they encounter them on the path, and proceed through crossings in a manner that is consistent with the safe use of the crosswalk by pedestrians.
- Drivers must yield to pedestrians and bicyclists in the crosswalk, and do everything they can to keep from hitting a pedestrian or bicyclists even if they have failed to meet their obligations.

### **Bicycle Crash Analysis for Wisconsin Using a Crash Typing Tool (PBCAT) and Geographic Information System (GIS) (2006)**

This document is based on a WisDOT research project which discusses the method and results of evaluating the relationship between road and intersection conditions and incidences of bicycle crashes. The results are used to support safety improvements and countermeasure design for inclusion in future plans and projects. Key findings include:

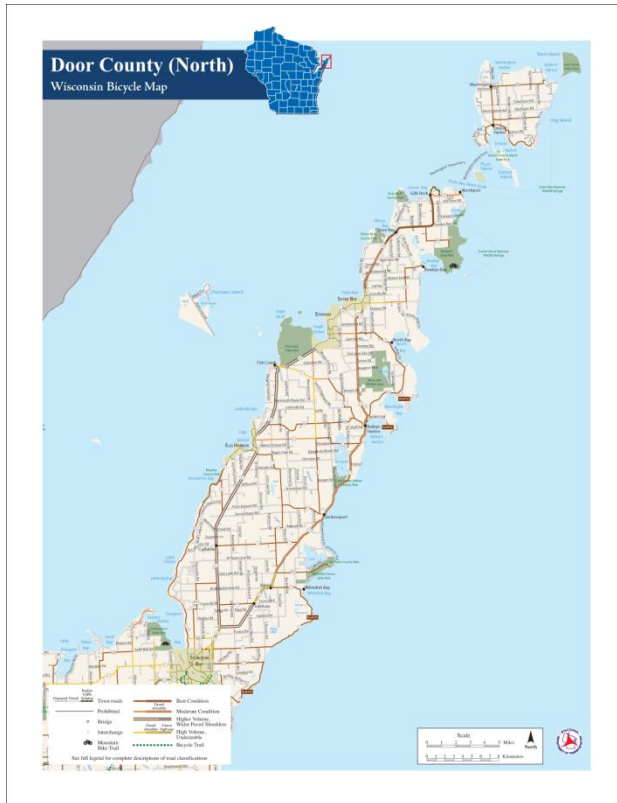
- Reported crashes between bicyclists and motorists in the State of Wisconsin have continued to decrease annually since the 1998 State Bicycle Transportation Plan was adopted.
- Four of the top five crash types most frequently reported indicated that the motorist made the critical error that contributed to the crash.
- There were far more reported urban crashes than rural crashes (94% compared 6%).
- The majority of reported crashes occurred at intersections (66% compared to 34%).
- There was a high frequency of reported sidewalk/crosswalk-type crashes (28% of all crashes).
- Reported crash rates were lower on wider roadways for both local roads and state highways.
- While urban streets had a much higher crash rate, rural highways had a much higher rate of fatalities.

### **Wisconsin Rural Bicycle Planning Guide (2006)**

This document is a reference for rural counties and small communities creating bicycle plans for their communities. It discusses the importance of bicycling as a form of transportation and outlines and describes the bicycle planning process and content requirements. The focus of this guide is on the utilitarian and transportation aspects of bicycling and less on recreational uses.

### **Wisconsin County Bicycle Maps (2009)**

These county bike maps provide a bicycling conditions assessment that benefits both cyclists and transportation planners. The conditions for cycling represented on the map are intended for an average adult cyclist with at least some experience operating on higher speed roadways. The methodology for assessing cycling conditions is based on the process described in Appendix A of the Wisconsin Rural Bicycle Planning Guide. The map for Northern Door County is illustrated below.



*Bicycle Suitability Map created by the Wisconsin Department of Transportation.*

### **Wisconsin Bicycle Planning Guidance (2003)**

This document is a reference for Metropolitan Planning Organizations (MPOs) responsible for planning in urbanized areas of Wisconsin. It discusses the importance of bicycling for transportation and outlines and describes the bicycle planning process and content requirements. The focus of this guide is also on the utilitarian and transportation aspects of bicycling and less on recreational uses.

### **Wisconsin Bicycle Facility Design Handbook (2004)**

This handbook is the primary source for facility design guidance in the state of Wisconsin. It discusses the operating characteristics and needs of bicyclists, and presents the wide range of design options for enhancing a community's bicycle transportation system. The guide covers basic roadway improvements for shared streets, details for on-street bicycle lanes, and the design of shared-use paths. Shared Lane Markings (SLMs), introduced into the 2009 edition of the FHWA Manual on Uniform Traffic Control Devices and in common use around the country, are not included in this guide.

### **Wisconsin Guide to Pedestrian Best Practices (2010)**

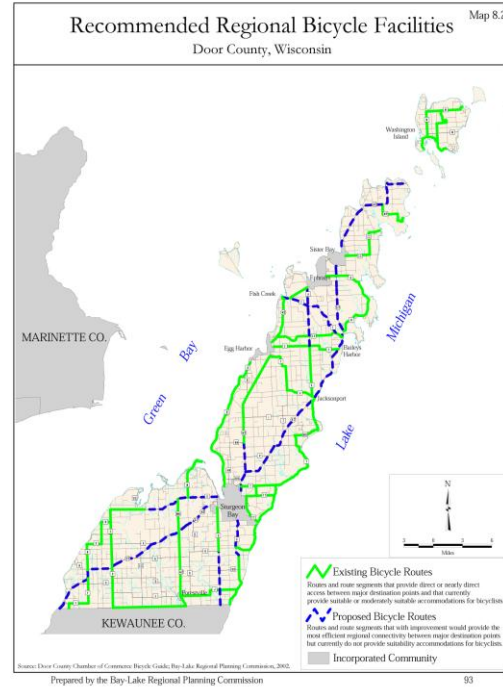
The Wisconsin Guide to Pedestrian Best Practices provides detailed design, planning, and program information for improving all aspects of the pedestrian environment. The guide serves as a companion document to the Wisconsin Pedestrian Policy Plan 2020 to assist in the implementation of the goals, objectives, and actions of the plan and serve as a reference or guidebook for state and local officials.

## Regional and County Documents

### Bay Lake Regional Bike Plan (2002)

Designed to build upon the efforts and framework of the Wisconsin Bicycle Transportation Plan 2020, the Bay Lake Regional Bike Plan provides a finer level of detail than the state plan, and establishes continuity and connectivity between the state plan and county or metropolitan plans. The plan focuses on inter-and intra-regional bicycle travel, and does not include analysis or assessment of facilities located within urban centers in the region. The plan identifies preliminary policies and recommended bicycle facilities for Door County. Recommendations include:

- Develop a continuous bicycle trunk, route, and trail system within the eight county Bay-Lake Region.
- Develop a bicycle trunk, route, and trail system that attains as high a level of efficiency as possible.
- Develop a bicycle trail and route system that attains as high a level of safety as possible.
- Promote bicycling as a significant and alternative mode of intracity and intercity travel.

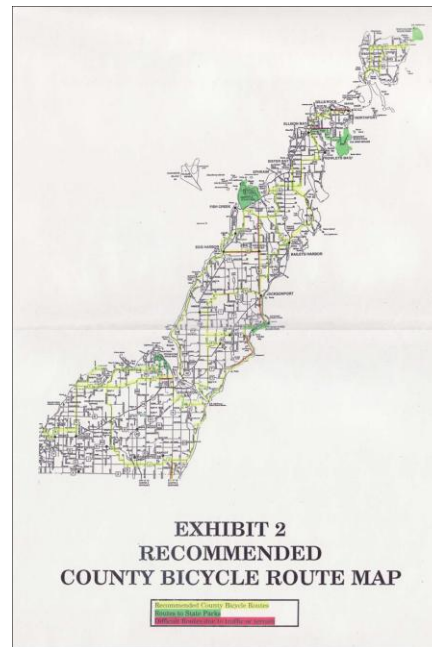


*Recommended Regional Bicycle Facilities as identified in the Bay Lake Regional Bike Plan.*

### Door County Bicycle Transportation Capital Improvement Plan (2003)

The Door County Bicycle Transportation Capital Improvement Plan provides goals and objectives for Door County to achieve an increase in bicycling for transportation. The plan describes bicycle route connections between municipalities, recommended back road bicycle routes, and identifies necessary roadway improvements. The plan also calls for:

- Posting bicycle route signs (wayfinding) on designated routes indicating direction and distance to important destinations
- Recognizing and including local bicycle transportation planning documents as part of the County plan

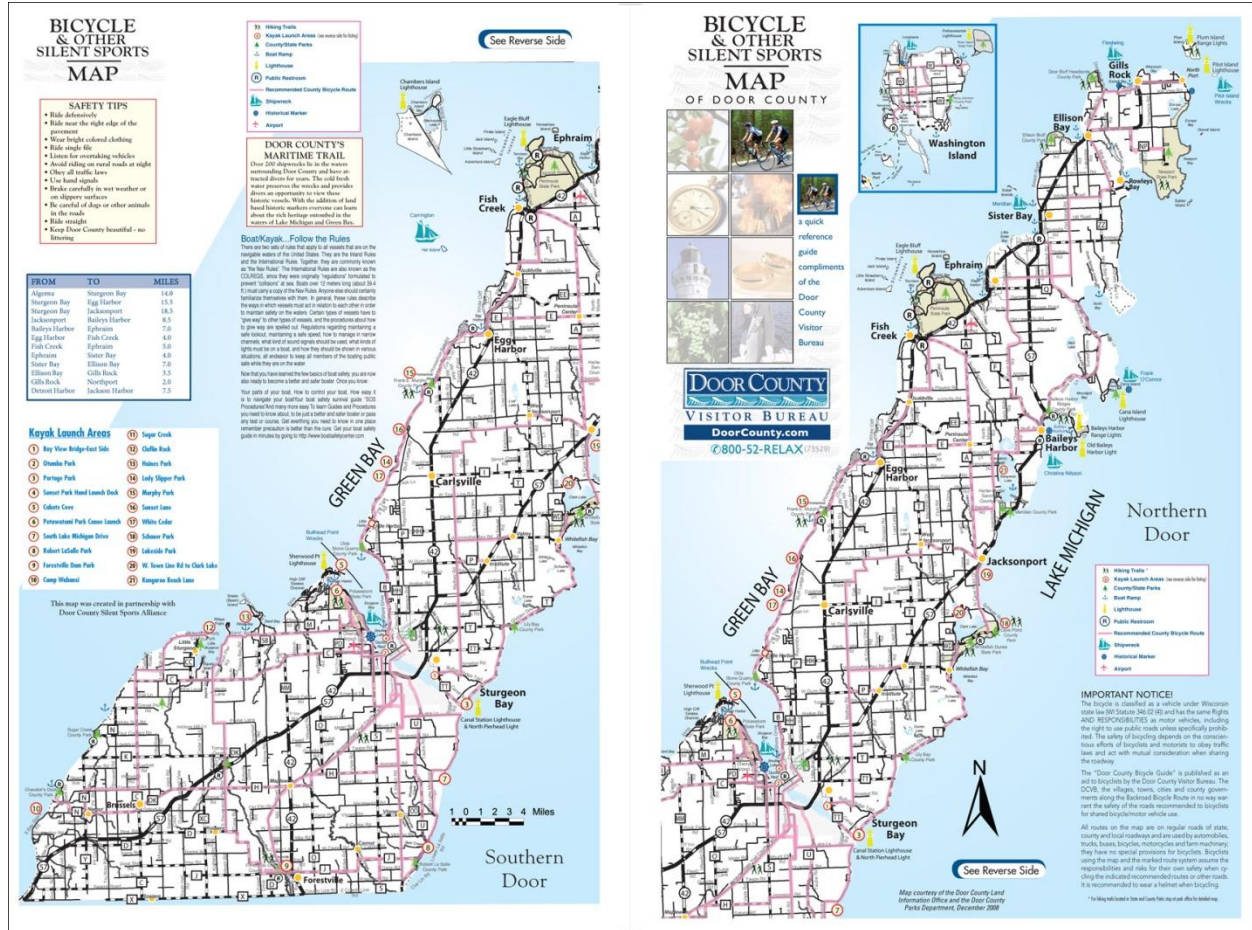


*Recommended County Bicycle Routes as identified in the Door County Bicycle Transportation Capital Improvement Plan.*



### Door County Visitor Bureau Bicycle & Other Silent Sports Map (2008)

Published as part of the tourism-focused Door County Bicycle Guide, the map identifies recommended county bicycle routes throughout Door County.



Recommended County Bicycle Routes as promoted by the Door County Visitors Bureau

### Local City, Town, and Village Planning Documents

Few towns and villages in Door County have adopted local bicycle and pedestrian plans. Those that have tend to focus on recommending policies and facilities designed to encourage bicycling and walking for transportation as opposed to recreation. The plans also base their policy recommendations on the 'five E's' of Engineering, Education, Encouragement, Enforcement and Evaluation. Communities with bicycle and pedestrian related plans include:

- Village of Egg Harbor Bicycle and Pedestrian Plan (2010)
- Town of Gibraltar 2010 Bicycle and Pedestrian Plan (2010)
- Town of Liberty Grove 2010 Bicycle Plan (2011)
- Town of Baileys Harbor 2011 Bicycle Plan (2011)
- City of Sturgeon Bay Bicycle Master Plan (2011)

Countywide planning efforts should acknowledge these plans by adopting strong, unified policy and planning recommendations, and through providing route connections into the locally proposed bicycling network.

*This Page Intentionally Left Blank*

## Appendix B: Complete Streets, Land Use and Design, and Mode Choice

Over the past several years, a significant body of research has emerged illustrating the relationship between transportation choices and the way communities are designed. In particular, much of this research has shown an association between active modes of transportation, such as walking and cycling, and certain elements of the built environment, namely land use mix, density, and road network characteristics. The interaction of community design and anticipated users is key to determining what facility types are appropriate for a certain location.

Although recreational physical activity may also be influenced by community design by the location of amenities such as trails, parks, or playing fields for example, recreational activity is often considered separately. Unlike utilitarian physical activity, it may not be integrated into people's everyday lives. In addition, recent research has shown that the built environment has a less significant relationship with recreational types of physical activity than it does with utilitarian types of physical activity<sup>1</sup>, such as active transportation.

To achieve an increase in bicycling and walking for transportation, communities must consider the way they design their streets, as well as the land use context that surrounds them. Various land use policies, design standards, and project implementation strategies exist that can enhance the bicycle and pedestrian friendliness of a community. This appendix explores these strategies and makes recommendations on how they may be implemented in Door County.

### Increasing Walkability and Bikeability of Communities

The literature has shown that five aspects of the built and natural environment in particular can have a significant influence on physical activity patterns.

#### Road network connectivity

Connectivity determines how directly a person can travel between two points using existing streets and paths. The design of street networks can influence the specific route and mode of transportation that people use. As connectivity increases, travel distances decrease and route options increase, allowing for more direct travel and route choices between destinations. As such, high levels of connectivity are more conducive to walking and cycling than lower levels. High levels of connectivity are typically found in environments with grid street networks characterized by relatively straight streets, four-way intersections, and a high number of blocks or intersections per unit of area.

#### Land use mix

Land use mix refers to the number of different types of land uses (such as residential, commercial, institutional, or retail) within a given area. A typical urban environment with a high mix of land uses would generally include uses such as homes as well as offices, stores, restaurants, and other services and amenities. In contrast, a typical suburban environment with a low level of land use mix is characterized by land uses that are segregated from each other (for example, housing is separated from office development, which is in turn

---

<sup>1</sup> Saelens, Brian E., James F. Sallis, Jennifer B. Black, and Diana Chen (2003). "Neighbourhood-Based Differences in Physical Activity: An Environment Scale Evaluation." *American Journal of Public Health*, Vol. 9, No. 9, pp. 1552-8.

separated from retail development). Mixing land uses increases the diversity of destinations in a given area, thereby potentially reducing the distance required to travel to a variety of destinations. As such, a good land use mix is also positively associated with physical activity, because it may shorten trip distances, thereby encouraging people to walk and bicycle. Door County's more urbanized areas typically include a greater diversity of land use than the areas dedicated to agriculture.

### **Density**

Density is a measure of urban form used to convey objective information about how compactly a particular environment is built. Density can be measured in a number of different ways, such as the number of people, jobs or buildings within a given area. Density typically refers either to residential density or to employment density, and can be measured as a gross or a net measure. Higher densities typically increase the number of potential destinations located within a geographic area, thereby increasing proximity between destinations, reducing travel distances and increasing the likelihood of walking or bicycling. Urban areas and Door County's smaller town centers and hamlets typically have high density levels, whereas more rural areas typically have lower densities with fewer people living across a larger land area.

### **Bicycle network characteristics**

Similar to the way in which road network characteristics influence cycling, the density and connectivity of bicycle networks themselves are also essential. Cities with dedicated policies regarding cycling place a priority on filling in existing gaps and creating a tighter bicycle network. Research on the effect of bicycle facility networks on bicycle use generally indicates that denser, well-connected networks encourage more people to use bicycle transportation. Research also finds that bicycle use is more common among individuals living closer to specific bicycle facilities. One study indicated that people living within 400 meters of a bicycle lane are more likely to use a bicycle.<sup>2</sup>

### **Topography**

A significant amount of research has shown that topography can influence the decision to bicycle, although the degree of influence is unclear. For example, one recent research project concluded that "hilliness was found to be, by far, the most significant determiner of the proportion that cycled to work in a district."<sup>3</sup> Further, an article by Guthrie states that, whilst other factors including land use, attractiveness of motorized modes, and specific cycling initiatives do have an impact on levels of cycling, hilliness is clearly the largest single determinant.<sup>4</sup>

The effects of connectivity, density, land use mix, and topography on travel behavior are intertwined, as together they combine to effectively shorten trip distances, thereby potentially increasing the rates of cycling and walking.

### **Land Use and Transportation Choice**

Wisconsin's 1999-2001 State Budget changed the state planning laws and established the foundation for comprehensive land use planning and identification of 14 local planning goals<sup>5</sup>. Many of the planning goals

---

<sup>2</sup> Stinson, Monique A. and Chandra R. Bhat (2003). "Commuter Bicyclist Route Choice." Transportation Research Record: Journal of the Transportation Research Board, No. 1828, pp 107-115.

<sup>3</sup> Parkin, John, Mark Wardman, and Matthew Page (2008). "Estimation of the Determinants of Bicycle Mode Share for the Journey to Work Using Census Data." Transportation. Vol. 35, No. 1, pp. 93-109.

<sup>4</sup> Guthrie, Neil (2009). "An Uphill Struggle." CTC Cycle Digest, Issue 58.

<sup>5</sup> State of Wisconsin. Smart Growth: Wisconsin's Planning Law. <http://dnr.wi.gov/org/es/science/landuse/smart/SGLaw.htm>. Accessed May 14, 2012.

support similar goals of complete streets legislation. Four goals in particular are dedicated to land use and transportation planning in support of more walking and bicycling:

- Encouragement of neighborhood designs that support a range of transportation choices
- Encouragement of land uses, densities and regulations that promote efficient development patterns and relatively low municipal, state governmental and utility costs
- Building of community identity by revitalizing main streets and enforcing design standards
- Providing an integrated, efficient and economical transportation system that affords mobility, convenience and safety and that meets the needs of all citizens, including transit-dependent and disabled citizens

## Complete Streets

A Complete Street is a roadway that includes items such as sidewalks, bike lanes or shoulders, bus lanes, transit stops, crosswalks, median refuges, curb extensions, and appropriate landscaping, in addition to general purpose vehicular travel lanes. These additional features add to the usability and livability of the street. As of October 2011, Complete Streets legislation has been passed in 25 states and almost 300 other jurisdictions throughout the country, and the Safe and Complete Streets Act of 2011 was introduced and referred to committee but not enacted.

Complete streets offer numerous benefits, including enhanced access for the nearly 1/3 of the US population that does not have access to a motor vehicle, reduction of injury and crash risks by as much as 50 percent, and provision of economic opportunities (e.g., bicycle tours and trail rides).<sup>6</sup>

According to the National Complete Streets Coalition ([www.completestreets.org](http://www.completestreets.org)), an ideal policy should include the following:

- A vision for how and why the community wants to complete its streets
- Specifies that ‘all users’ includes pedestrians, bicyclists, and transit passengers of all ages and abilities, as well as trucks, buses, and automobiles
- Applies to both new and retrofit projects, including design, planning, maintenance, and operations, for the entire right-of-way
- Makes any exceptions specific and sets a clear procedure that requires high-level approval of exceptions
- Encourages street connectivity and aims to create a comprehensive, integrated, connected network for all modes
- Is adoptable by all agencies to cover all roads
- Directs the use of the latest and best design criteria and guidelines while recognizing the need for flexibility in balancing user needs
- Directs that complete streets solutions will complement the context of the community

Door County can use the resources associated with the National Complete Streets Coalition (including sample policies from around the country) to develop and tailor a policy consistent with the area’s context and goals. The policy itself need not be cumbersome in its language; however, the real “teeth” associated with the

---

<sup>6</sup>“Wisconsin’s Pedestrian and Bike Accommodation Law, Complete Streets” Training. Web. Accessed 4 April 2012.

policy is the subsequent development of design guidelines such as typical cross sections that can be applied in varied contexts throughout each of the member jurisdictions.

## Federal and State Complete Streets Policies

While the Federal Highway Administration (FHWA) does not have a formal Complete Streets policy, the concept and ideals are represented in the following:

- SAFETEA-LU, the federal transportation bill that encourages enhanced provision of cycling and walking facilities and programs
- US Department of Transportation Policy Statement on Bicycling and Pedestrian Accommodation (2010) stating that, “Every transportation agency, including DOT, has the responsibility to improve conditions and opportunities for walking and bicycling and to integrate walking and bicycling into their transportation systems. Because of the numerous individual and community benefits that walking and bicycling provide — including health, safety, environmental, transportation, and quality of life — transportation agencies are encouraged to go beyond minimum standards to provide safe and convenient facilities for these modes.”
- FHWA Guidance on Bicycle and Pedestrian Provisions of the Federal-aid Program (1999) states that, “Bicycling and walking ought to be accommodated, as an element of good planning, design, and operation in all new transportation projects unless there are substantial safety or cost reasons for not doing so.”
- 23 U.S.C 217 (g) Planning and Design
  1. In General. – Bicyclists and pedestrians shall be given due consideration in the comprehensive transportation plans developed by each metropolitan planning organization and State.
  2. Safety considerations. – Transportation plans and projects shall provide due consideration for safety and contiguous routes for bicyclists and pedestrians.

The concept of complete streets may not always be explicit or formally recognized as a law and may take the form of a policy statement, design guides, or simple administrative procedures that relate to complete streets. However, legislation that utilizes the term ‘complete streets’ is direct and sends a clear message about the intentions of the implementing body.

### Complete Streets Accommodations in Wisconsin

Wisconsin’s Pedestrian and Bicycle Accommodations law addressing Complete Streets was codified in 2009 as State statute SS 84.01(35) and later into administrative rule as Transportation 75 (Trans-75). The rule aims to “ensure that bikeways and pedestrian ways are established in all new highway construction and reconstruction projects funded in whole or in part from state funds or federal funds.” Exceptions to the law include circumstances when<sup>7</sup>:

- Cyclists and pedestrians are prohibited by law from using the highway

---

7. <http://docs.legis.wisconsin.gov/statutes/statutes/84/01/35/a>

- The cost of establishing a bikeway or pedestrian way is disproportionate to the probable use of the bikeway or pedestrian way (specifically defined as 20 percent of the total project cost), however, the highway project will spend up to 20 percent of the project costs on establishing bicycle and pedestrian facilities
- A facility would have excessive negative impacts in a constrained environment, defined as:
  - Reduction of a terrace width to less than 3 feet for more than 50 percent of the total project length
  - Eliminating structures, improvements, or landscaping would dramatically reduce the aesthetic or functionality of the area
  - A loss or degradation of natural resources, historical, or archaeological sites
- There is an absence of need as indicated by sparse population, traffic volumes, or other factors, defined as:
  - **Sidewalk** – May be omitted in an outlying district defined as “territory near or contiguous to a community where within any 1,000 feet along the highway the buildings average more than 200 feet apart.” Sidewalks may also be omitted in an outlying district or rural area unless land use plans indicate significant development within 10 years.
  - **Bikeway** – Bikeways may be omitted in an outlying district or rural area unless land use plans indicate significant development within 10 years. A bikeway may be omitted in an outlying district or rural area that will have less than 750 ADT in the design year and:
    - 2-way bicycle traffic volume is or is expected to be less than 25 per day during peak travel days
    - The highway is not identified in any government bike transportation plan
    - The highway does not provide a connection of 1 mile or less between any existing and planned routes
    - The highway does not provide a connection of 1 mile or less between an existing bikeway and the nearest local road
- Community refuses to accept maintenance responsibility (with the exception of the National Highway System)

### **Application of Trans-75**

While Trans-75 does consider the need for snow storage, disproportionate project costs, and areas of low potential use, it places a strong emphasis on the need for roadways to serve all users. Trans-75 is applicable to all state and federally owned and operated roadways. State bicycle and pedestrian coordinators for each region are available as resources for the planning, design, and construction process.

### **Implementing Complete Streets in Door County**

A full integration of bicycling and walking into the transportation system includes design considerations of roadways, but also design considerations of land use and access. Aspects of the built environment that impact cyclists and pedestrians include connectivity, block length, and mixed use. One strategy that Door County can choose to implement is the development of a street design guide planning process that focuses on project context. For example, the process used in Charlotte, NC includes the following steps:

1. Define the existing and future land use and urban design context
2. Define the existing and future transportation context
3. Identify deficiencies

4. Describe future objectives
5. Recommend street classifications and initial cross-section
6. Describe trade-offs and select cross section



## Appendix C: High to Low Speed Transition Areas

This appendix discusses the concept of transitioning drivers from high-to-low speeds for enhancing pedestrian and bicyclist safety and comfort in the developed areas and small communities of Door County. The discussion presents the goals of speed transitions, and offers a toolkit of design solutions to help the County select and apply those tools in their communities.

### Goals of Speed Transition in Rural Areas

Door County has jurisdiction over a variety of roadways with a wide range of form and function. The majority of County roads are designed for long-distance travel between communities with an emphasis on safe mobility for users.

Over time, development in Door County has grown around these mobility-focused highways or major roads. As a result, the "main street" of these small communities is a part of county highway network. Within these developed areas, the road needs to accommodate local circulation and access in addition to high volumes of through traffic. These competing needs present a potential safety problem for residents, drivers, and visitors.

High-to-low speed transition tools exist to help roadway users adjust their travel speed and attention in advance of a developed area. Slower travel speeds are typically more appropriate within the small communities where pedestrian and bicycle activity is expected. These tools have been applied and evaluated extensively in the United States in urban areas, particularly on low-speed local streets, although their application is still relatively new to many areas of Wisconsin. Rural roads serve higher-volume, higher speed traffic, and guidelines on appropriate tools is an emerging area of research and practice. Much of the content in this appendix is guided by the 2009 FHWA publication *Traffic Calming on Main Roads Through Rural Communities*, and the 2011 NCHRP Synthesis 412 *Speed Reduction Techniques for Rural High-to-Low Speed Transitions*.

High speed travel creates conditions incompatible with the demands of communities and developed areas. As speeds increase, a driver's area of focus is significantly decreased, resulting in a smaller area of awareness and reduced ability to react to the surrounding environment.

Increased speeds are also directly tied to the likelihood of a fatality in a collision with a pedestrian. A pedestrian struck at 50 mph has an 85% likelihood of death; at 30 mph that risk is reduced to 45%, and at 20 mph the risk drops to only 15%.

### High-to-Low Speed Transition Tools

Because the selection of speed transition techniques should be sensitive to the street and community context, this appendix does not recommend specific tools or identify particular locations. Instead the toolkit presents techniques and tools, and discusses the general considerations for appropriate implementation in Door County.

Table C-1 describes the expected speed, volume, and maintenance impacts of various tools, as determined by use in other communities. Tools are also classified as appropriate for use in one or more of the transition areas illustrated in Figure C-1: the approach zone, the transition zone, at the entrance, or the developed area within the community.

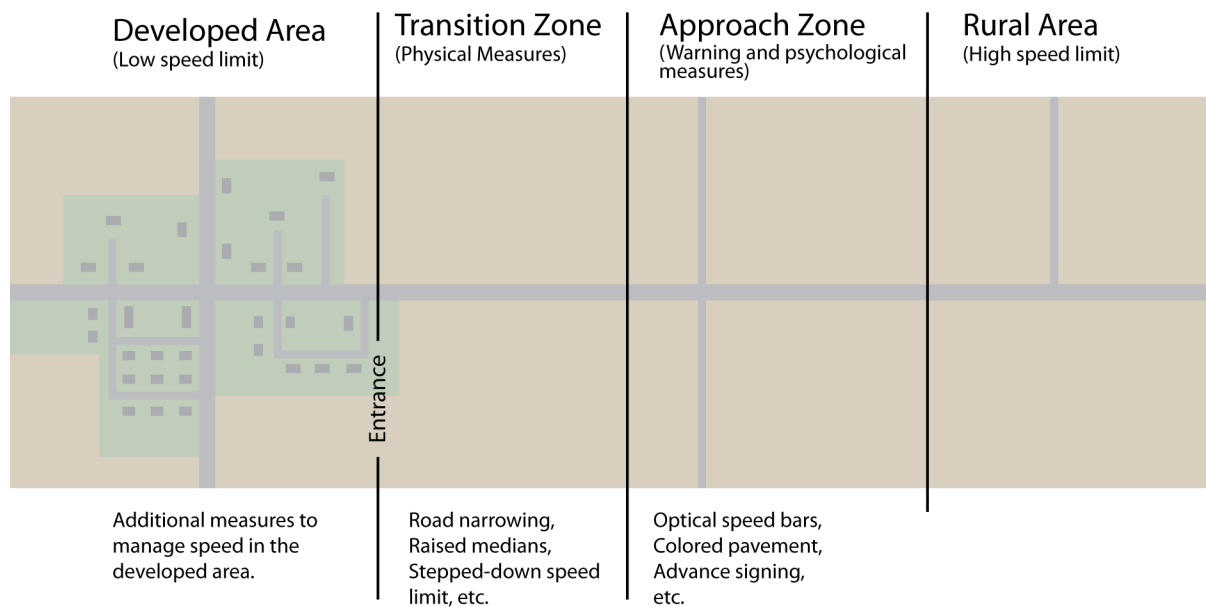



Figure C-1. Transition area concepts

Table C-1. High-to-Low Speed Transition Tools <sup>8</sup>					
Photo	Treatment	Change in Speed , Volume	Maintenance	Application	Appropriate for Door County
Low cost measures – under \$2,500					
	Standard signage (information, regulatory, warning)	Varies, minimal	Minimal	Everywhere	Yes




<sup>8</sup> Speed impact results compiled from FHWA. *Traffic Calming on Main Roads Through Rural Communities*. 2009.; TRB. NCHRP Synthesis 412 *Speed Reduction Techniques for Rural High-to-Low Speed Transitions*. 2011.

APPENDIX C: HIGH TO LOW SPEED TRANSITION AREAS

Table C-1. High-to-Low Speed Transition Tools <sup>8</sup>					
Photo	Treatment	Change in Speed , Volume	Maintenance	Application	Appropriate for Door County
	Pavement markings - Lane narrowing using painted center island and edge marking	-3 to +4	Regular painting	Transition Zone or within community	In village areas
	Pavement markings - "Slow" pavement legend	-2 to 3	Regular painting	Within community	At entrance or within community
	Optical Speed Bars <sup>1</sup>	-9.5 to 0	Regular painting	Approach Zone	
	Pavement markings - "35 mph" pavement legend w/ red background <sup>9</sup>	-9 to 0	Accelerated painting cycle	Approach Zone or within community	As needed



<sup>9</sup> Experimental approval required per Section 1A.10 of MUTCD

**Table C-1. High-to-Low Speed Transition Tools<sup>8</sup>**

Photo	Treatment	Change in Speed , Volume	Maintenance	Application	Appropriate for Door County
<b>Medium cost measures - \$2,500 to \$5,000</b>					
	Parabolic Speed Hump/Table <sup>10</sup>	-5 to -4	Regular painting	Within community, or downstream end of a Transition Zone.	Within village, near schools, parks, or in residential areas
<b>Higher cost measures - \$5,000 to \$12,000</b>					
	Electronic speed feedback sign <sup>11</sup>	-4 to -6 (Change only present while sign is in place)	Troubleshooting electronics	Transition Zone, Entrance, or within community	Within village, near schools, parks, or in residential areas
	Gateways	Varies, minimal impact on volume	Gateway features can be struck, causing injury and requiring repairs to gateway	Entrance to a village or residential area	Strong potential

<sup>10</sup> Only appropriate when the posted speed limit is 30 mph or less, and approach speeds are less than 40 mph.

<sup>11</sup> Most effective in temporary installations. Long term effects of permanent installation are unclear.

Table C-1. High-to-Low Speed Transition Tools <sup>8</sup>					
Photo	Treatment	Change in Speed , Volume	Maintenance	Application	Appropriate for Door County
	Road narrowing (chicanes, central islands, curb bulb outs, reduced pavement width)	Up to -9, significant reduction in collisions	Dependent upon design elements	Transition Zone, Entrance, or within community	Strong potential
	Access restrictions (gated roads, physical closures)	High impact on volume, varying impact on speed	Prone to vandalism	Within a community to manage access to a neighborhood or special area such as a park	Minimal

### Key Implementation Considerations

Consider appropriate approach zone and transition zone distances in advance of the developed areas. Drivers need adequate distance to slow down to community-compatible speeds. Speed limit signs should not abruptly jump from highway speed to town speed, but should be reduced gradually, potentially in combination with other speed transition tools. Consider the use of speed reduction warning signs to alert users of upcoming changes. Do not transition too early however, or drivers may not recognize the need to slow down. Upon leaving the developed area, speed limits and design details should gradually transition back to highway conditions.

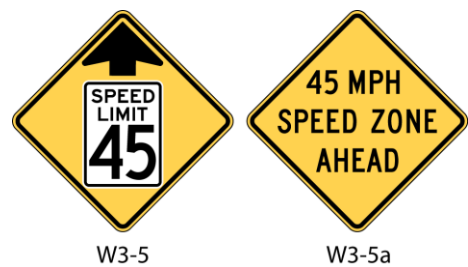


Figure 2. Speed reduction warning signs (MUTCD 2009)

Speed limit lowering alone is often not enough to influence driver behavior, and is not an adequate technique to address perceived speeding problems. Incorrectly set speed limits may lead to disregard of posted speeds and animosity toward law enforcement. Consider the use of the USLIMITS<sup>12</sup> online tool for setting appropriate speed limits in rural communities.

Horizontal deflection measures, such as neighborhood traffic circles, median islands, or curb extensions, are effective at speed reduction and may be necessary to achieve the speed environment that rural communities often desire.

---

<sup>12</sup> <http://safety.fhwa.dot.gov/USLIMITS/>

## Appendix D: US Bicycle Routes System Brief

### Background

- In 2008 the American Association of State Highway and Transportation Officials (AASHTO) established a [national corridor plan](#) for U.S. Bicycle Routes to facilitate travel between the states over routes which have been identified as being suitable for cycling.
- USBR routes usually use roads and streets suitable for bicycle travelers with separated trails incorporated where appropriate. Facility construction/upgrade is not required but is encouraged over time as roads are maintained and upgraded.
- State DOTs determine road suitability and submit [AASHTO applications](#) for USBR designation.
- State DOTs confirm that all relevant local jurisdictions support the proposed route. Documentation might be letters, resolutions of support, or memorandums. It is optional but this documentation may be submitted with the application.
- A well-defined process has been developed for [route implementation](#) and can be reviewed via a web-based training.
- [AASHTO Purpose and Policy Statement on U.S. Bicycle Routes](#) (revised 5-15-09) list the specific requirements for DOTs.
- Extensive reference information is available at [www.adventurecycling.org/usbrs](http://www.adventurecycling.org/usbrs).
- [Environmental, economic, health, and transportation benefits](#) are well-documented.

### Route Implementation Process

- There are three phases of Implementation: Planning, Designation, and Promotion.
- There are three methods for implementation: 1) State DOTs manage process from start to finish; 2) State DOTs partner with a non-profit or a volunteer or hire a paid consultant or 3) A committee or group works with the DOT to implement the route.
- State DOT and/or non-profit partners identify a corridor for development.
- At least two states must agree on the corridor/cross-over point unless the route connects two existing routes within a state or to Canada or Mexico.
- A specific route (turn by turn listing of roads, streets, and trails) is defined.
- Each local jurisdiction (road or trail “owner”) is contacted to provide feedback on the DRAFT route. The proposed route is modified as required to obtain local jurisdiction support. Experience shows that volunteers are efficient and effective at obtaining that support.
- The state DOT prepares Application to the [AASHTO Special Committee on US Route Numbering \(USRN\)](#) which includes a map and turn by turn route list.

- AASHTO USRN committee reviews applications during AASHTO's spring and annual meetings (May and October) for completeness (documentation) but does not rule on the specific route choices of roads, streets, or trails.
- Routes can be changed/adjusted or deleted through the same AASHTO application process.
- There is an [existing USBR sign](#) (M1-9 in the Manual of Uniform Traffic Control Devices (MUTCD)) and a new (green/white) sign that has received interim approval.

## Economic Drivers

- Numerous studies show significant [economic impact and community benefits](#) from bicycle tourism
- Bicycling economic impact in [Wisconsin](#) approaches \$1 billion per year.
- Typical bicycle travelers spend [approximately \\$100 per day](#) on multi-day tours.
- Return on investment is high for bicycling facilities. [North Carolina Outer Banks study](#) demonstrated \$6.9 million investment = annual \$60 million return in tourism generated income.
- Proximity to bicycle facilities means [higher real estate values](#), faster home sales, and more desirable neighborhoods.
- Bicycling infrastructure projects create more jobs than road-only projects. See [PERI study](#).
- US Bicycle Routes utilize existing roads, streets, and trails and are very low cost to implement and maintain.

## Health & Environmental Drivers

- Bicycling has [health benefits](#), reducing heart disease, diabetes, osteoporosis, depression, obesity, arthritis, and more.
- The physical environment matters, see "[Increasing Physical Activity Through Community Design: A Guide for Public Health Practitioners](#)"
- Designating and promoting bicycle routes and trails improves safety and promotes physical activity as an element of daily life.
- Designation of bicycle routes [increases mode share and bicycle safety](#).
- Active transportation saves money in the long-term by reducing public health expenditures.
- More people bicycling means [reduced air pollution and less motorized congestion](#).
- Increased bicycling decreases energy consumption and pollution.
- Bicyclist tourism has low impact on public spaces and low cost to implement.
- [Cyclists engage](#) and appreciate the communities and natural environments they encounter.



## Concerns

- Liability issues vary from state to state but generally states do not incur added liability from designating U.S. Bicycle Routes. (See [Transportation Research Board report from April, 2010](#))
- The limited liability of governments for bicycle routes is documented in a study “[Liability Aspects of Bikeway Designation](#)” (also available at: [scholarsbank.uoregon.edu/xmlui/handle/1794/10426](http://scholarsbank.uoregon.edu/xmlui/handle/1794/10426)).
- Some local jurisdictions are concerned about increased bicycle traffic. An increase of 2000 bicycle travelers per year would have significant economic impact on a local community on a USBR but is only 10 additional cyclists per day
- The target audience for USBRs is long distance bicycle travelers who are experienced road users with experience handling traffic density and speed. In some cases, routes may be chosen that encourage less experienced bicycle travelers. In this case, off-road facilities would be appropriate.
- There is no cost obligation for implementing a USBR other than staff time and promotion (maps).
- Signs not required, but are encouraged. Signs can be funded through the DOT, private-public partnerships, local jurisdictions or other methods. USBR sign placement and USBR markings are subject to the guidance in the MUTCD.
- There are a number of ways a U.S. Bicycle Route can be promoted including maps (paper or electronic), signs, pavement markings, downloadable GPS coordinates, noting routes on existing state and local maps.
- The roads, streets, and trails chosen for a USBR can be adapted easily through the AASHTO Application. Route changes are proposed to AASHTO twice per year, spring and annual meetings (May and October). There is no reason why there would be resistance to any reasonable change request.
- The [choice of roads/trails](#) for a USBR is a trade-off between low-traffic, direct routing, access to services (bike shops, motels, campgrounds), access to points of interest, and scenic roads. The best route for a family weekend bike ride may not be the best route for someone on a multi-day long distance bicycle trip.

*This Page Intentionally Left Blank*

## Appendix E: Demand and Benefits Model

The Demand Benefits model determines the number of walking or bicycling trips that occur in a day. This model uses Census and other national studies to extrapolate the number of bicycling or walking trips taken by populations that traditionally have a higher bicycle/walking mode split than work commuters (such as elementary school and college students). National transportation surveys have also shown that commute trips are only a fraction of the total trips an individual takes on a given day (National Household Travel Survey [NHTS], 2009). The model uses the NHTS findings to estimate the number of non-work, non-school trips taken by commuters and provide an estimate of additional utilitarian trips (e.g., trips that are not made for exercise or other types of recreation).

The benefits portion of this analysis tool uses 2009 NHTS trip length data to estimate the miles of travel per trip that are replaced by walking and bicycling. The model uses data from the EPA and other respected sources to quantify the air quality and other benefits of reduced vehicle miles traveled (VMT). This appendix identifies the assumptions made in the model and the resulting estimate of the number of current and future bicycling trips in Door County.

### Data Used in the Model

Journey-to-work information collected by the U.S. Census Bureau's *American Communities Survey* (ACS) from the 2010 five-year estimate is the foundation of this analysis. Model variables from the ACS include:

- Total population (27,807 people)
- Employed population (13,424 people)
- School enrollment (3,230 students grade K-12; 882 college students)
- Travel-to-work mode split (see Table 1).

The 2009 NHTS provides a substantial national dataset of travel characteristics, particularly for bicycling and walking trips. Data used from this survey include:

- Student mode split, grades K-12
- Ratio of walking and bicycling work trips to non-work, non-social/recreational trips
- Ratio of work trips to social and recreational trips
- Average trip length by trip purpose and mode

Table 1: Commute Mode Share Data Sources and Assumptions

	Bicycling	Walking	Source
Employed	0.4%	4.7%	2010 ACS
K-12	0.67%	10.57%	NHTS 2009
College	0.4%	4.7%	Assumed same as 2010 ACS "Employed"

Several of these variables provide an indirect method of estimating the number of walking and bicycling trips made for non-work reasons, such as shopping and running errands. NHTS data indicate that for every bicycle work trip, there are slightly more than two utilitarian bicycle trips made. Although these trips cannot be directly attached to a certain group of people (not all utilitarian bicycling trips are made by people who bicycle to work), these multipliers allow a high percentage of the community's walking and bicycling activity to be captured in an annual estimate. The *Safe Routes to School Baseline Data Report* (2010) was used to determine the average distances of school-related walking and bicycling trips.

## Disclaimer

As with any modeling projection, the accuracy of the result is dependent on the accuracy of the input data and other assumptions. Effort was made to collect the best data possible for input to the model, but in many cases the use of national data was required where local data were unavailable. Examples of information that could improve the accuracy of this exercise include detailed results of local Safe Routes to Schools parent and student surveys, a regional household travel survey, and a travel survey of college students.

## Existing Walking and Bicycling Trips

Table 2 shows the results of the model, which estimates that 337 bicycle and 6,755 walking trips occur in Door County each day for transportation purposes. The majority are non-work utilitarian trips, which include medical/dental services, shopping/errands, family or personal business, obligations, meals, and other trips.

Table 2. Model Estimate of Current Walking and Bicycling Trips

	Bicycling	Walking	Source
<b>Work Commute Trips</b>			
Work commuters	54	631	Employed population multiplied by mode split Number of commuters multiplied by two for return trips
Weekday trips	107	1,262	
<b>K-12 School Trips</b>			
K-12 commuters	22	341	School children population multiplied by mode split
Weekday trips	43	683	Numbers multiplied by two for return trips
<b>College Commute Trips</b>			
College commuters	4	41	College population multiplied by mode split
Weekday trips	7	83	College bicyclists multiplied by two for return trips
<b>Utilitarian Trips</b>			
Daily trips (weekday average)	179	4,727	Adult trips (sum of work and college) multiplied by ratio of utilitarian to work trips (NHTS).
<b>Total Current Daily Trips</b>	<b>337</b>	<b>6,755</b>	

Trips made for social or recreational purposes are not included in this model since its underlying goal is estimating the transportation benefits of bicycling and walking for non-discretionary trips (e.g., trips to work, the grocery store and medical appointments). However, it is worth noting that NHTS data show that there are approximately 6.5 social and recreational bicycle trips made for every bicycle commute trip. This means that there are approximately 700 bicycle trips being made in Door County every day for purely social and recreational purposes. NHTS data estimate that 5.9 social and recreational walking trips are made for every walking commute trip, which equals an estimated 7,445 pedestrian trips.

## Current Trip Replacement and Reduction in Vehicle Miles Traveled

To estimate the total distance that Door County residents travel to work or school by walking and bicycling, the model isolates different walking and bicycling user groups and applies trip distance information by mode based on the 2009 NHTS. The model values shown in Table 3 estimate that in Door County about 2.3 million bicycling and walking trips each year replace approximately 1.9 million vehicle trips and about 1.4 million vehicle-miles traveled.

Table 3. Current Walking and Bicycling Trip Replacement

	Bicycling	Walking	Source
<b>Commute Trips</b>			
Weekday trips reduced	84	1,029	Trips multiplied by the drive-alone trip percentage to determine auto trips replaced by bicycle trips
Weekday miles reduced	297	689	Number of vehicle trips reduced multiplied by average bicycle/walking work trip length (NHTS 2009)
<b>School Trips</b>			
Weekday trips reduced	26	454	Trips multiplied by drive alone trip percentage to determine auto trips replaced by bicycle/walking trips
Weekday miles reduced	26	209	Number of vehicle trips reduced multiplied by average trip length to/from school (SRTS 2010)
<b>College Trips</b>			
Weekday trips reduced	6	68	Trips multiplied by drive alone trip percentage to determine auto trips replaced by bicycle/walking trips
Weekday miles reduced	8	38	Number of vehicle trips reduced multiplied by average school/daycare/religious trip length (NHTS 2009) for bicycling/walking modes
<b>Utilitarian Trips</b>			
Daily trips reduced (includes Sat/Sun)	140	3,854	Trips multiplied by drive alone trip percentage to determine auto trips replaced by bicycle/walking trips
Daily miles reduced (includes Sat/Sun)	265	2,569	Number of vehicle trips reduced multiplied by average utilitarian trip length (NHTS 2009) for bicycling/walking modes
<b>Yearly Results</b>			
Yearly trips by mode	103,370	2,205,652	2,309,022
Yearly vehicle trips replaced by mode	79,094	1,778,125	1,857,219
Yearly vehicle miles replaced by mode	180,748	1,166,707	1,347,455

## Current Benefits

To the extent that bicycling and walking trips replace single-occupancy vehicle trips, they reduce emissions and have tangible economic impacts by reducing traffic congestion, crashes, and maintenance costs. In addition, the reduced need to own and operate a vehicle saves families money. These benefits are shown in Table 4.

Table 4. Annual Benefits of Current Bicycling and Walking Trips in Door County

	Bicycling	Walking	Source
Yearly vehicle miles reduced	1,164,864	1,982,602	
<b>Air Quality Benefits</b>			
Reduced Hydrocarbons (pounds/year)	3,493	5,944	EPA, 2005 <sup>13</sup>
Reduced Particulate Matter (pounds/year)	26	44	EPA, 2005
Reduced Nitrous Oxides (pounds/year)	2,440	4,152	EPA, 2005
Reduced Carbon Monoxide (pounds/year)	31,844	54,199	EPA, 2005
Reduced Carbon Dioxide (pounds/year)	947,624	1,612,858	EPA, 2005
<b>Economic Benefits of Air Quality</b>			
Particulate Matter	\$2,179	\$3,708	NHTSA, 2011 <sup>14</sup>
Nitrous Oxides	\$4,879	\$8,305	NHTSA, 2011
Carbon Dioxide	\$16,247	\$27,653	U.S. Government
<b>Reduced External Costs of Vehicle Travel</b>			
Traffic Congestion	\$51,254	\$87,234	AAA, 2008 <sup>15</sup>
Vehicle Crashes	\$267,919	\$455,998	AAA, 2008
Roadway Maintenance Costs	\$163,081	\$277,564	Kitamura, R., Zhao, H., and Gubby, A. R., 1989 <sup>16</sup>
<b>Household Transportation Savings</b>			
Reduction in HH transportation spending	\$640,675	\$1,090,431	IRS operational standard mileage rates for 2010 <sup>17</sup>
<b>Total</b>	<b>\$1,146,234</b>	<b>\$1,950,894</b>	

<sup>13</sup> From EPA report 420-F-05-022 "Emission Facts: Average Annual Emissions and Fuel Consumption for Gasoline-Fueled Passenger Cars and Light Trucks." 2005.

<sup>14</sup> NHTSA Corporate Average Fuel Economy for MY 2011 Passenger Cars and Light Trucks, Table VIII-5 (<http://www.nhtsa.dot.gov/portal/site/nhtsa/menuitem.d0b5a45b55bfbe582f57529cdba046a0/>).

<sup>15</sup> Crashes vs. Congestion – What’s the Cost to Society?" <http://www.aaanewsroom.net/Assets/Files/20083591910.CrashesVsCongestionFullRe>

<sup>16</sup> Kitamura, R., Zhao, H., and Gubby, A. R. (1989). *Development of a Pavement Maintenance Cost Allocation Model*. Institute of Transportation Studies – University of California, Davis ([http://pubs.its.ucdavis.edu/publication\\_detail.php?id=19](http://pubs.its.ucdavis.edu/publication_detail.php?id=19)). \$0.08/mile (1989), adjusted to 2010 dollars using the Bureau of Labor Statistics Inflation Calculator ([http://www.bls.gov/data/inflation\\_calculator.htm](http://www.bls.gov/data/inflation_calculator.htm)).

<sup>17</sup> <http://www.irs.gov/newsroom/article/0,,id=216048,00.html>

## Future Walking and Bicycling Trips

Estimating future benefits requires additional assumptions regarding Door County future population and anticipated commuting patterns in 2025, the timeframe for this planning effort. Future population predictions determined in the Door County Comprehensive Plan 2030 were used in this model. Table 5 shows the demographics used in the future analysis.

*Table 5. Future (2025) Demographics*

	Number	Percent of 2025 Population	Source
Population	36,108	100.0%	Door County Comprehensive Plan 2030.
Employed population	23,506	65.1%	Assumes same percentage of population is employed
School population, K-12	4,306	11.9%	Assumes same percent as from ACS 2010 estimate
College student population	1,176	3.3%	Assumes same as 2010 ACS estimate

## Future Walking and Bicycling Trips

Table 6 shows projected 2025 bicycling and walking trips for two assumed bicycle mode share scenarios. The first scenario assumes a 1% bicycle mode share and the second assumes a 1.5% mode share. For simplicity, these mode shares were assumed to apply for all trip types (commuting, utilitarian, school, etc.). Walking mode share was assumed to remain constant based on an assessment of existing conditions, opportunities and constraints.

Table 6. Future (2025) Bicycling and Walking Trips

	Bicycling		Walking	Source
	1% Share	1.5% Share		
<b>Commute Trips</b>				
Work commuters	235	353	1,105	Employed population multiplied by mode split
Weekday trips	470	705	2,210	Number of commuters multiplied by two for return trips
<b>School Trips</b>				
K-12 commuters	65	65	455	School children population multiplied by mode split
Weekday trips	129	129	910	Numbers multiplied by two for return trips
<b>College Trips</b>				
College commuters	12	18	55	College population multiplied by mode split
Weekday trips	24	35	111	College bicyclists multiplied by two for return trips
<b>Utilitarian Trips</b>				
Daily trips	773	1,160	8,156	Adult trips (sum of work and college) multiplied by ratio of utilitarian to work trips (NHTS).
<b>Total Future Weekday Trips</b>	<b>1,396</b>	<b>2,029</b>	<b>11,386</b>	

The important factor to consider with these future assumptions is not the accuracy of the mode share percentages, but the benefits that would accrue to Door County if those numbers are reached. As more jurisdictions across the country track changes in bikeway mileage over time and participate in annual bicycle counts, more data will be available to better understand and refine future mode share predictive measures.

### Future Vehicle Trip Replacement

The same trip replacement factors used for the existing analysis were applied to the numbers in Table 6 in order to generate estimates of bicycling and walking trip replacement for the 2025 scenario. Table 7 shows that a 1% bicycle mode share scenario would result in about 4.1 million walking and bicycling trips, which will reduce vehicle trips by about 3.3 million and vehicle-miles traveled by about 2.7 million. A 1.5% bicycle mode share would result in an estimated 4.3 million annual walking and bicycling trips, along with reductions of 3.5 million vehicle trips and more than million 3.2 vehicle-miles traveled.

### Future Benefits

Table 8 shows the air quality and economic benefits of the future projected walking and bicycling trips in Door County. For the 1% bicycle mode share assumption, annual household transportation savings are estimated to accrue at \$427,602. A 1.5% bicycle mode share would result in an estimated savings of \$641,390.



Table 7. Future (2025) Walking and Bicycling Trip Replacement

	Bicycling		Walking	Source
	1% Share	1.5% Share		
<b>Commute Trips</b>				
Weekday trips reduced	369	556	1,802	Trips multiplied by the drive-alone trip percentage to determine auto trips replaced by bicycle and walking trips
Weekday miles reduced	1,306	1,969	1,207	Number of vehicle trips reduced multiplied by average bicycle/walking work trip length (NHTS 2009)
<b>School Trips</b>				
Weekday trips reduced	78	78	605	Trips multiplied by drive alone trip percentage to determine auto trips replaced by bicycle/walking trips
Weekday miles reduced	60	60	215	Number of vehicle trips reduced multiplied by average trip length to/from school (SRTS 2010)
<b>College Trips</b>				
Weekday trips reduced	18	28	90	Trips multiplied by drive alone trip percentage to determine auto trips replaced by bicycle/walking trips
Weekday miles reduced	27	41	50	Number of vehicle trips reduced multiplied by average school/daycare/religious trip length (NHTS 2009) for bicycling/walking modes
<b>Utilitarian Trips</b>				
Daily trips reduced (includes Sat/Sun)	607	915	6,650	Trips multiplied by drive alone trip percentage to determine auto trips replaced by bicycle/walking trips
Daily miles reduced (includes Sat/Sun)	1,149	1,732	4,433	Number of vehicle trips reduced multiplied by average utilitarian trip length (NHTS 2009) for bicycling/walking modes
<b>Yearly Results</b>				
Yearly trips by mode	434,928	639,753	3,755,116	
Yearly vehicle trips replaced by mode	336,757	499,962	3,034,707	
Yearly vehicle miles replaced by mode	777,458	1,166,163	1,985,962	

Table 8. Benefits of Future Bicycling and Walking Trips in Door County

	Bicycling		Walking	Source
	1% Share	1.5% Share		
Yearly vehicle miles reduced	777,458	1,166,163	1,985,962	
<b>Air Quality Benefits</b>				
Reduced Hydrocarbons (pounds/year)	2,331	3,496	5,954	EPA, 2005 <sup>18</sup>
Reduced Particulate Matter (pounds/year)	17	26	44	EPA, 2005
Reduced Nitrous Oxides (pounds/year)	1,628	2,442	4,159	EPA, 2005
Reduced Carbon Monoxide (pounds/year)	21,254	31,880	54,291	EPA, 2005
Reduced Carbon Dioxide (pounds/year)	632,466	948,681	1,615,591	EPA, 2005
<b>Economic Benefits of Air Quality</b>				
Particulate Matter	\$1,454	\$2,181	\$3,715	NHTSA, 2011 <sup>19</sup>
Nitrous Oxides	\$3,257	\$4,885	\$8,319	NHTSA, 2011
Carbon Dioxide	\$10,844	\$16,265	\$27,700	U.S. Government
<b>Reduced External Costs of Vehicle Travel</b>				
Traffic Congestion	\$34,208	\$51,311	\$87,382	AAA, 2008 <sup>20</sup>
Vehicle Crashes	\$178,815	\$268,218	\$456,771	AAA, 2008
Roadway Maintenance Costs	\$108,844	\$163,263	\$278,035	Kitamura, R., Zhao, H., and Gubby, A. R., 1989 <sup>21</sup>
<b>Household Transportation Savings</b>				
Reduction in HH transportation spending	\$427,602	\$641,390	\$1,092,279	IRS operational standard mileage rates for 2010 <sup>22</sup>
<b>Total</b>	<b>\$765,024</b>	<b>\$1,147,513</b>	<b>\$1,954,200</b>	

<sup>18</sup> From EPA report 420-F-05-022 "Emission Facts: Average Annual Emissions and Fuel Consumption for Gasoline-Fueled Passenger Cars and Light Trucks." 2005.

<sup>19</sup> NHTSA Corporate Average Fuel Economy for MY 2011 Passenger Cars and Light Trucks, Table VIII-5 (<http://www.nhtsa.dot.gov/portal/site/nhtsa/menuitem.d0b5a45b55bfbe582f57529cdba046a0/>).

<sup>20</sup> Crashes vs. Congestion – What's the Cost to Society?" <http://www.aaanewsroom.net/Assets/Files/20083591910.CrashesVsCongestionFullRe>

<sup>21</sup> Kitamura, R., Zhao, H., and Gubby, A. R. (1989). *Development of a Pavement Maintenance Cost Allocation Model*. Institute of Transportation Studies – University of California, Davis ([http://pubs.its.ucdavis.edu/publication\\_detail.php?id=19](http://pubs.its.ucdavis.edu/publication_detail.php?id=19)). \$0.08/mile (1989), adjusted to 2010 dollars using the Bureau of Labor Statistics Inflation Calculator ([http://www.bls.gov/data/inflation\\_calculator.htm](http://www.bls.gov/data/inflation_calculator.htm)).

<sup>22</sup> <http://www.irs.gov/newsroom/article/0,,id=216048,00.html>

## Appendix F: Bicycle and Pedestrian Design Guidelines

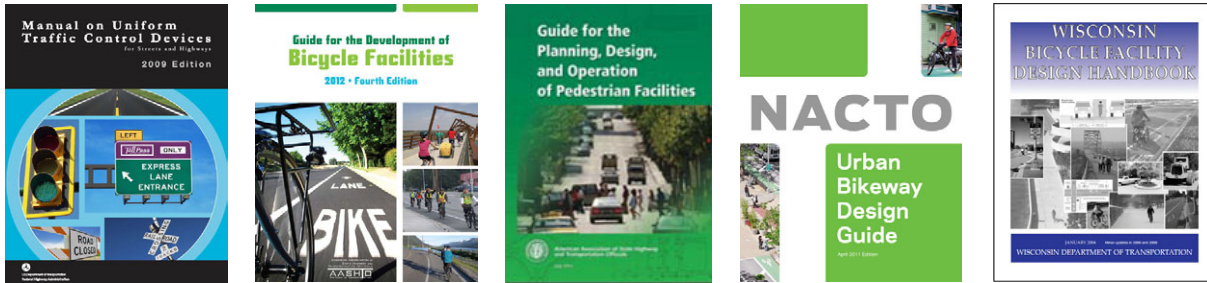
This appendix is intended to assist Door County in the selection and design of bicycle and pedestrian facilities, pulling together best practices by facility type from public agencies and municipalities nationwide. Within this appendix, facilities/treatments are covered within a single sheet tabular format relaying important design information and discussion, example photos, schematics (if applicable), and existing summary guidance from current draft standards. Existing standards are referenced throughout and should be the first source of information when seeking to implement any of the treatments featured here.

### Guiding Principles

The following are guiding principles for these bicycle and pedestrian design guidelines:

- **The walking and bicycling environment should be safe.** All bicycling and walking routes should be physically safe and perceived as safe by all users. Safe means minimal conflicts with external factors, such as noise, vehicular traffic and protruding architectural elements. Safe also means routes are clear and well marked with appropriate pavement markings and directional signage.
- **The pedestrian and bicycle network should be accessible.** Sidewalks, shared-use paths, bike routes and crosswalks should permit the mobility of residents of all ages and abilities. The pedestrian and bicycle network should employ principles of universal design. Bicyclists have a range of skill levels, and facilities should be designed with a goal of providing for inexperienced/recreational bicyclists (especially children and seniors) to the greatest extent possible.
- **Pedestrian and bicycle network improvements should be economical.** Pedestrian and bicycle improvements should achieve the maximum benefit for their cost, including initial cost and maintenance cost, as well as a reduced reliance on more expensive modes of transportation. Where possible, improvements in the right-of-way should stimulate, reinforce and connect with adjacent private improvements.
- **The pedestrian and bicycle network should connect to places people want to go.** The pedestrian and bicycle network should provide continuous direct routes and convenient connections between destinations such as homes, schools, shopping areas, public services, recreational opportunities and transit. A complete network of on-street bicycling facilities should connect seamlessly to existing and proposed shared-use paths to complete recreational and commuting routes.
- **The walking and bicycling environment should be clear and easy to use.** Sidewalks, shared-use paths and crossings should allow all people to easily find a direct route to a destination with minimal delays, regardless of whether these persons have mobility, sensory, or cognitive disability impairments. All roads are legal for the use of pedestrians and bicyclists (except freeways, from which each is prohibited unless a separate facility on that right of way is provided). This means that most streets are bicycle facilities and should be designed, marked and maintained accordingly.
- **The walking and bicycling environment should be attractive and enhance community livability.** Good design should integrate with and support the development of complementary uses and should encourage preservation and construction of art, landscaping and other items that add value to communities. These components might include open spaces such as plazas, courtyards and squares, and amenities like street furniture, banners, art, plantings and special paving. These along with historical elements and cultural references, should promote a sense of place. Public activities should be encouraged and the municipal code should permit commercial activities such as dining, vending and advertising when they do not interfere with safety and accessibility.
- **Design guidelines are flexible and should be applied using professional judgment.** This document references specific national guidelines for bicycle and pedestrian facility design, as well as a number of design treatments not specifically covered under current guidelines. Statutory and regulatory guidance may change. For this reason, the guidance and recommendations in this document function to complement other resources considered during a design process, and in all cases sound engineering judgment should be used.

## National Standards and Guidelines



The Federal Highway Administration’s **Manual on Uniform Traffic Control Devices** (MUTCD) defines the standards used by road managers nationwide to install and maintain traffic control devices on all public streets, highways, bikeways, and private roads open to public traffic. The MUTCD is the primary source for guidance on lane striping requirements, signal warrants, and recommended signage and pavement markings.

Bikeway treatments not explicitly covered by the MUTCD are often subject to experiments, interpretations and official rulings by the FHWA. The **MUTCD Official Rulings** is a resource that allows website visitors to obtain information about these supplementary materials. Copies of various documents (such as incoming request letters, response letters from the FHWA, progress reports, and final reports) are available on this website.<sup>1</sup>

American Association of State Highway and Transportation Officials (AASHTO) **Guide for the Development of Bicycle Facilities**, updated in June 2012 provides guidance on dimensions, use, and layout of specific bicycle facilities. The standards and guidelines presented by AASHTO provide basic information, such as minimum sidewalk widths, bicycle lane dimensions, detailed striping requirements and recommended signage and pavement markings.

The National Association of City Transportation Officials’ (NACTO) 2012 **Urban Bikeway Design Guide**<sup>2</sup> is the newest publication of nationally recognized bikeway design standards, and offers guidance on the current state of the practice designs. The NACTO Urban Bikeway Design Guide is based on current practices in the best cycling cities in the world. The intent of the guide is to offer substantive guidance for cities seeking to improve bicycle transportation in places where competing demands for the use of the right of way present unique challenges. All of the NACTO Urban Bikeway Design Guide treatments are in use internationally and in many cities around the US.

Offering similar guidance for pedestrian design, the 2004 AASHTO **Guide for the Planning, Design and Operation of Pedestrian Facilities** provides comprehensive guidance on planning and designing for people on foot.

Meeting the requirements of the Americans with Disabilities Act (ADA) is an important part of any bicycle and pedestrian facility project. The United States Access Board’s proposed **Public Rights-of-Way Accessibility Guidelines**<sup>3</sup> (PROWAG) and the **2010 ADA Standards for Accessible Design**<sup>4</sup> (2010 Standards) contain standards and guidance for the construction of accessible facilities. This includes requirements for sidewalk curb ramps, slope requirements, and pedestrian railings along stairs.

Some of these treatments are not directly referenced in the current versions of the AASHTO Guide or the MUTCD, although many of the elements of these treatments are found within these documents. In all cases, engineering judgment is recommended to ensure that the application makes sense for the context of each treatment, given the many complexities of urban streets.

## Local Standards

The **Wisconsin Bicycle Facility Design Handbook** is the primary source for facility design guidance in the state of Wisconsin. It discusses the operating characteristics and needs of bicyclists, and presents the wide range of design options for enhancing a community’s bicycle transportation system. The guide covers basic roadway improvements for shared streets, details for on-street bicycle lanes, and the design of shared-use paths.

The **Trans 75** administrative rule aims to “ensure that bikeways and pedestrian ways are established in all new highway construction and reconstruction projects funded in whole or in part from state funds of federal funds.”

1 *MUTCD Official Rulings. FHWA. <http://mutcd.fhwa.dot.gov/orsearch.asp>*

2 *<http://nacto.org/cities-for-cycling/design-guide/>*

3 *<http://www.access-board.gov/prowag/>*

4 *[http://www.ada.gov/2010ADASTandards\\_index.htm](http://www.ada.gov/2010ADASTandards_index.htm)*

# Design Needs of Pedestrians

## Types of Pedestrians

Pedestrians have a variety of characteristics and the transportation network should accommodate a variety of needs, abilities, and possible impairments. Age is one major factor that affects pedestrians' physical characteristics, walking speed, and environmental perception. Children have low eye height and walk at slower speeds than adults. They also perceive the environment differently at various stages of their cognitive development. Older adults walk more slowly and may require assistive devices for walking stability, sight, and hearing. Table 3-1 summarizes common pedestrian characteristics for various age groups.

The MUTCD recommends a normal walking speed of three and a half feet per second when calculating the pedestrian clearance interval at traffic signals. The walking speed can drop to three feet per second for areas with older populations and persons with mobility impairments. While the type and degree of mobility impairment varies greatly across the population, the transportation system should accommodate these users to the greatest reasonable extent.

**Table 3-1 Pedestrian Characteristics by Age**

Age	Characteristics
<b>0-4</b>	Learning to walk Requires constant adult supervision Developing peripheral vision and depth perception
<b>5-8</b>	Increasing independence, but still requires supervision Poor depth perception
<b>9-13</b>	Susceptible to "dart out" intersection dash Poor judgment Sense of invulnerability
<b>14-18</b>	Improved awareness of traffic environment Poor judgment
<b>19-40</b>	Active, fully aware of traffic environment
<b>41-65</b>	Slowing of reflexes
<b>65+</b>	Difficulty crossing street Vision loss Difficulty hearing vehicles approaching from behind

Source: AASHTO Guide for the Planning, Design, and Operation of Pedestrian Facilities (July 2004), Exhibit 2-1.

# Sidewalks

Sidewalks are the most fundamental element of the walking network, as they provide an area for pedestrian travel that is separated from vehicle traffic. Sidewalks are typically constructed out of concrete and are separated from the roadway by a curb or gutter and sometimes a landscaped planting strip area. Sidewalks are a common application in both urban and suburban environments.

Attributes of well-designed sidewalks include the following:

**Accessibility:** A network of sidewalks should be accessible to all users.

**Adequate width:** Two people should be able to walk side-by-side and pass a third comfortably. Different walking speeds should be possible. In areas of intense pedestrian use, sidewalks should accommodate the high volume of walkers.

**Safety:** Design features of the sidewalk should allow pedestrians to have a sense of security and predictability. Sidewalk users should not feel they are at risk due to the presence of adjacent traffic.

**Continuity:** Walking routes should be obvious and should not require pedestrians to travel out of their way unnecessarily.

**Landscaping:** Plantings and street trees should contribute to the overall psychological and visual comfort of sidewalk users, and be designed in a manner that contributes to the safety of people.

**Drainage:** Sidewalks should be well graded to minimize standing water.

**Social space:** There should be places for standing, visiting, and sitting. The sidewalk area should be a place where adults and children can safely participate in public life.

**Quality of place:** Sidewalks should contribute to the character of neighborhoods and business districts.

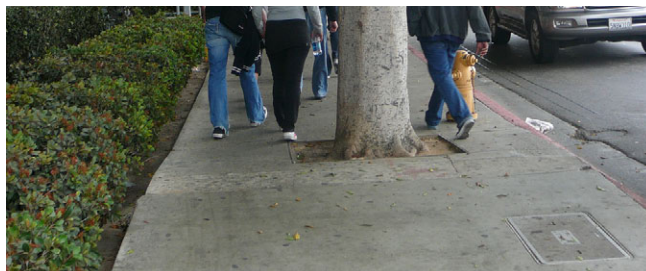
## Zones in the Sidewalk Corridor



## Sidewalk Widths



## Sidewalk Obstructions and Driveway Ramps



# Zones in the Sidewalk Corridor

## Description

Sidewalks are the most fundamental element of the walking network, as they provide an area for pedestrian travel separated from vehicle traffic. A variety of considerations are important in sidewalk design. Providing adequate and accessible facilities can lead to increased numbers of people walking, improved safety, and the creation of social space.



Parking Lane/Enhancement Zone	Furnishing Zone	Pedestrian Through Zone	Frontage Zone
<p>The parking lane can act as a flexible space to further buffer the sidewalk from moving traffic. Curb extensions and bike corrals may occupy this space where appropriate.</p> <p>In the <b>edge zone</b> there should be a 6 inch wide curb.</p>	<p>The furnishing zone buffers pedestrians from the adjacent roadway, and is also the area where elements such as street trees, signal poles, signs, and other street furniture are properly located.</p>	<p>The through zone is the area intended for pedestrian travel. This zone should be entirely free of permanent and temporary objects.</p> <p>Wide through zones are needed in downtown areas or where pedestrian flows are high.</p>	<p>The Frontage Zone allows pedestrians a comfortable “shy” distance from the building fronts. It provides opportunities for window shopping, to place signs, planters, or chairs.</p> <p>Not applicable if adjacent to a landscaped space.</p>

## Discussion

Sidewalks should be more than areas to travel; they should provide places for people to interact. There should be places for standing, visiting, and sitting. Sidewalks should contribute to the character of neighborhoods and business districts, strengthen their identity, and be an area where adults and children can safely participate in public life.

## Additional References and Guidelines

- USDOJ. (2010). ADA Standards for Accessible Design.
- United States Access Board. (2007). Public Rights-of-Way Accessibility Guidelines (PROWAG).
- AASHTO. (2004). Guide for the Planning, Design, and Operation of Pedestrian Facilities.

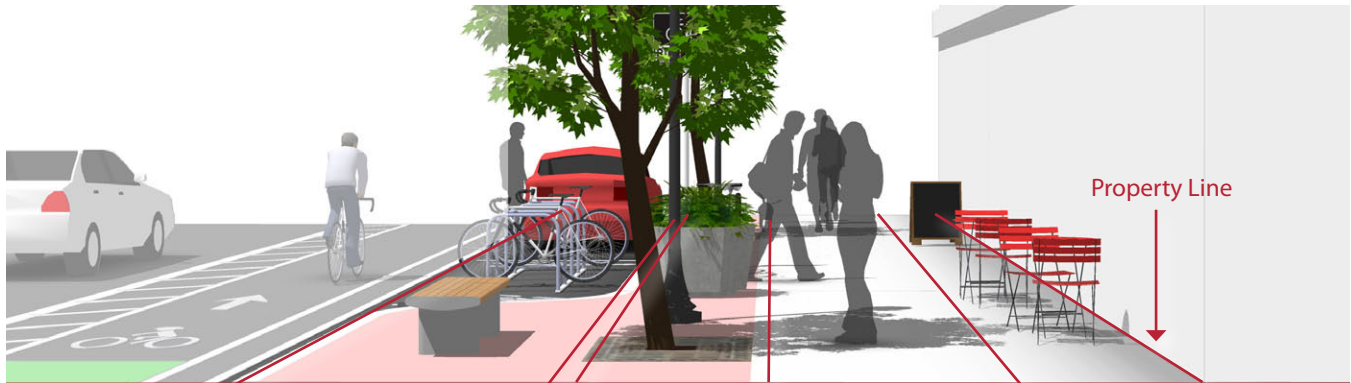
## Materials and Maintenance

Sidewalks are typically constructed out of concrete and are separated from the roadway by a curb or gutter and sometimes a landscaped space. Colored, patterned, or stamped concrete can add distinctive visual appeal.

# Sidewalk Widths

## Description

The width and design of sidewalks will vary depending on street context, functional classification, and pedestrian demand. Below are preferred widths of each sidewalk zone according to general street type. Standardizing sidewalk guidelines for different areas of the city, dependent on the above listed factors, ensures a minimum level of quality for all sidewalks.



Street Classification	Parking Lane/ Enhancement Zone	Furnishing Zone	Pedestrian Through Zone	Frontage Zone	Total
Local Streets	Varies	2 - 5 feet	4 - 6 feet	N/A	6 - 11 feet
Commercial Areas	Varies	4 - 6 feet	6 - 12 feet	2.5 - 10 feet	11 - 28 feet
Arterials and Collectors	Varies	2 - 6 feet	4 - 8 feet	2.5 - 5 feet	8 - 19 feet

↑  
Areas that have significant accumulations of snow during the winter may prefer a wider furnishing zone for snow storage.

↑  
Six feet enables two pedestrians (including wheelchair users) to walk side-by-side, or to pass each other comfortably

## Discussion

It is important to provide adequate width along a sidewalk corridor. Two people should be able to walk side-by-side and pass a third comfortably. In areas of high demand, sidewalks should contain adequate width to accommodate the high volumes and different walking speeds of pedestrians. The Americans with Disabilities Act requires a 4 foot clear width in the pedestrian zone plus 5 foot passing areas every 200 feet.

## Additional References and Guidelines

USDOJ. (2010). ADA Standards for Accessible Design.  
 United States Access Board. (2007). Public Rights-of-Way Accessibility Guidelines (PROWAG).  
 AASHTO. (2004). Guide for the Planning, Design, and Operation of Pedestrian Facilities.

## Materials and Maintenance

Sidewalks are typically constructed out of concrete and are separated from the roadway by a curb or gutter and sometimes a landscaped boulevard. Surfaces must be firm, stable, and slip resistant. Colored, patterned, or stamped concrete can add distinctive visual appeal.



# Sidewalk Obstructions and Driveway Ramps

## Description

Obstructions to pedestrian travel in the sidewalk corridor typically include driveway ramps, curb ramps, sign posts, utility and signal poles, mailboxes, fire hydrants and street furniture.

## Guidance

Reducing the number of accesses reduces the need for special provisions. This strategy should be pursued first.

Obstructions should be placed between the sidewalk and the roadway to create a buffer for increased pedestrian comfort.

Dipping the entire sidewalk at the driveway approaches keeps the cross-slope at a constant grade. This is the least-preferred driveway option.

Where constraints preclude a planter strip, wrapping the sidewalk around the driveway allows the sidewalk to still remain level.

When sidewalks abut hedges, fences, or buildings, an additional two feet of lateral clearance should be added to provide appropriate shy distance.



Planter strips allow sidewalks to remain level, with the driveway grade change occurring within the planter strip.

When sidewalks abut angled on-street parking, wheel stops should be used to prevent vehicles from overhanging in the sidewalk.

## Discussion

Driveways are a common sidewalk obstruction, especially for wheelchair users. When constraints only allow curb-tight sidewalks, dipping the entire sidewalk at the driveway approaches keeps the cross-slope at a constant grade. However, this may be uncomfortable for pedestrians and could create drainage problems behind the sidewalk.

## Additional References and Guidelines

USDOJ. (2010). ADA Standards for Accessible Design.  
 United States Access Board. (2007). Public Rights-of-Way Accessibility Guidelines (PROWAG).  
 AASHTO. (2004). Guide for the Planning, Design, and Operation of Pedestrian Facilities.

## Materials and Maintenance

Sidewalks are typically constructed out of concrete and are separated from the roadway by a curb or gutter and sometimes a landscaped space. Surfaces must be firm, stable, and slip resistant.

# Pedestrians at Intersections

Attributes of pedestrian-friendly intersection design include:

**Clear Space:** Corners should be clear of obstructions. They should also have enough room for curb ramps, for transit stops where appropriate, and for street conversations where pedestrians might congregate.

**Visibility:** It is critical that pedestrians on the corner have a good view of vehicle travel lanes and that motorists in the travel lanes can easily see waiting pedestrians.

**Legibility:** Symbols, markings, and signs used at corners should clearly indicate what actions the pedestrian should take.

**Accessibility:** All corner features, such as curb ramps, landings, call buttons, signs, symbols, markings, and textures, should meet accessibility standards and follow universal design principles.

**Separation from Traffic:** Corner design and construction should be effective in discouraging turning vehicles from driving over the pedestrian area. Crossing distances should be minimized.

**Lighting:** Adequate lighting is an important aspect of visibility, legibility, and accessibility.

These attributes will vary with context but should be considered in all design processes. For example, suburban and rural intersections may have limited or no signing. However, legibility regarding appropriate pedestrian movements should still be taken into account during design.

## Marked Crosswalks



## Median Refuge Islands



## ADA Compliant Curb Ramps



# Marked Crosswalks

## Description

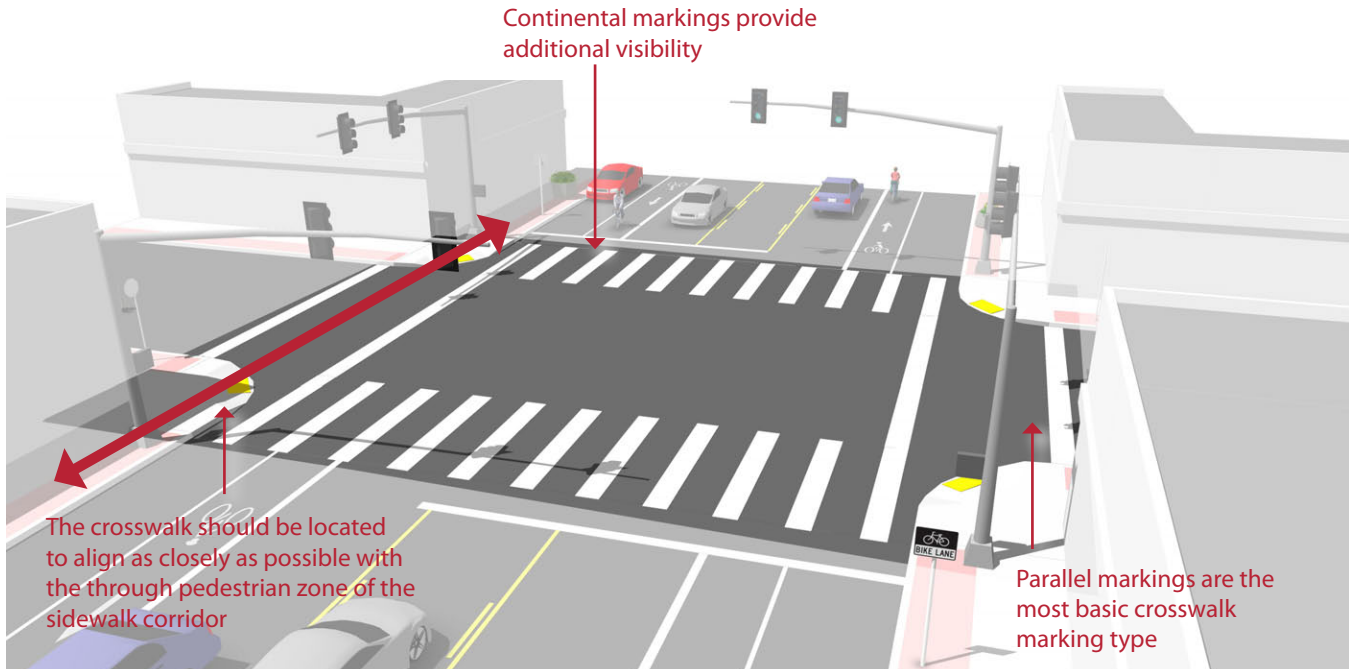
A marked crosswalk signals to motorists that they must stop for pedestrians and encourages pedestrians to cross at designated locations. Installing crosswalks alone will not necessarily make crossings safer especially on multi-lane roadways.

At mid-block locations, crosswalks can be marked where there is a demand for crossing and there are no nearby marked crosswalks.

## Guidance

At signalized intersections, all crosswalks should be marked. At un-signalized intersections, crosswalks may be marked under the following conditions:

- At a complex intersection, to orient pedestrians in finding their way across.
- At an offset intersection, to show pedestrians the shortest route across traffic with the least exposure to vehicular traffic and traffic conflicts.
- At an intersection with visibility constraints, to position pedestrians where they can best be seen by oncoming traffic.
- At an intersection within a school zone on a walking route.



## Discussion

Continental crosswalk markings should be used at crossings with high pedestrian use or where vulnerable pedestrians are expected, including: school crossings, across arterial streets for pedestrian-only signals, at mid-block crosswalks, and at intersections where there is expected high pedestrian use and the crossing is not controlled by signals or stop signs.

## Additional References and Guidelines

FHWA. (2009). Manual on Uniform Traffic Control Devices. (3B.18)  
 AASHTO. (2004). Guide for the Planning, Design, and Operation of Pedestrian Facilities.  
 FHWA. (2005). Safety Effects of Marked vs. Unmarked Crosswalks at Uncontrolled Locations.  
 FHWA. (2010). Crosswalk Marking Field Visibility Study.

## Materials and Maintenance

Because the effectiveness of marked crossings depends entirely on their visibility, maintaining marked crossings should be a high priority. Thermoplastic markings offer increased durability than conventional paint.

# Median Refuge Islands

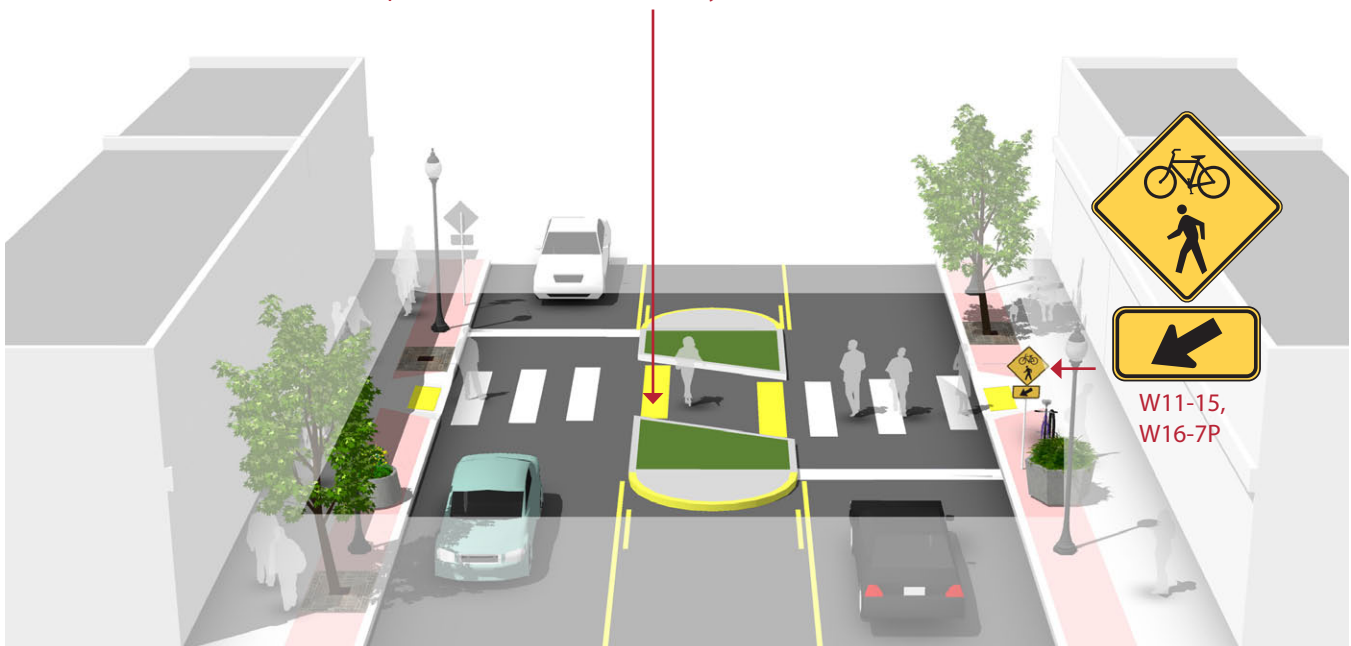
## Description

Median refuge islands are located at the mid-point of a marked crossing and help improve pedestrian safety by allowing pedestrians to cross one direction of traffic at a time. Refuge islands minimize pedestrian exposure by shortening crossing distance and increasing the number of available gaps for crossing.

## Guidance

- Can be applied on any roadway with a left turn center lane or median that is at least 6' wide.
- Appropriate at signalized or unsignalized crosswalks
- The refuge island must be accessible, preferably with an at-grade passage through the island rather than ramps and landings.
- The island should be at least 6' wide between travel lanes (to accommodate bikes with trailers and wheelchair users) and at least 20' long.
- On streets with speeds higher than 25 mph there should also be double centerline marking, reflectors, and "KEEP RIGHT" signage.

Cut through median islands are preferred over curb ramps, to better accommodate bicyclists.



## Discussion

If a refuge island is landscaped, the landscaping should not compromise the visibility of pedestrians crossing in the crosswalk. Shrubs and ground plantings should be no higher than 1 ft 6 in.

On multi-lane roadways, consider configuration with active warning beacons for improved yielding compliance.

## Additional References and Guidelines

FHWA. (2009). Manual on Uniform Traffic Control Devices.  
AASHTO. (2004). Guide for the Planning, Design, and Operation of Pedestrian Facilities.  
NACTO. (2012). Urban Bikeway Design Guide.

## Materials and Maintenance

Refuge islands may collect road debris and may require somewhat frequent maintenance. Refuge islands should be visible to snow plow crews and should be kept free of snow berms that block access.

## ADA Compliant Curb Ramps

### Description

Curb ramps are the design elements that allow all users to make the transition from the street to the sidewalk. There are a number of factors to be considered in the design and placement of curb ramps at corners. Properly designed curb ramps ensure that the sidewalk is accessible from the roadway. A sidewalk without a curb ramp can be useless to someone in a wheelchair, forcing them back to a driveway and out into the street for access.

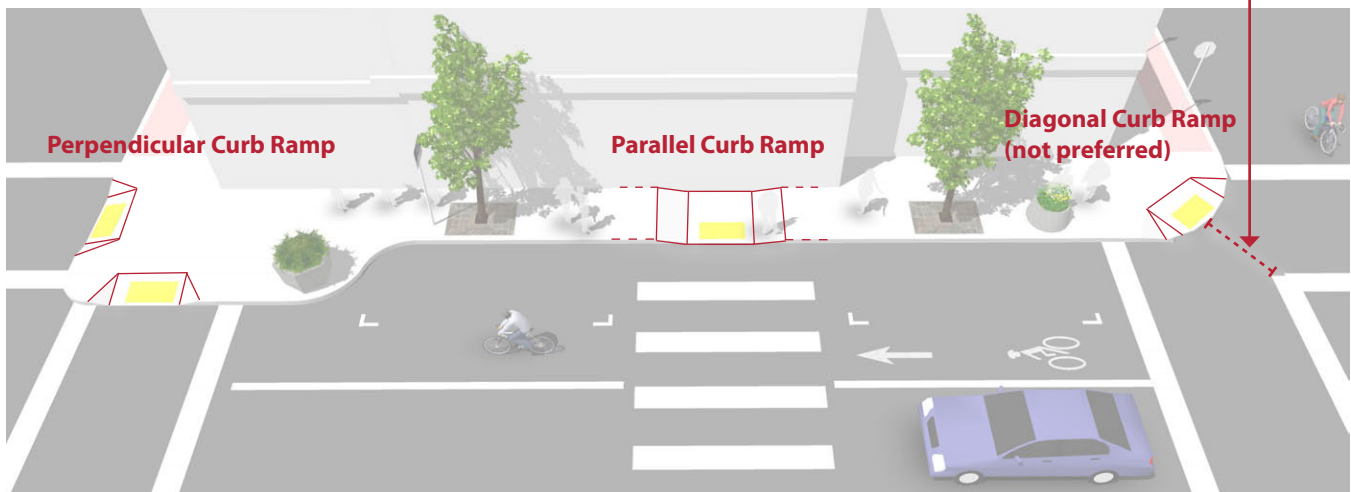
Although diagonal curb ramps might save money, they create potential safety and mobility problems for pedestrians, including reduced maneuverability and increased interaction with turning vehicles, particularly in areas with high traffic volumes. Diagonal curb ramp configurations are the least preferred of all options.

### Guidance

- The landing at the top of a ramp shall be at least 4 feet long and at least the same width as the ramp itself.
- The ramp shall slope no more than 1:50 (2.0%) in any direction.
- If the ramp runs directly into a crosswalk, the landing at the bottom will be in the roadway.
- If the ramp lands on a dropped landing within the sidewalk or corner area where someone in a wheelchair may have to change direction, the landing must be a minimum of 5'-0" long and at least as wide as the ramp, although a width of 5'-0" is preferred.

Curb ramps shall be located so that they do not project into vehicular traffic lanes, parking spaces, or parking access aisles. Three configurations are illustrated below.

Diagonal ramps shall include a clear space of at least 48" within the crosswalk for user maneuverability



Crosswalk spacing not to scale. For illustration purposes only.

### Discussion

The edge of an ADA compliant curb ramp will be marked with a tactile warning device (also known as truncated domes) to alert people with visual impairments to changes in the pedestrian environment. Contrast between the raised tactile device and the surrounding infrastructure is important so that the change is readily evident. These devices are most effective when adjacent to smooth pavement so the difference is easily detected. The devices must provide color contrast so partially sighted people can see them.

### Additional References and Guidelines

United States Access Board. (2002). Accessibility Guidelines for Buildings and Facilities.  
 United States Access Board. (2007). Public Rights-of-Way Accessibility Guidelines (PROWAG).  
 USDOJ. (2010). ADA Standards for Accessible Design.

### Materials and Maintenance

It is critical that the interface between a curb ramp and the street be maintained adequately. Asphalt street sections can develop potholes at the foot of the ramp, which can catch the front wheels of a wheelchair.

# Roadway Crossings

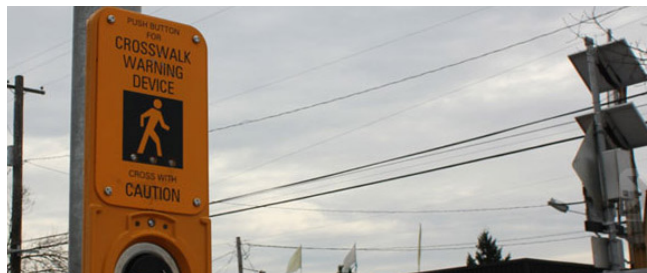
Crossing beacons and signals facilitate crossings of roadways for pedestrians and bicyclists. Beacons make crossing intersections safer by clarifying when to enter an intersection and by alerting motorists to the presence of pedestrians and bicyclists.

Flashing amber warning beacons can be utilized at unsignalized intersection crossings. Push buttons, signage, and pavement markings may be used to highlight these facilities for pedestrians, bicyclists and motorists.

Determining which type of signal or beacon to use for a particular intersection depends on a variety of factors. These include speed limits, traffic volumes, and the anticipated levels of pedestrian and bicycle crossing traffic.

An intersection with crossing beacons may reduce stress and delays for a crossing users, and discourage illegal and unsafe crossing maneuvers.

## Active Warning Beacons



## Hybrid Beacon (HAWK)



## Active Warning Beacons

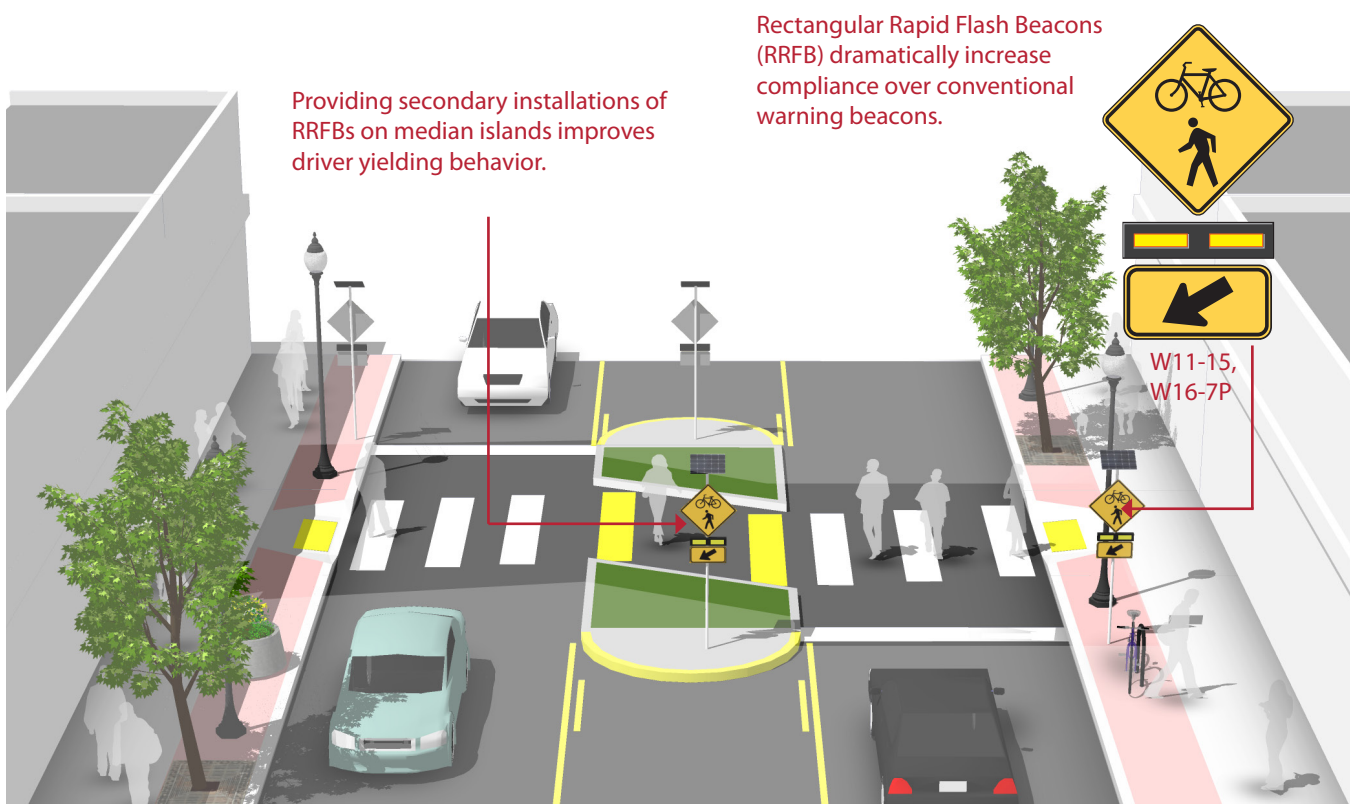
### Description

Active warning beacons are user actuated illuminated devices designed to increase motor vehicle yielding compliance at crossings of multi lane or high volume roadways.

Types of active warning beacons include conventional circular yellow flashing beacons, in-roadway warning lights, or Rectangular Rapid Flash Beacons (RRFB).

### Guidance

- Warning beacons shall not be used at crosswalks controlled by YIELD signs, STOP signs, or traffic signals.
- Warning beacons shall initiate operation based on pedestrian or bicyclist actuation and shall cease operation at a predetermined time after actuation or, with passive detection, after the pedestrian or bicyclist clears the crosswalk.



### Discussion

Rectangular rapid flash beacons have the most increased compliance of all the warning beacon enhancement options.

A study of the effectiveness of going from a no-beacon arrangement to a two-beacon RRFB installation increased yielding from 18 percent to 81 percent. A four-beacon arrangement raised compliance to 88 percent. Additional studies over long term installations show little to no decrease in yielding behavior over time.

### Additional References and Guidelines

NACTO. (2012). Urban Bikeway Design Guide.  
 FHWA. (2009). Manual on Uniform Traffic Control Devices.  
 FHWA. (2008). MUTCD - Interim Approval for Optional Use of Rectangular Rapid Flashing Beacons (IA-11)

### Materials and Maintenance

Depending on power supply, maintenance can be minimal. If solar power is used, RRFBs should run for years without issue.

# Hybrid Beacon for Mid-Block Crossing

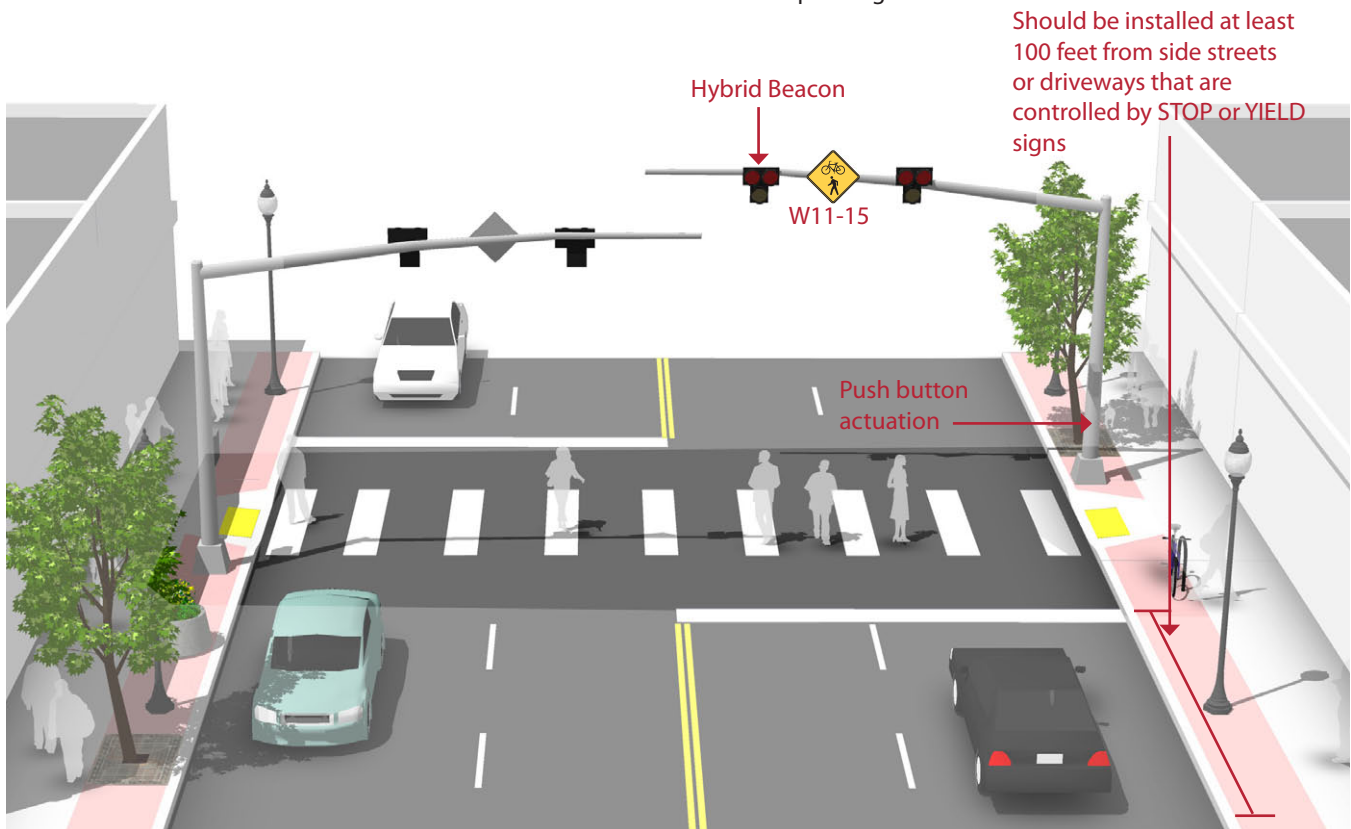
## Description

Hybrid beacons are used to improve non-motorized crossings of major streets. A hybrid beacon consists of a signal-head with two red lenses over a single yellow lens on the major street, and a pedestrian signal head for the crosswalk

## Guidance

Hybrid beacons may be installed without meeting traffic signal control warrants if roadway speed and volumes are excessive for comfortable pedestrian crossings.

- If installed within a signal system, signal engineers should evaluate the need for the hybrid signal to be coordinated with other signals.
- Parking and other sight obstructions should be prohibited for at least 100 feet in advance of and at least 20 feet beyond the marked crosswalk to provide adequate sight distance.



## Discussion

Hybrid beacon signals are normally activated by push buttons, but may also be triggered by infrared, microwave or video detectors. The maximum delay for activation of the signal should be two minutes, with minimum crossing times determined by the width of the street.

Each crossing, regardless of traffic speed or volume, requires additional review by a registered engineer to identify sight lines, potential impacts on traffic progression, timing with adjacent signals, capacity, and safety.

## Additional References and Guidelines

FHWA. (2009). Manual on Uniform Traffic Control Devices.  
NACTO. (2012). Urban Bikeway Design Guide.

## Materials and Maintenance

Hybrid beacons are subject to the same maintenance needs and requirements as standard traffic signals. Signing and striping need to be maintained to help users understand any unfamiliar traffic control.



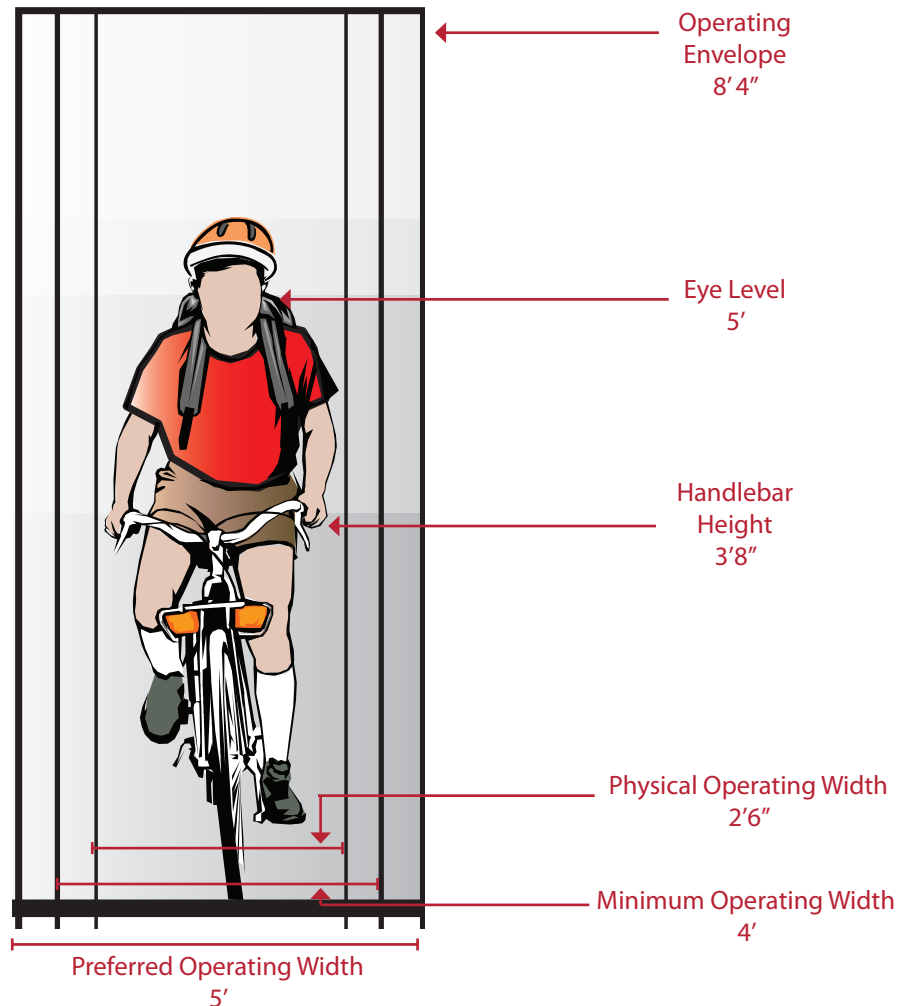
## Design Needs of Bicyclists

The purpose of this section is to provide the facility designer with an understanding of how bicyclists operate and how their bicycle influences that operation. Bicyclists, by nature, are much more affected by poor facility design, construction and maintenance practices than motor vehicle drivers. Bicyclists lack the protection from the elements and roadway hazards provided by an automobile's structure and safety features. By understanding the unique characteristics and needs of bicyclists, a facility designer can provide quality facilities and minimize user risk.

### Bicycle as a Design Vehicle

Similar to motor vehicles, bicyclists and their bicycles exist in a variety of sizes and configurations. These variations occur in the types of vehicle (such as a conventional bicycle, a recumbent bicycle or a tricycle), and behavioral characteristics (such as the comfort level of the bicyclist). The design of a bikeway should consider reasonably expected bicycle types on the facility and utilize the appropriate dimensions.

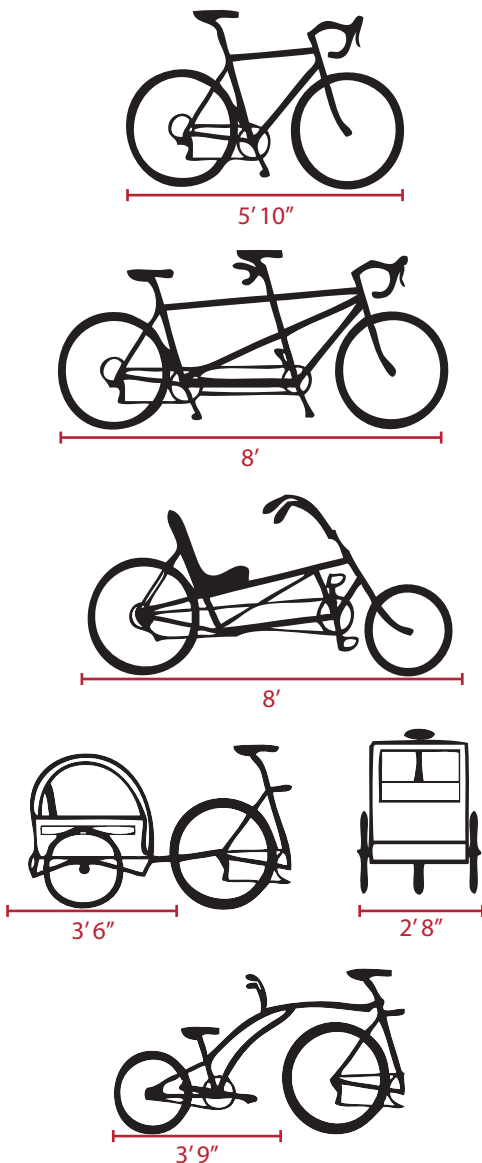
The figure below illustrates the operating space and physical dimensions of a typical adult bicyclist, which are the basis for typical facility design. Bicyclists require clear space to operate within a facility. This is why the minimum operating width is greater than the physical dimensions of the bicyclist. Bicyclists prefer five feet or more operating width, although four feet may be minimally acceptable.



**Standard Bicycle Rider Dimensions**

Source: AASHTO Guide for the Development of Bicycle Facilities, 3rd Edition

In addition to the design dimensions of a typical bicycle, there are many other commonly used pedal-driven cycles and accessories to consider when planning and designing bicycle facilities. The most common types include tandem bicycles, recumbent bicycles, and trailer accessories. The figure and table below summarize the typical dimensions for bicycle types.



**Bicycle as Design Vehicle - Typical Dimensions**

Source: AASHTO Guide for the Development of Bicycle Facilities, 3rd Edition \*AASHTO does not provide typical dimensions for tricycles.

**Design Speed Expectations**

The expected speed that different types of bicyclists can maintain under various conditions also influences the design of facilities such as shared use paths. The table to the right provides typical bicyclist speeds for a variety of conditions.

**Bicycle as Design Vehicle - Typical Dimensions**

Bicycle Type	Feature	Typical Dimensions
<b>Upright Adult Bicyclist</b>	Physical width	2 ft 6 in
	Operating width (Minimum)	4 ft
	Operating width (Preferred)	5 ft
	Physical length	5 ft 10 in
	Physical height of handlebars	3 ft 8 in
	Operating height	8 ft 4 in
	Eye height	5 ft
	Vertical clearance to obstructions (tunnel height, lighting, etc)	10 ft
Approximate center of gravity	2 ft 9 in - 3 ft 4 in	
<b>Recumbent Bicyclist</b>	Physical length	8 ft
	Eye height	3 ft 10 in
<b>Tandem Bicyclist</b>	Physical length	8 ft
<b>Bicyclist with child trailer</b>	Physical length	10 ft
	Physical width	2 ft 8 in

**Bicycle as Design Vehicle - Design Speed Expectations**

Bicycle Type	Feature	Typical Speed
<b>Upright Adult Bicyclist</b>	Paved level surfacing	15 mph
	Crossing Intersections	10 mph
	Downhill	30 mph
	Uphill	5 -12 mph
<b>Recumbent Bicyclist</b>	Paved level surfacing	18 mph

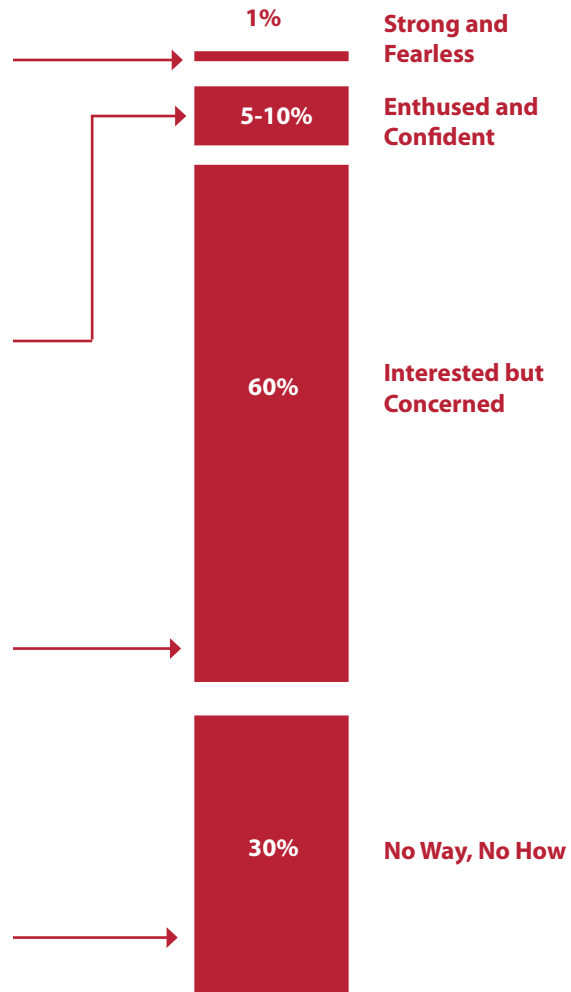
\*Tandem bicycles and bicyclists with trailers have typical speeds equal to or less than upright adult bicyclists.

## Types of Bicyclists

It is important to consider bicyclists of all skill levels when creating a non-motorized plan or project. Bicyclist skill level greatly influences expected speeds and behavior, both in separated bikeways and on shared roadways. Bicycle infrastructure should accommodate as many user types as possible, with decisions for separate or parallel facilities based on providing a comfortable experience for the greatest number of people.

The bicycle planning and engineering professions currently use several systems to classify the population, which can assist in understanding the characteristics and infrastructure preferences of different bicyclists. The most conventional framework classifies the “design cyclist” as *Advanced, Basic, or Child*<sup>1</sup>. A more detailed understanding of the US population as a whole is illustrated in the figure below. Developed by planners in Portland, OR<sup>2</sup> and supported by data collected nationally since 2005, this classification provides the following alternative categories to address varying attitudes towards bicycling in the US:

- **Strong and Fearless** (approximately 1% of population) – Characterized by bicyclists that will typically ride anywhere regardless of roadway conditions or weather. These bicyclists can ride faster than other user types, prefer direct routes and will typically choose roadway connections -- even if shared with vehicles -- over separate bicycle facilities such as shared use paths.
- **Enthusied and Confident** (5-10% of population) - This user group encompasses bicyclists who are fairly comfortable riding on all types of bikeways but usually choose low traffic streets or shared use paths when available. These bicyclists may deviate from a more direct route in favor of a preferred facility type. This group includes all kinds of bicyclists such as commuters, recreationalists, racers and utilitarian bicyclists.
- **Interested but Concerned** (approximately 60% of population) – This user type comprises the bulk of the cycling population and represents bicyclists who typically only ride a bicycle on low traffic streets or shared-use trails under favorable weather conditions. These bicyclists perceive significant barriers to their increased use of cycling, specifically traffic and other safety issues. These people may become “Enthusied & Confident” with encouragement, education and experience.
- **No Way, No How** (approximately 30% of population) – Persons in this category are not bicyclists, and perceive severe safety issues with riding in traffic. Some people in this group may eventually become more regular cyclists with time and education. A significant portion of these people will not ride a bicycle under any circumstances.



Typical Distribution of Bicyclist Types

1 *Selecting Roadway Design Treatments to Accommodate Bicycles. (1994). Publication No. FHWA-RD-92-073*  
 2 *Four Types of Cyclists. (2009). Roger Geller, City of Portland Bureau of Transportation. <http://www.portlandonline.com/transportation/index.cfm?&a=237507>*

# Bicycle Facility Selection and Classification

## Facility Selection Guidelines

There are no 'hard and fast' rules for determining the most appropriate type of bicycle facility for a particular location – roadway speeds, volumes, right-of-way width, presence of parking, adjacent land uses, and expected bicycle user types are all critical elements of this decision. Studies find that the most significant factors influencing bicycle use are motor vehicle traffic volumes and speeds. Additionally, most bicyclists prefer facilities separated from motor vehicle traffic or located on local roads with low motor vehicle traffic speeds and volumes. Because off-street pathways are physically separated from the roadway, they are perceived as safe and attractive routes for bicyclists who prefer to avoid motor vehicle traffic. Consistent use of treatments and application of bikeway facilities allow users to anticipate whether they would feel comfortable riding on a particular facility, and plan their trips accordingly. This section provides guidance on various factors that affect the type of facilities that should be provided.

This page summarizes the bicycle facility typology developed for Door County. The specific facility type that should be provided depends on the surrounding environment (e.g. auto speed and volume, topography, and adjacent land use) and expected bicyclist needs (e.g. bicyclists commuting on a highway versus students riding to school on residential streets).

**Shared Roadways** are bikeways where bicyclists and cars operate within the same travel lane, either side by side or in single file depending on roadway configuration. The most basic type of bikeway is a signed shared roadway. This facility provides continuity with other bicycle facilities (usually bike lanes), or designates preferred routes through high-demand corridors.



**Shared Roadways** may also be designated by pavement markings, signage and other treatments including directional signage, traffic diverters, chicanes, chokers and /or other traffic calming devices to reduce vehicle speeds or volumes.



**Separated Bikeways**, such as bike lanes, use signage and striping to delineate the right-of-way assigned to bicyclists and motorists. Bike lanes encourage predictable movements by both bicyclists and motorists.



**Shared-Use Paths** are facilities separated from roadways for use by bicyclists and pedestrians.



## Shared Roadways

On shared roadways, bicyclists and motor vehicles use the same roadway space. These facilities are typically used on roads with low speeds and traffic volumes, however they can be used on higher volume roads with wide outside lanes or shoulders. A motor vehicle driver will usually have to cross over into the adjacent travel lane to pass a bicyclist, unless a wide outside lane or shoulder is provided.

Shared roadways employ a large variety of treatments from simple signage and shared lane markings to more complex treatments including directional signage, traffic diverters, chicanes, chokers, and/or other traffic calming devices to reduce vehicle speeds or volumes.

### Signed Shared Roadway



### Marked Shared Roadway



# Signed Shared Roadway

## Description

Signed Shared Roadways are facilities shared with motor vehicles. They are typically used on roads with low speeds and traffic volumes, however can be used on higher volume roads with wide outside lanes or shoulders. A motor vehicle driver will usually have to cross over into the adjacent travel lane to pass a bicyclist, unless a wide outside lane or shoulder is provided.

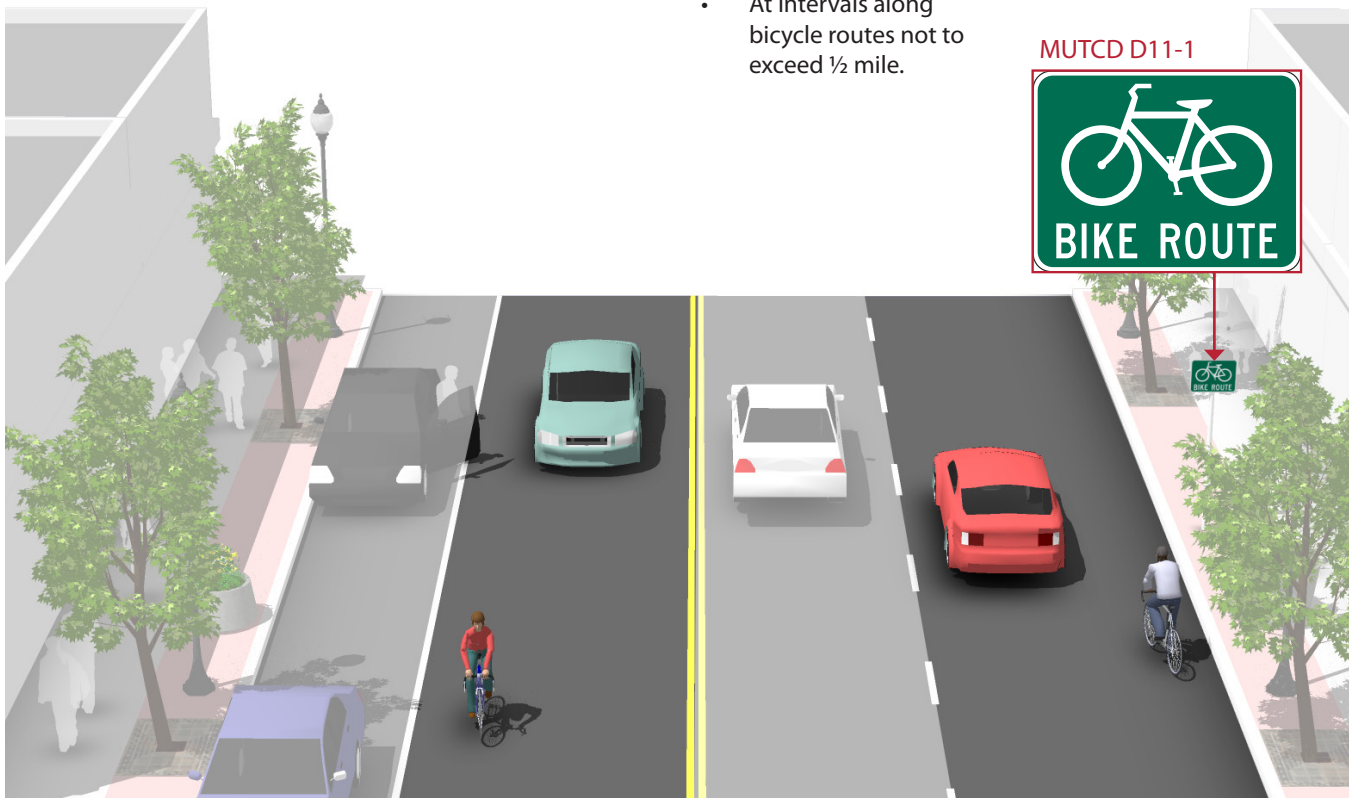
## Guidance

Lane width varies depending on roadway configuration.

Bicycle Route signage (D11-1) should be applied at intervals frequent enough to keep bicyclists informed of changes in route direction and to remind motorists of the presence of bicyclists. Commonly, this includes placement at:

- Beginning or end of Bicycle Route.
- At major changes in direction or at intersections with other bicycle routes.
- At intervals along bicycle routes not to exceed ½ mile.

MUTCD D11-1



## Discussion

Signed Shared Roadways serve either to provide continuity with other bicycle facilities (usually bike lanes) or to designate preferred routes through high-demand corridors.

## Additional References and Guidelines

AASHTO. (2012). Guide for the Development of Bicycle Facilities.  
FHWA. (2009). Manual on Uniform Traffic Control Devices.  
WisDOT. (2009). Wisconsin Bicycle Facility Design Handbook.

## Materials and Maintenance

Maintenance needs for bicycle wayfinding signs are similar to other signs, and will need periodic replacement due to wear.

# Marked Shared Roadway

## Description

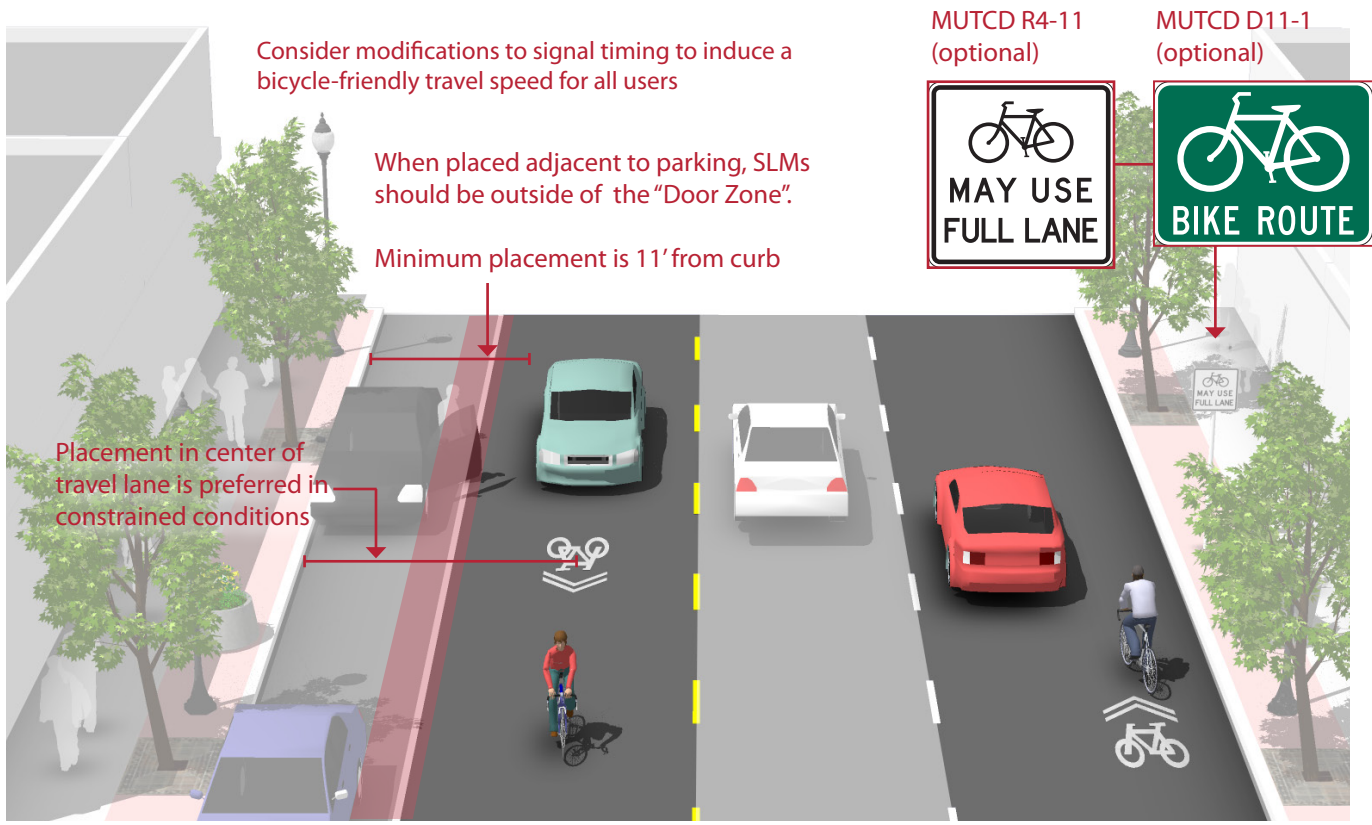
A marked shared roadway is a general purpose travel lane marked with shared lane markings (SLM) used to encourage bicycle travel and proper positioning within the lane.

In constrained conditions, the SLMs are placed in the middle of the lane to discourage unsafe passing by motor vehicles. On a wide outside lane, the SLMs can be used to promote bicycle travel to the right of motor vehicles.

In all conditions, SLMs should be placed outside of the door zone of parked cars.

## Guidance

- In constrained conditions, preferred placement is in the center of the travel lane to minimize wear and promote single file travel.
- Minimum placement of SLM marking centerline is 11 feet from edge of curb where on-street parking is present, 4 feet from edge of curb with no parking. If parking lane is wider than 7.5 feet, the SLM should be moved further out accordingly.



## Discussion

Bike Lanes should be considered on roadways with outside travel lanes wider than 15 feet, or where other lane narrowing or removal strategies may provide adequate road space. SLMs shall not be used on shoulders, in designated Bike Lanes, or to designate Bicycle Detection at signalized intersections. (MUTCD 9C.07)

## Additional References and Guidelines

AASHTO. (2012). Guide for the Development of Bicycle Facilities.  
 FHWA. (2009). Manual on Uniform Traffic Control Devices.  
 NACTO. (2012). Urban Bikeway Design Guide.

## Materials and Maintenance

Placing SLMs between vehicle tire tracks will increase the life of the markings and minimize the long-term cost of the treatment.

# Separated Bikeways

Designated exclusively for bicycle travel, separated bikeways are segregated from vehicle travel lanes by striping, and can include pavement stencils and other treatments. Separated bikeways are most appropriate on arterial and collector streets where higher traffic volumes and speeds warrant greater separation.

Separated bikeways can increase safety and promote proper riding by:

- Defining road space for bicyclists and motorists, reducing the possibility that motorists will stray into the bicyclists' path.
- Discouraging bicyclists from riding on the sidewalk.
- Reducing the incidence of wrong way riding.
- Reminding motorists that bicyclists have a right to the road.

## Shoulder Bikeway



## Bicycle Lanes





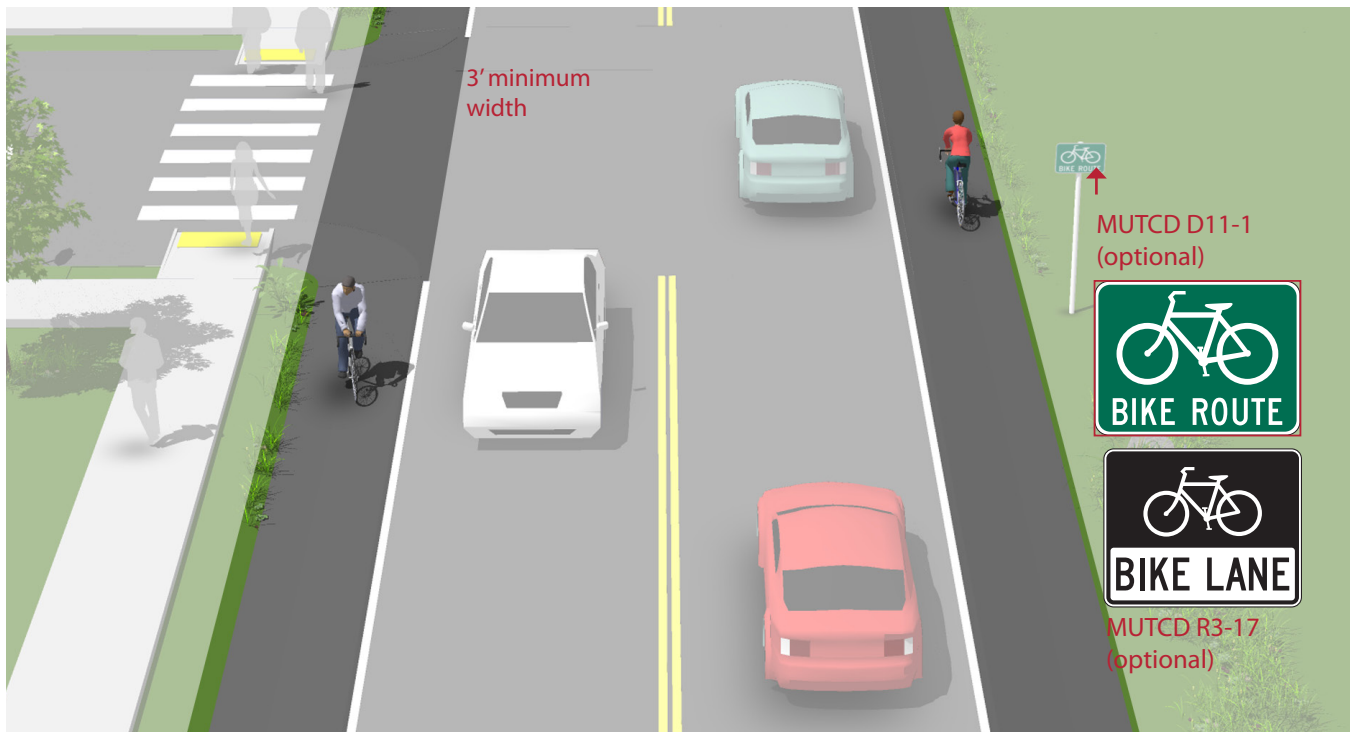
# Shoulder Bikeways

## Description

Typically found in less-dense areas, shoulder bikeways are paved roadways with striped shoulders (4'+) wide enough for bicycle travel. Shoulder bikeways often, but not always, include signage alerting motorists to expect bicycle travel along the roadway. Shoulder bikeways should be considered a temporary treatment, with full bike lanes planned for construction when the roadway is widened or completed with curb and gutter. This type of treatment is not typical in urban areas and should only be used where constraints exist.

## Guidance

- If 4 feet or more is available for bicycle travel, the full bike lane treatment of signs, legends, and an 8" bike lane line would be provided.
- If it is not possible to meet minimum bicycle lane dimensions, a reduced width paved shoulder can still improve conditions for bicyclists on constrained roadways. In these situations, a minimum of 3 feet of operating space should be provided.



## Discussion

A wide outside lane may be sufficient accommodation for bicyclists on streets with insufficient width for bike lanes but which do have space available to provide a wider (14'-16') outside travel lane. Consider configuring as a marked shared roadway in these locations.

Where feasible, roadway widening should be performed with pavement resurfacing jobs, but not exceeding desirable bike lane widths.

## Additional References and Guidelines

AASHTO. (2012). Guide for the Development of Bicycle Facilities.  
 FHWA. (2009). Manual on Uniform Traffic Control Devices.  
 WisDOT. (2009). Wisconsin Bicycle Facility Design Handbook.

## Materials and Maintenance

Paint can wear more quickly in high traffic areas or in winter climates. Shoulder bikeways should be cleared of snow through routine snow removal operations.

# Bicycle Lane

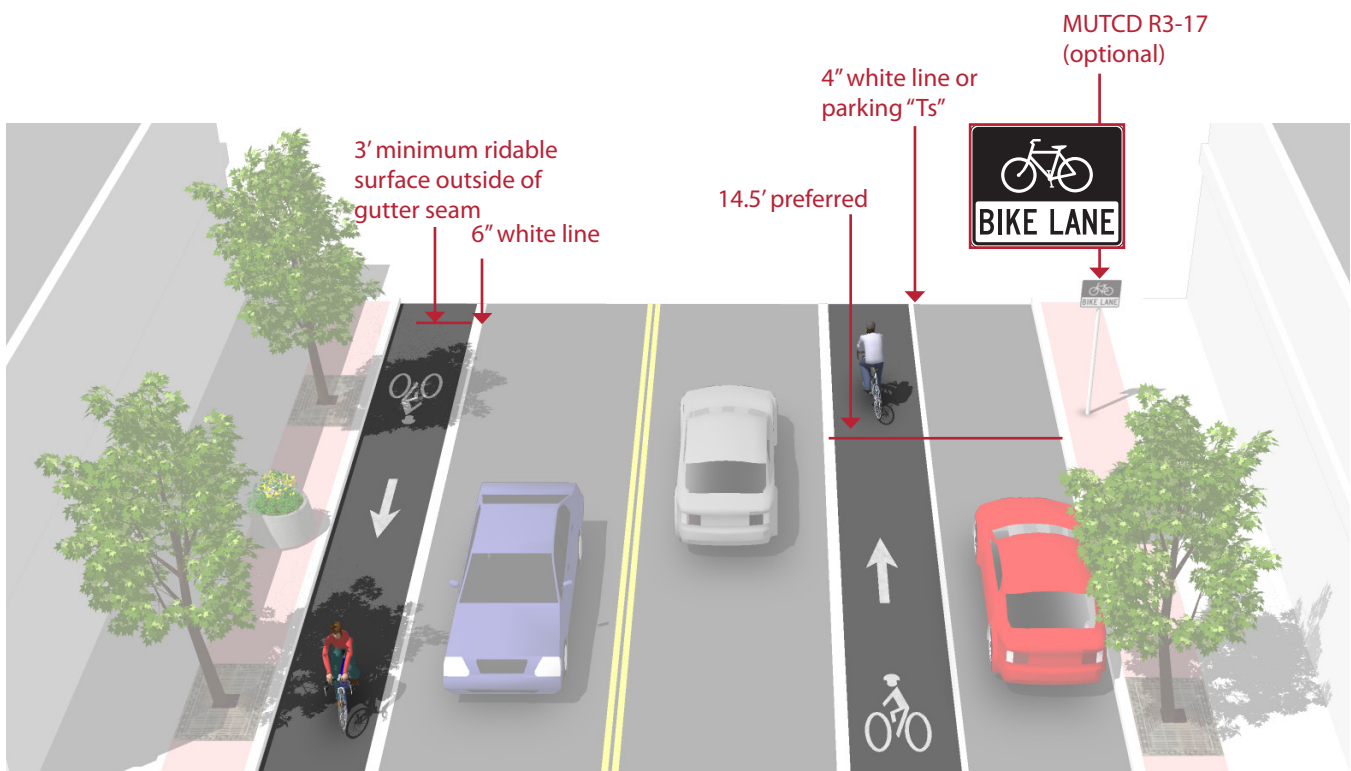
## Description

Bike lanes designate an exclusive space for bicyclists through the use of pavement markings and signage. The bike lane is located adjacent to motor vehicle travel lanes and is used in the same direction as motor vehicle traffic. Bike lanes are typically on the right side of the street, between the adjacent travel lane and curb, road edge or parking lane.

Many bicyclists, particularly less experienced riders, are more comfortable riding on a busy street if it has a striped and signed bikeway than if they are expected to share a lane with vehicles.

## Guidance

- 4 foot minimum when no curb and gutter is present.
- 5 foot minimum when adjacent to curb and gutter or 3 feet more than the gutter pan width if the gutter pan is wider than 2 feet.
- 14.5 foot preferred from curb face to edge of bike lane. (12 foot minimum).
- 7 foot maximum width for use adjacent to arterials with high travel speeds. Greater widths may encourage motor vehicle use of bike lane.



## Discussion

Wider bicycle lanes are desirable in certain situations such as on higher speed arterials (45 mph+) where use of a wider bicycle lane would increase separation between passing vehicles and bicyclists. Appropriate signing and stenciling is important with wide bicycle lanes to ensure motorists do not mistake the lane for a vehicle lane or parking lane.

## Additional References and Guidelines

AASHTO. (2012). Guide for the Development of Bicycle Facilities.  
FHWA. (2009). Manual on Uniform Traffic Control Devices.  
NACTO. (2012). Urban Bikeway Design Guide.  
WisDOT. (2009). Wisconsin Bicycle Facility Design Handbook.

## Materials and Maintenance

Paint can wear more quickly in high traffic areas or in winter climates. Bicycle lanes should be cleared of snow through routine snow removal operations.

## Separated Bikeways at Intersections

Intersections are junctions at which different modes of transportation meet and facilities overlap. An intersection facilitates the interchange between bicyclists, motorists, pedestrians and other modes in order to advance traffic flow in a safe and efficient manner. Designs for intersections with bicycle facilities should reduce conflict between bicyclists (and other vulnerable road users) and vehicles by heightening the level of visibility, denoting clear right-of-way and facilitating eye contact and awareness with other modes. Intersection treatments can improve both queuing and merging maneuvers for bicyclists, and are often coordinated with timed or specialized signals.

The configuration of a safe intersection for bicyclists may include elements such as color, signage, medians, signal detection and pavement markings. Intersection design should take into consideration existing and anticipated bicyclist, pedestrian and motorist movements. In all cases, the degree of mixing or separation between bicyclists and other modes is intended to reduce the risk of crashes and increase bicyclist comfort. The level of treatment required for bicyclists at an intersection will depend on the bicycle facility type used, whether bicycle facilities are intersecting, and the adjacent street function and land use.

**Bike Lanes at Right Turn Only Lanes**



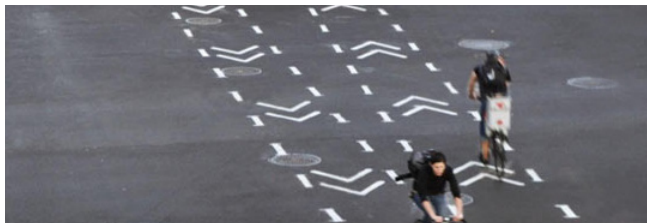
**Colored Bike Lanes in Conflict Areas**



**Combined Bike Lane/Turn Lane**



**Intersection Crossing Markings**



**Bike Lanes at High Speed Interchanges**



# Bike Lanes at Right Turn Only Lanes

## Description

The appropriate treatment at right-turn lanes is to place the bike lane between the right-turn lane and the right-most through lane or, where right-of-way is insufficient, to use a combined bike lane/turn lane.

The design (right) illustrates a bike lane pocket, with signage indicating that motorists should yield to bicyclists through the conflict area.

## Guidance

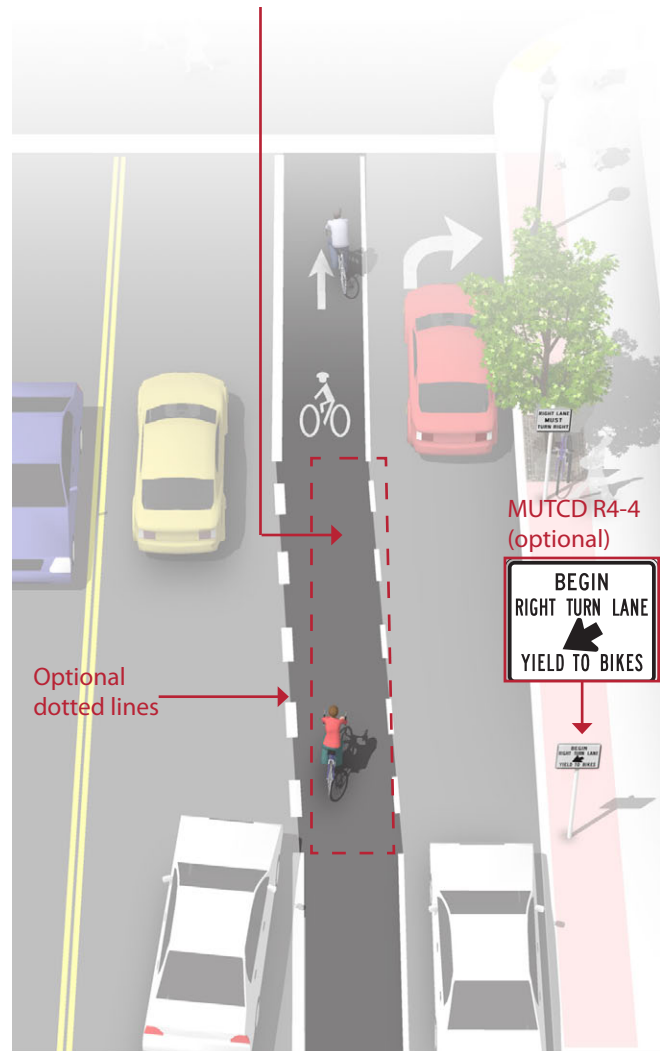
### At auxiliary right turn only lanes (add lane):

- Continue existing bike lane width; standard width of 5 to 6 feet or 4 feet in constrained locations.
- Use signage to indicate that motorists should yield to bicyclists through the conflict area.
- Consider using colored conflict areas to promote visibility of the mixing zone.

### Where a through lane becomes a right turn only lane:

- Do not define a dotted line merging path for bicyclists.
- Drop the bicycle lane in advance of the merge area.
- Use shared lane markings to indicate shared use of the lane in the merging zone.

Colored pavement may be used in the weaving area to increase visibility and awareness of potential conflict



## Discussion

For other potential approaches to providing accommodations for bicyclists at intersections with turn lanes, please see shared bike lane/turn lane, bicycle signals, and colored bike facilities.

## Additional References and Guidelines

AASHTO. (2012). Guide for the Development of Bicycle Facilities.  
FHWA. (2009). Manual on Uniform Traffic Control Devices.  
NACTO. (2012). Urban Bikeway Design Guide.  
WisDOT. (2009). Wisconsin Bicycle Facility Design Handbook.

## Materials and Maintenance

Because the effectiveness of markings depends entirely on their visibility, maintaining markings should be a high priority.

## Colored Bike Lanes in Conflict Areas

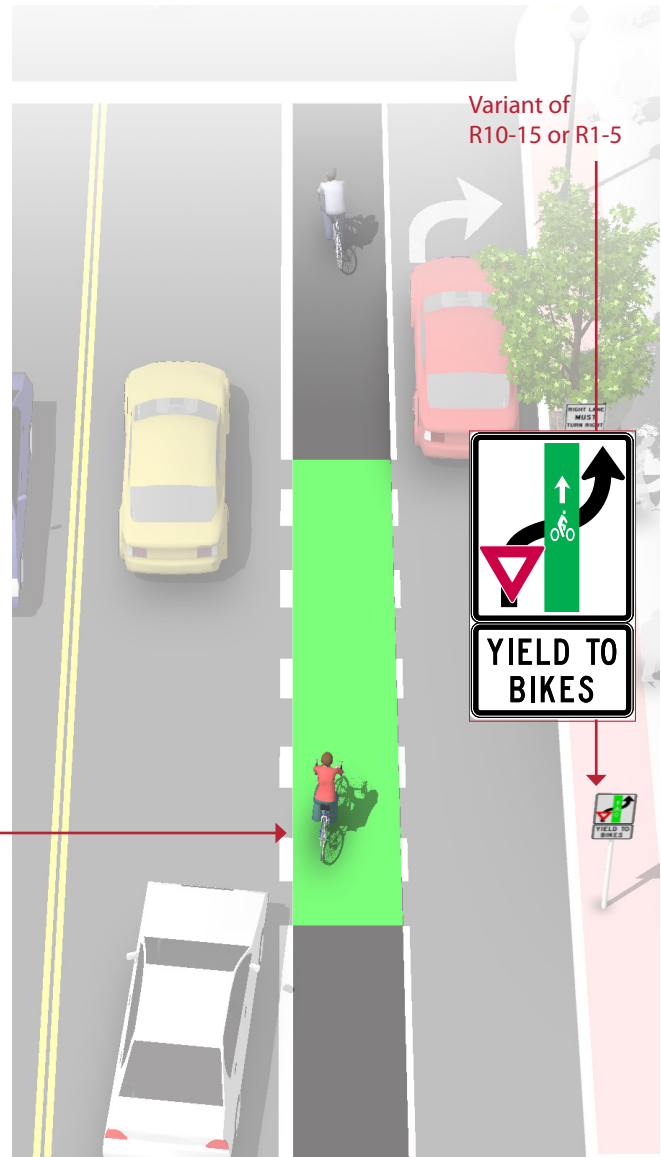
### Description

Colored pavement within a bicycle lane increases the visibility of the facility and reinforces priority of bicyclists in conflict areas.

### Guidance

- Green colored pavement was given interim approval by the Federal Highways Administration in March 2011. See interim approval for specific color standards.
- The colored surface should be skid resistant and retro-reflective.
- A “Yield to Bikes” sign should be used at intersections or driveway crossings to reinforce that bicyclists have the right-of-way in colored bike lane areas.

Normal white dotted edge lines should define colored space



### Discussion

Evaluations performed in Portland, OR, St. Petersburg, FL and Austin, TX found that significantly more motorists yielded to bicyclists and slowed or stopped before entering the conflict area after the application of the colored pavement when compared with an uncolored treatment.

### Additional References and Guidelines

FHWA. (2011). Interim Approval (IA-14) has been granted. Requests to use green colored pavement need to comply with the provisions of Paragraphs 14 through 22 of Section 1A.10  
 NACTO. (2012). Urban Bikeway Design Guide.

### Materials and Maintenance

Because the effectiveness of markings depends entirely on their visibility, maintaining markings should be a high priority.

# Combined Bike Lane / Turn Lane

## Description

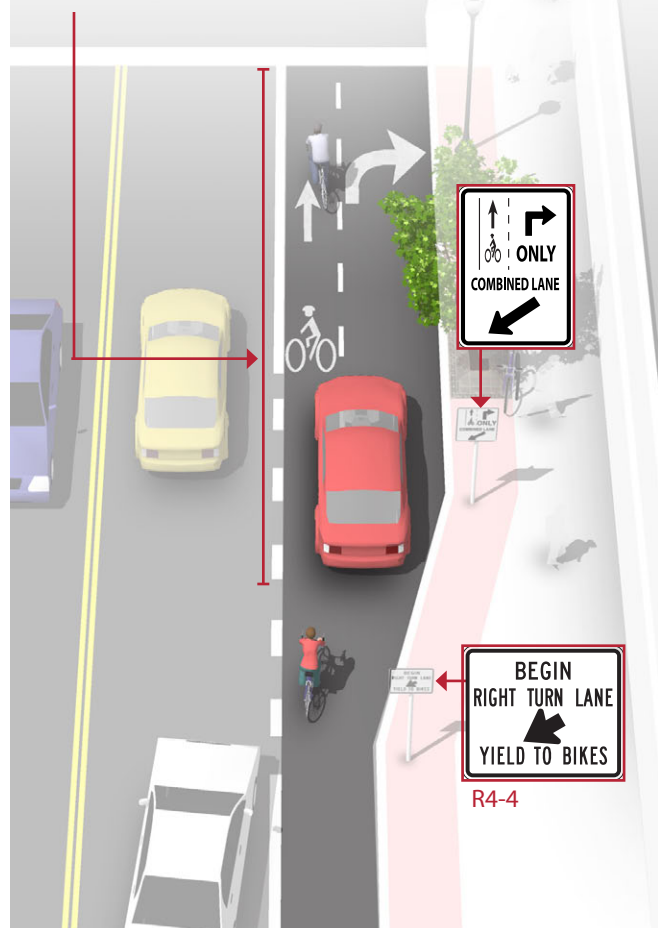
The combined bicycle/right turn lane places a standard-width bike lane on the left side of a dedicated right turn lane. A dotted line delineates the space for bicyclists and motorists within the shared lane. This treatment includes signage advising motorists and bicyclists of proper positioning within the lane.

This treatment is recommended at intersections lacking sufficient space to accommodate both a standard through bike lane and right turn lane.

## Guidance

- Maximum shared turn lane width is 13 feet; narrower is preferable.
- Bike Lane pocket should have a minimum width of 4 feet with 5 feet preferred.
- A dotted 4 inch line and bicycle lane marking should be used to clarify bicyclist positioning within the combined lane, without excluding cars from the suggested bicycle area.
- A "Right Turn Only" sign with an "Except Bicycles" plaque may be needed to make it legal for through bicyclists to use a right turn lane.

Short length turn pockets encourage slower motor vehicle speeds



## Discussion

Case studies cited by the Pedestrian and Bicycle Information Center indicate that this treatment works best on streets with lower posted speeds (30 MPH or less) and with lower traffic volumes (10,000 ADT or less). May not be appropriate for high-speed arterials or intersections with long right turn lanes. May not be appropriate for intersections with large percentages of right-turning heavy vehicles.

## Additional References and Guidelines

NACTO. (2012). Urban Bikeway Design Guide.  
This treatment is currently slated for inclusion in the next edition of the AASHTO Guide for the Development of Bicycle Facilities

## Materials and Maintenance

Locate markings out of tire tread to minimize wear. Because the effectiveness of markings depends on their visibility, maintaining markings should be a high priority.

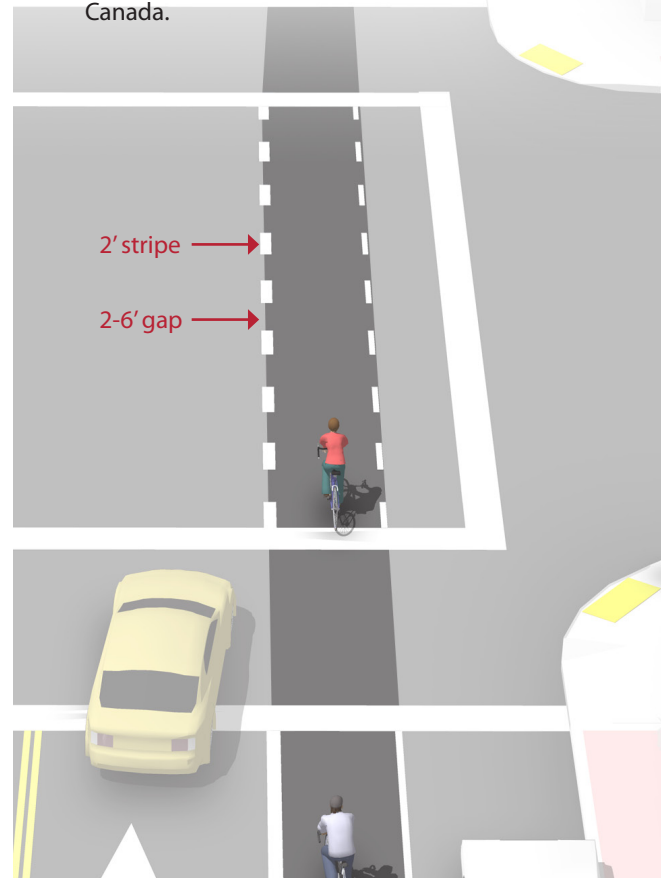
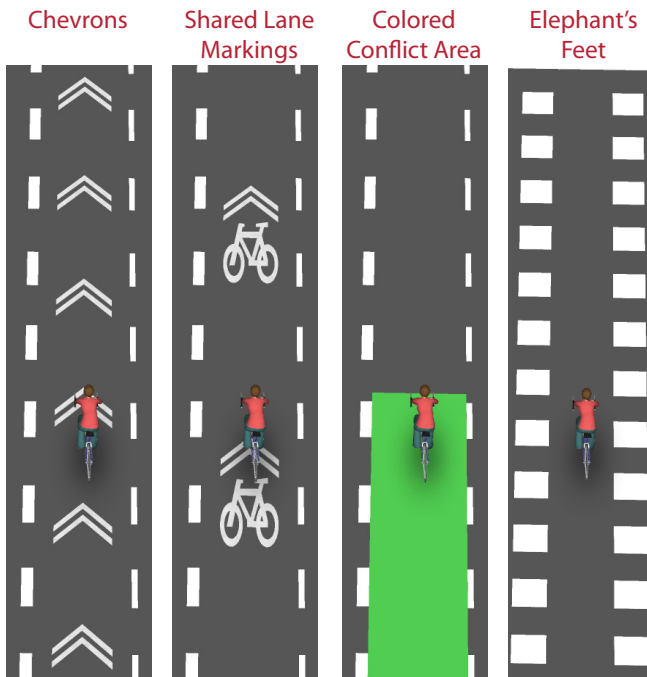
# Intersection Crossing Markings

## Description

Bicycle pavement markings through intersections indicate the intended path of bicyclists through an intersection or across a driveway or ramp. They guide bicyclists on a safe and direct path through the intersection and provide a clear boundary between the paths of through bicyclists and either through or crossing motor vehicles in the adjacent lane.

## Guidance

- See MUTCD Section 3B.08: “dotted line extensions”
- Crossing striping shall be at least six inches wide when adjacent to motor vehicle travel lanes. Dotted lines should be two-foot lines spaced two to six feet apart.
- Chevrons, shared lane markings, or colored bike lanes in conflict areas may be used to increase visibility within conflict areas or across entire intersections. Elephant’s Feet markings are common in Europe and Canada.



## Discussion

Additional markings such as chevrons, shared lane markings, or colored bike lanes in conflict areas are strategies currently in use in the United States and Canada. Cities considering the implementation of markings through intersections should standardize future designs to avoid confusion.

## Additional References and Guidelines

AASHTO. (2012). Guide for the Development of Bicycle Facilities.  
 FHWA. (2009). Manual on Uniform Traffic Control Devices. (3A.06)  
 NACTO. (2012). Urban Bikeway Design Guide.

## Materials and Maintenance

Because the effectiveness of marked crossings depends entirely on their visibility, maintaining marked crossings should be a high priority.

# Bike Lanes at High Speed Interchanges

## Description

Some arterials may contain high speed freeway-style designs such as merge lanes and exit ramps, which can create difficulties for bicyclists. The entrance and exit lanes typically have intrinsic visibility problems because of low approach angles and feature high speed differentials between bicyclists and motor vehicles.

Strategies to improve safety focus on increasing sight distances, creating formal crossings, and minimizing crossing distances.

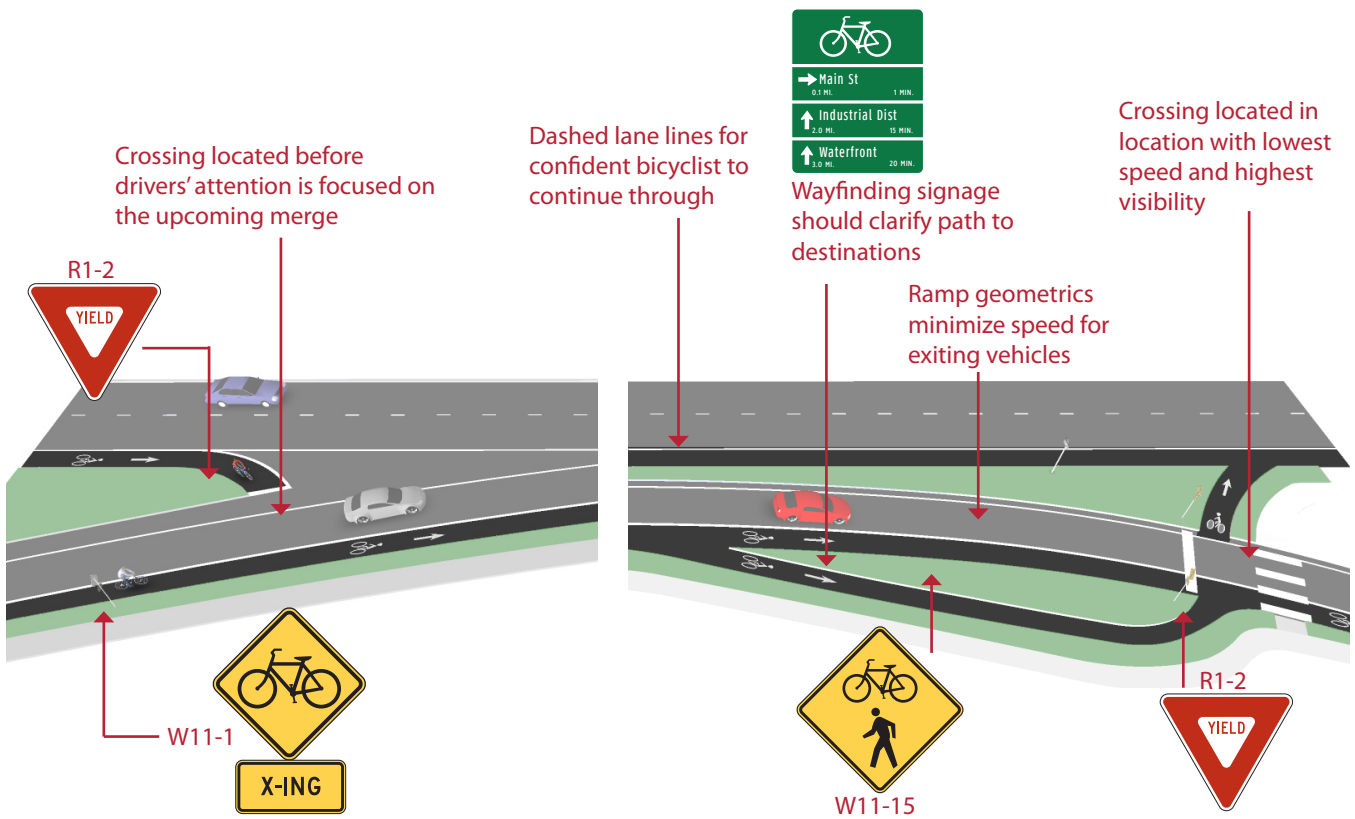
## Guidance

### Entrance Ramps:

Angle the bike lane to increase the approach angle with entering traffic. Position crossing before drivers' attention is focused on the upcoming merge.

### Exit Ramps:

Use a jug handle turn to bring bicyclists to increase the approach angle with exiting traffic, and add yield striping and signage to the bicycle approach.



## Discussion

While the jug-handle approach is the preferred configuration at exit ramps, provide the option for through bicyclists to perform a vehicular merge and proceed straight through under safe conditions.

## Additional References and Guidelines

- AASHTO. (2012). Guide for the Development of Bicycle Facilities.
- FHWA. (2009). Manual on Uniform Traffic Control Devices. Bicycle and Pedestrian Transportation. Lesson 15: Bicycle Lanes.
- WisDOT. (2009). Wisconsin Bicycle Facility Design Handbook.

## Materials and Maintenance

Locate crossing markings out of wheel tread when possible to minimize wear and maintenance costs.



## Shared-Use Paths

A shared-use path (also known as a greenway or multi-use path) allows for two-way, off-street bicycle use and also may be used by pedestrians, skaters, wheelchair users, joggers and other non-motorized users. These facilities are frequently found in parks, along rivers, beaches, and in greenbelts or utility corridors where there are few conflicts with motorized vehicles. Path facilities can also include amenities such as lighting, signage, and fencing (where appropriate).

Key features of shared-use paths include:

- Frequent access points from the local road network.
- Directional signs to direct users to and from the path.
- A limited number of at-grade crossings with streets or driveways.
- Terminating the path where it is easily accessible to and from the street system.
- Separate treads for pedestrians and bicyclists when heavy use is expected.

### General Design Practices



### Shared-Use Paths in River and Utility Corridors



### Shared-Use Paths in Abandoned Rail Corridors



### Shared-Use Paths in Active Rail Corridors



### Shared-Use Paths Along Roadways



# General Design Practices

## Description

Shared-use paths can provide a desirable facility, particularly for recreation, and users of all skill levels preferring separation from traffic. Paths should generally provide directional travel opportunities not provided by existing roadways.

## Guidance

### Width

- 8 feet is the minimum allowed for a two-way path and is only recommended for low traffic situations.
- 10 feet is recommended in most situations and will be adequate for moderate to heavy use.
- 12 feet is recommended for heavy use situations with high concentrations of multiple users. A separate track (5' minimum) can be provided for pedestrian use.

### Lateral Clearance

- A 2 foot or greater shoulder on both sides of the path should be provided. An additional foot of lateral clearance (total of 3') is required by the MUTCD for the installation of signage or other furnishings.

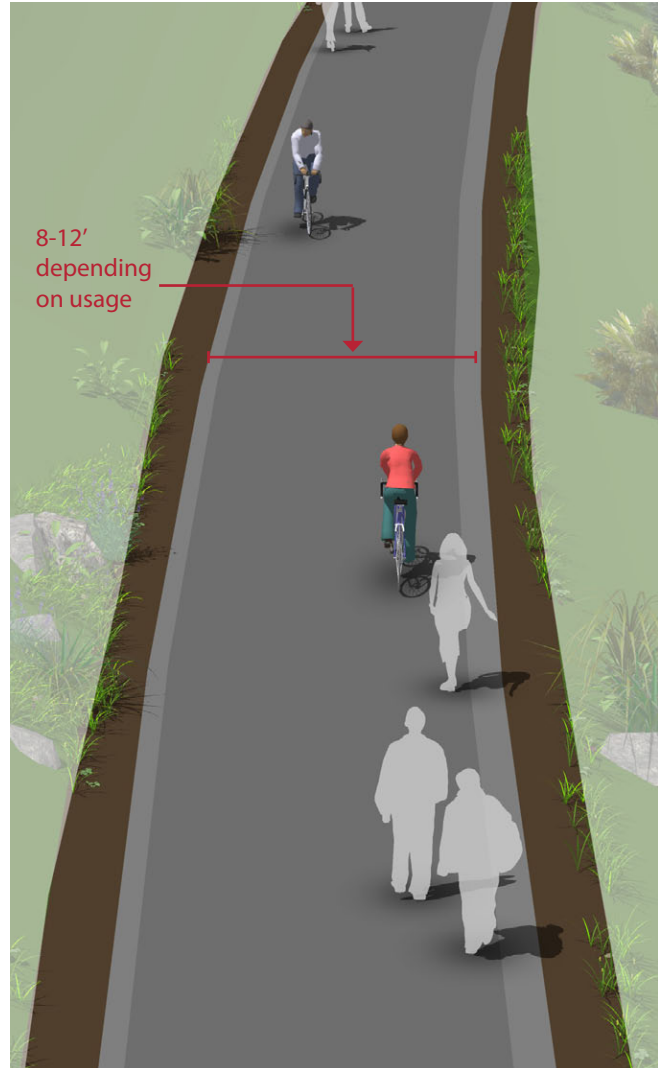
### Overhead Clearance

- Clearance to overhead obstructions should be 8 feet minimum, with 10 feet recommended.

### Striping

- When striping is required, use a 4 inch dashed yellow centerline stripe with 4 inch solid white edge lines.
- Solid centerlines can be provided on tight or blind corners, and on the approaches to roadway crossings.

Terminate the path where it is easily accessible to and from the street system, preferably at a controlled intersection or at the beginning of a dead-end street.



## Discussion

The AASHTO Guide for the Development of Bicycle Facilities generally recommends against the development of shared use paths along roadways. Also known as “sidepaths”, these facilities create a situation where a portion of the bicycle traffic rides against the normal flow of motor vehicle traffic and can result in wrong-way riding when either entering or exiting the path.

## Additional References and Guidelines

AASHTO. (2012). Guide for the Development of Bicycle Facilities.  
FHWA. (2009). Manual on Uniform Traffic Control Devices.  
Flink, C. (1993). Greenways: A Guide To Planning Design And Development.  
WisDOT. (2009). Wisconsin Bicycle Facility Design Handbook.

## Materials and Maintenance

Asphalt is the most common surface for bicycle paths. The use of concrete for paths has proven to be more durable over the long term. Saw cut concrete joints rather than troweled improve the experience of path users.

## Shared-Use Paths in River and Utility Corridors

### Description

Utility and waterway corridors often offer excellent shared-use path development and bikeway gap closure opportunities. Utility corridors typically include powerline and sewer corridors, while waterway corridors include canals, drainage ditches, rivers, and beaches. These corridors offer excellent transportation and recreation opportunities for bicyclists of all ages and skills.

### Guidance

Shared-use paths in utility corridors should meet or exceed general design practices. If additional width allows, wider paths, and landscaping are desirable.

### Access Points

Any access point to the path should be well-defined with appropriate signage designating the pathway as a bicycle facility and prohibiting motor vehicles.

### Path Closure

Public access to the shared-use path may be prohibited during the following events:

- Canal/flood control channel or other utility maintenance activities
- Inclement weather or the prediction of storm conditions



### Discussion

Similar to railroads, public access to flood control channels or canals is undesirable by all parties. Hazardous materials, deep water or swift current, steep, slippery slopes, and debris all constitute risks for public access. Appropriate fencing may be required to keep path users within the designated travel way. Creative design of fencing is encouraged to make the path facility feel welcoming to the user.

### Additional References and Guidelines

AASHTO. (2012). Guide for the Development of Bicycle Facilities.  
 FHWA. (2009). Manual on Uniform Traffic Control Devices.  
 Flink, C. (1993). Greenways: A Guide To Planning Design And Development.

### Materials and Maintenance

Asphalt is the most common surface for bicycle paths. The use of concrete for paths has proven to be more durable over the long term. Saw cut concrete joints rather than troweled improve the experience of path users.

# Shared-Use Paths in Abandoned Rail Corridors

## Description

Commonly referred to as Rails-to-Trails or Rail-Trails, these projects convert vacated rail corridors into off-street paths. Rail corridors offer several advantages, including relatively direct routes between major destinations and generally flat terrain.

In some cases, rail owners may rail-bank their corridors as an alternative to a complete abandonment of the line, thus preserving the rail corridor for possible future use.

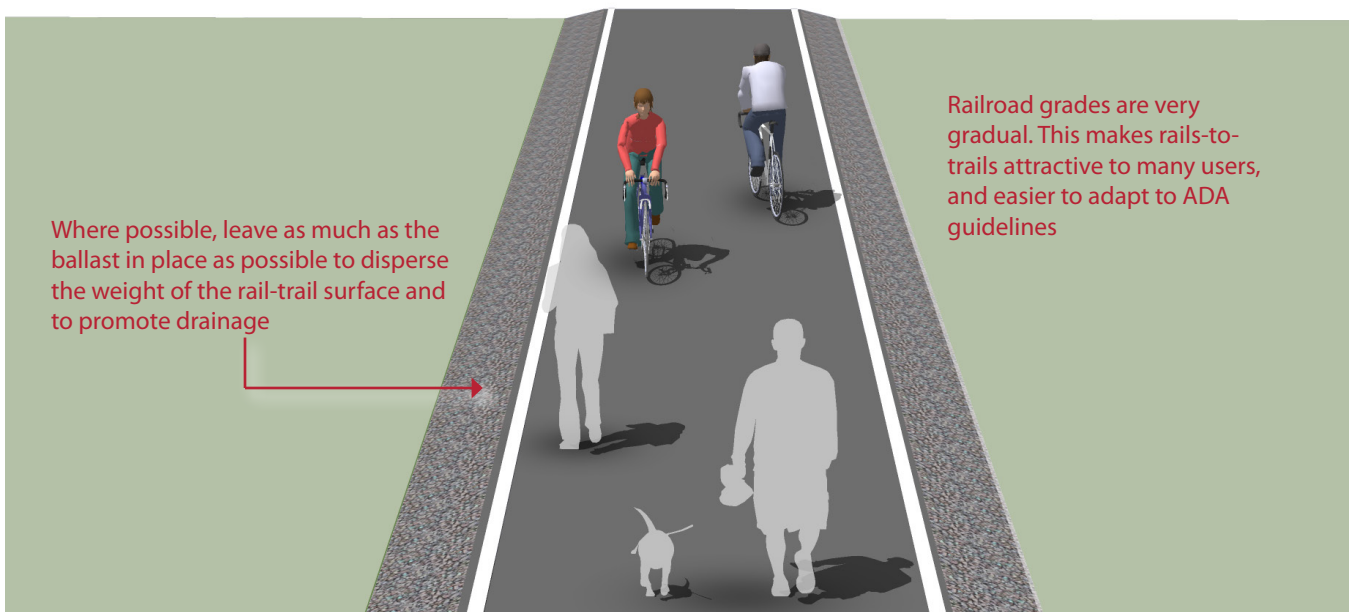
The railroad may form an agreement with any person, public or private, who would like to use the banked rail line as a trail or linear park until it is again needed for rail use. Municipalities should acquire abandoned rail rights-of-way whenever possible to preserve the opportunity for trail development.

## Guidance

Shared-use paths in abandoned rail corridors should meet or exceed general design practices. If additional width allows, wider paths, and landscaping are desirable.

In full conversions of abandoned rail corridors, the sub-base, superstructure, drainage, bridges, and crossings are already established. Design becomes a matter of working with the existing infrastructure to meet the needs of a rail-trail.

If converting a rail bed adjacent to an active rail line, see Shared-Use Paths in Existing Active Rail Corridors.



## Discussion

It is often impractical and costly to add material to existing railroad bed fill slopes. This results in trails that meet minimum path widths, but often lack preferred shoulder and lateral clearance widths.

Rail-to-trails can involve many challenges including the acquisition of the right of way, cleanup and removal of toxic substances, and rehabilitation of tunnels, trestles and culverts. A structural engineer should evaluate existing railroad bridges for structural integrity to ensure they are capable of carrying the appropriate design loads.

## Additional References and Guidelines

AASHTO. (2012). Guide for the Development of Bicycle Facilities.  
FHWA. (2009). Manual on Uniform Traffic Control Devices.  
Flink, C. (1993). Greenways: A Guide To Planning Design And Development.

## Materials and Maintenance

Asphalt is the most common surface for bicycle paths. The use of concrete for paths has proven to be more durable over the long term. Saw cut concrete joints rather than troweled improve the experience of path users.

## Shared-Use Paths in Active Rail Corridors

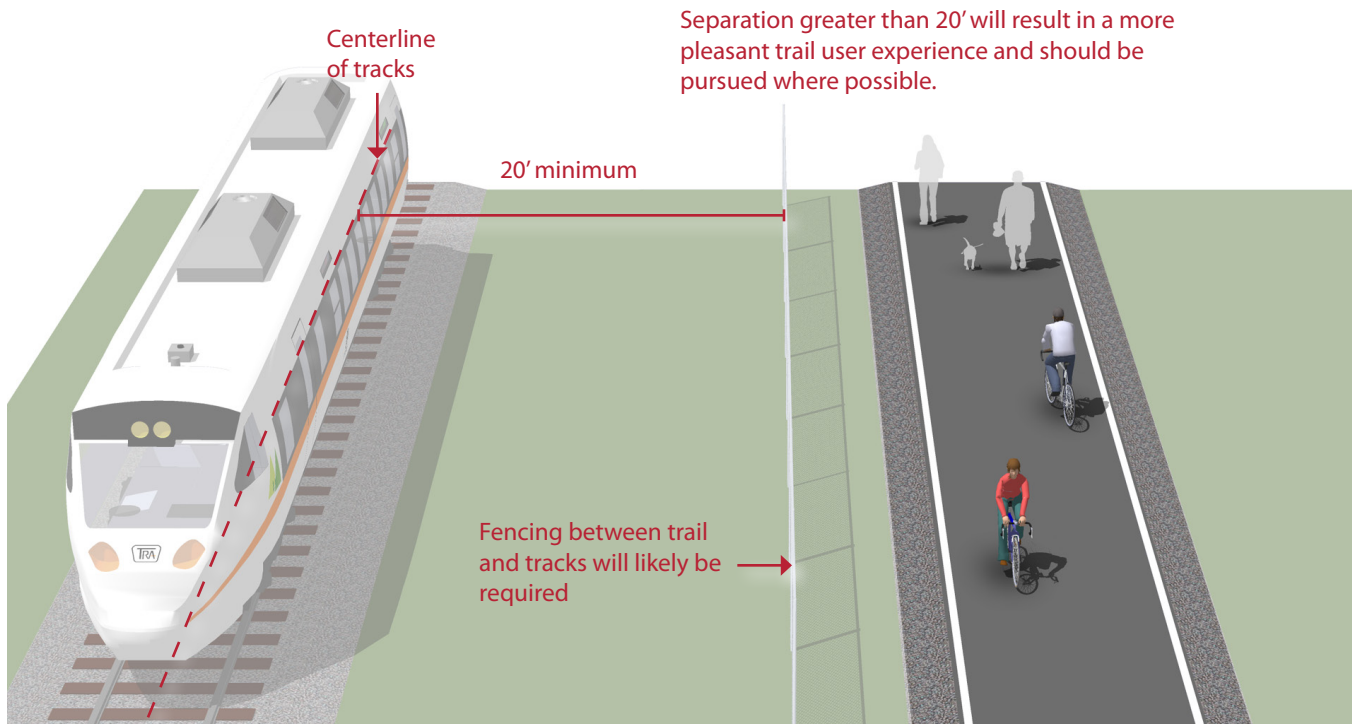
### Description

Rails-with-Trails projects typically consist of paths adjacent to active railroads. It should be noted that some constraints could impact the feasibility of rail-with-trail projects. In some cases, space needs to be preserved for future planned freight, transit or commuter rail service. In other cases, limited right-of-way width, inadequate setbacks, concerns about safety/trespassing, and numerous mid-block crossings may affect a project's feasibility.

### Guidance

Shared-use paths in utility corridors should meet or exceed general design practices. If additional width allows, wider paths, and landscaping are desirable.

If required, fencing should be a minimum of 5 feet in height with higher fencing usual next to sensitive areas such as switching yards. Setbacks from the active rail line will vary depending on the speed and frequency of trains, and available right-of-way.



### Discussion

Railroads typically require fencing with all rail-with-trail projects. Concerns with trespassing and security can vary with the amount of train traffic on the adjacent rail line and the setting of the bicycle path, i.e. whether the section of track is in an urban or rural setting.

### Additional References and Guidelines

AASHTO. (2012). Guide for the Development of Bicycle Facilities.  
 FHWA. (2009). Manual on Uniform Traffic Control Devices.  
 FHWA. (2002). Rails-with-Trails: Lessons Learned.

### Materials and Maintenance

Asphalt is the most common surface for bicycle paths. The use of concrete for paths has proven to be more durable over the long term. Saw cut concrete joints rather than troweled improve the experience of path users.

# Shared-Use Paths Along Roadways

## Description

A shared-use path allows for two-way, off-street bicycle use and also may be used by pedestrians, skaters, wheelchair users, joggers and other non-motorized users. These facilities are frequently found in parks, along rivers, beaches, and in greenbelts or utility corridors where there are few conflicts with motorized vehicles.

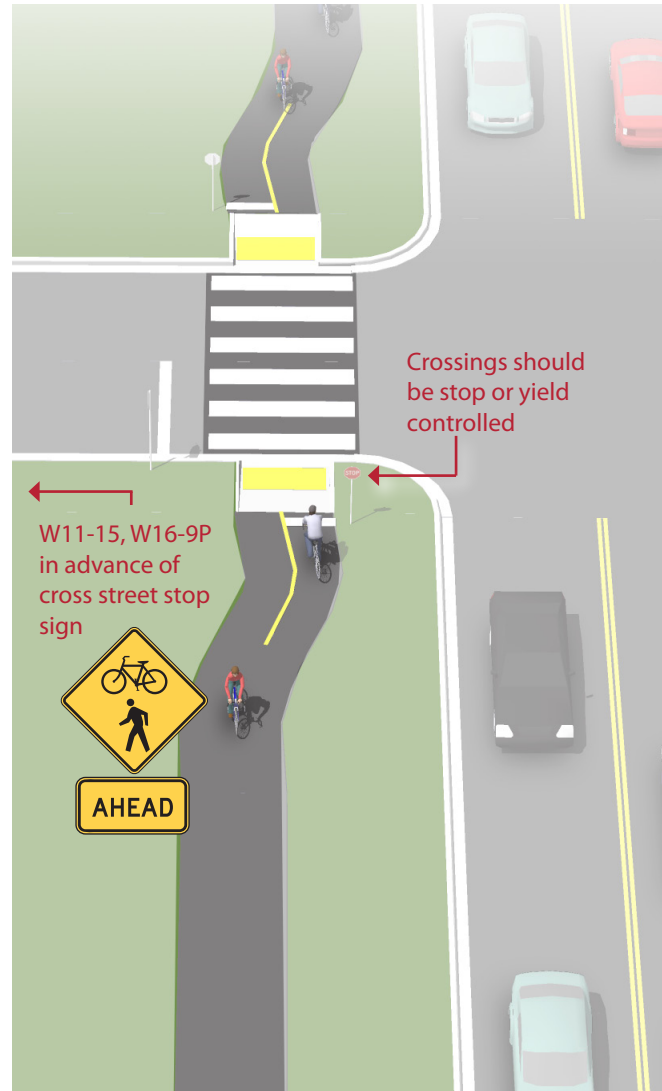
Along roadways, these facilities create a situation where a portion of the bicycle traffic rides against the normal flow of motor vehicle traffic and can result in wrong-way riding where bicyclists enter or leave the path.

The AASHTO Guide for the Development of Bicycle Facilities generally recommends against the development of shared-use paths directly adjacent to roadways.

## Guidance

- 8 feet is the minimum allowed for a two-way bicycle path and is only recommended for low traffic situations.
- 10 feet is recommended in most situations and will be adequate for moderate to heavy use.
- 12 feet is recommended for heavy use situations with high concentrations of multiple users such as joggers, bicyclists, rollerbladers and pedestrians. A separate track (5' minimum) can be provided for pedestrian use.
- Bicycle lanes should be provided as an alternate (more transportation-oriented) facility whenever possible.

Pay special attention to the entrance/exit of the path as bicyclists may continue to travel on the wrong side of the street.



## Discussion

When designing a bikeway network, the presence of a nearby or parallel path should not be used as a reason to not provide adequate shoulder or bicycle lane width on the roadway, as the on-street bicycle facility will generally be superior to the "sidepath" for experienced bicyclists and those who are cycling for transportation purposes.

## Additional References and Guidelines

AASHTO. (2012). Guide for the Development of Bicycle Facilities.  
NACTO. (2012). Urban Bikeway Design Guide. See entry on Raised Cycle Tracks.  
WisDOT. (2009). Wisconsin Bicycle Facility Design Handbook.

## Materials and Maintenance

Asphalt is the most common surface for bicycle paths. The use of concrete for paths has proven to be more durable over the long term. Saw cut concrete joints rather than troweled improve the experience of path users.

## Bikeway Signing

The ability to navigate through a city is informed by landmarks, natural features and other visual cues. Signs throughout the city should indicate to bicyclists:

- Direction of travel
- Location of destinations
- Travel time/distance to those destinations

These signs will increase users' comfort and accessibility to the bicycle systems.

Signage can serve both wayfinding and safety purposes including:

- Helping to familiarize users with the bicycle network
- Helping users identify the best routes to destinations
- Helping to address misperceptions about time and distance
- Helping overcome a "barrier to entry" for people who are not frequent bicyclists (e.g., "interested but concerned" bicyclists)

A community-wide bicycle wayfinding signage plan would identify:

- Sign locations
- Sign type – what information should be included and design features
- Destinations to be highlighted on each sign – key destinations for bicyclists
- Approximate distance and travel time to each destination

Bicycle wayfinding signs also visually cue motorists that they are driving along a bicycle route and should use caution. Signs are typically placed at key locations leading to and along bicycle routes, including the intersection of multiple routes. Too many road signs tend to clutter the right-of-way, and it is recommended that these signs be posted at a level most visible to bicyclists rather than per vehicle signage standards.

### Wayfinding Sign Types



### Wayfinding Sign Placement



# Wayfinding Sign Types

## Description

A bicycle wayfinding system consists of comprehensive signing and/or pavement markings to guide bicyclists to their destinations along preferred bicycle routes. There are three general types of wayfinding signs:

### Confirmation Signs

Indicate to bicyclists that they are on a designated bikeway. Make motorists aware of the bicycle route.

Can include destinations and distance/time. Do not include arrows.

### Turn Signs

Indicate where a bikeway turns from one street onto another street. Can be used with pavement markings.

Include destinations and arrows.

### Decisions Signs

Mark the junction of two or more bikeways.

Inform bicyclists of the designated bike route to access key destinations.

Destinations and arrows, distances and travel times are optional but recommended.



## Discussion

There is no standard color for bicycle wayfinding signage. Section 1A.12 of the MUTCD establishes the general meaning for signage colors. Green is the color used for directional guidance and is the most common color of bicycle wayfinding signage in the US, including those in the MUTCD.

## Additional References and Guidelines

AASHTO. (2012). Guide for the Development of Bicycle Facilities.  
FHWA. (2009). Manual on Uniform Traffic Control Devices.  
NACTO. (2012). Urban Bikeway Design Guide.

## Materials and Maintenance

Maintenance needs for bicycle wayfinding signs are similar to other signs and will need periodic replacement due to wear.



# Wayfinding Sign Placement

## Confirmation Signs

Every ¼ to ½ mile on off-street facilities and every 2 to 3 blocks along on-street bicycle facilities, unless another type of sign is used (e.g., within 150 ft of a turn or decision sign). Should be placed soon after turns to confirm destination(s). Pavement markings can also act as confirmation that a bicyclist is on a preferred route.

## Turn Signs

Near-side of intersections where bike routes turn (e.g., where the street ceases to be a bicycle route or does not go through). Pavement markings can also indicate the need to turn to the bicyclist.

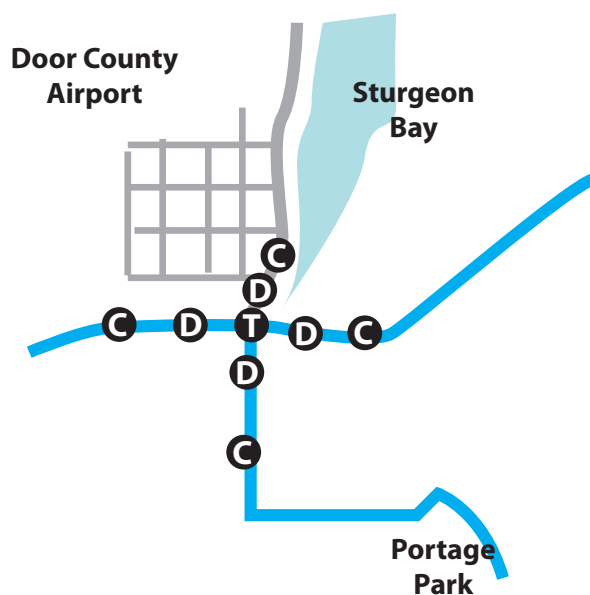
## Guidance

Signs are typically placed at decision points along bicycle routes – typically at the intersection of two or more bikeways and at other key locations leading to and along bicycle routes.

## Decisions Signs

Near-side of intersections in advance of a junction with another bicycle route.

Along a route to indicate a nearby destination.



## D Decision Sign



## C Confirmation Sign



## T Turn Sign



## Discussion

It can be useful to classify a list of destinations for inclusion on the signs based on their relative importance to users throughout the area. A particular destination's ranking in the hierarchy can be used to determine the physical distance from which the locations are signed. For example, primary destinations (such as the downtown area) may be included on signage up to five miles away. Secondary destinations (such as a transit station) may be included on signage up to two miles away. Tertiary destinations (such as a park) may be included on signage up to one mile away.

## Additional References and Guidelines

AASHTO. (2012). Guide for the Development of Bicycle Facilities.  
FHWA. (2009). Manual on Uniform Traffic Control Devices.  
NACTO. (2012). Urban Bikeway Design Guide.

## Materials and Maintenance

Maintenance needs for bicycle wayfinding signs are similar to other signs and will need periodic replacement due to wear.

*This Page Intentionally Left Blank*

## Appendix G: Ahnapee Trail Extension Feasibility Study

The following appendix presents a long-term vision for a northern extension of the Ahnapee State Trail. This project will go far beyond the planning horizon of the Door County Bicycle, Pedestrian and Recreational Facilities Plan, and as such potential alignment alternatives are not identified in detail.

The reality of a long-term implementation should not discourage efforts for further planning and design. Only with a dedicated, concerted effort will a project of this magnitude be completed.

### Setting

From downtown Sturgeon Bay, the 46-mile, county-operated Ahnapee State trail winds its way in a southerly direction along the Ahnapee and Kewaunee rivers to Algoma, Casco, Luxemburg and Kewaunee, passing by a mixture of evergreen glades, farmland, prairies and wooded areas teeming with wildlife and native wildflowers.

The trail is a rail-to-trail conversion, following the route of the old Ahnapee and Western Railway (A&W). The multi-use trail varies in width from 8 to 10 feet wide, with a crushed limestone surface. The trail is used by hikers, bikers, and equestrians seasonally and by snowmobilers and cross-country skiers in the winter. Although it is technically a state trail, annual passes for cyclists are not required. The trail is an important link in the snowmobile network as it connects with 95 miles of snowmobile trails in Kewaunee County and 275 miles of trail in Door County.

### Recent Plans and Development

The original 1975 Master Plan for the Ahnapee State Trail identified the alignment of the abandoned rail line as the location for the new recreational trail, specified locations of trailheads and rest areas and set standards for surface materials. The recommendations and spirit of the original plan have been almost fully implemented as envisioned by the original Department of Natural Resources (DNR) plan. Since that time, new development and planning relevant to the Ahnapee State Trail have been pursued.

#### Door County Parks and Open Space Plan 2011-2015

In 1994, Door County signed a 15-year renewable lease with the Wisconsin Department of Natural Resources for the operation and maintenance of the Ahnapee State Trail. The lease designated that the trail become a part of the County Parks System. In 1995, funding in excess of \$175,000 was provided through state and federal funds to upgrade and improve the trail under the supervision of the Door County Parks Department. The trail was raised in low areas, and several culverts were installed, and it was resurfaced to a 10' width. Door County's responsibility for trail maintenance and supervision runs from the south county line at County Line Road, 12 miles north to, and including, the parking lot just east of Neenah Street in Sturgeon Bay. In 1998, over 5000 trees and shrubs were planted along open areas of the trail's right-of-way, and repairs to the restrooms and parking lot at Neenah Street were made. The entire trail is mechanically brushed every other fall.

The Ahnapee is a multi-faceted trail. Brushing, weed control, mowing and grading are annual or biannual maintenance requirements. A wayside is currently under development in Maplewood at an old abandoned gas station. Screening fencing, restrooms and a small parking area are planned as funding becomes available. Privately owned property south of the trail between Highway 42 and County H has been donated to the

county and has been developed as a part of the proposed wayside. The old trailhead, parking lot, and restrooms at the Sturgeon Bay city limits are being refurbished as funds become available. Restrooms at the Forestville wayside (Forestville Dam County Park) were replaced in 2006. Currently land is being acquired, by the State of Wisconsin, to extend the Ahnapee Trail from the north parking lot to the Bayview Bridge. Negotiations are also underway with the Wisconsin Department of Transportation to provide a trail extension north of the Bayview Bridge up to Michigan Street, plus a Memorial Drive connection is planned on the north end of the Bayview Bridge. The Door County Parks Department long range goal is to provide a trail up to the north split of Highway 42-57.

## Existing Conditions

### Alignment

The 46-mile trail winds its way in a southerly direction along the Ahnapee and Kewaunee rivers to Algoma, Casco, Luxemburg and Kewaunee. Near Sunset Road in Kewaunee County, the trail branches off in three directions, west to Luxemburg, northeast towards Algoma, and southeast towards the city of Kewaunee.



### Current Design

The Ahnapee Trail currently varies in width from 8 to 10 feet wide with a crushed limestone surface. User groups vary by season and include hikers, bikers, and equestrians, snowmobilers and cross-country skiers.

## Current Use

### Current Uses

The trail may bring a number of different users to the trail at the same time. It is important to use good trail etiquette to ensure the enjoyment and safety of all trail users

Walking, Running and Biking

The level grade and limestone surface make this trail suitable for bicyclists, walkers, and runners. As noted earlier, bikers do not need a trail pass while using the trail. Due to the possibility of hoof marks in the trail surface, wider-tire bicycles are recommended. Pets are welcome on the trail, as long as pet owners have the pet on a leash, 8 feet or shorter, at all times.

### **Snowmobiles**

Snowmobiles are permitted on the trail. Operators must follow all Wisconsin snowmobile laws, including traveling no more than 15 miles per hour within any village limit. The trail also connects to numerous miles of county snowmobile trails.

### **Cross Country Skiers**

The trail is open to cross-country skiing and snowshoeing, however, the trail is not groomed, and skiers and snowshoers must share the trail with snowmobiles. Skiers do not need a trail pass while using the trail.

### **Horse Enthusiasts/Equestrians**

Equestrian use of the trail is available from April 15 to November 15. Riders are asked to limit their use of the trail immediately following a heavy rainfall to reduce the amount of damage to the trail and they must pick up after their horse. Two categories of horse enthusiast groups have expressed interest in the Ahnapee Trail extension planning efforts: saddle horse/trail riders and drivers (carriages and carts). Each group has distinct trail planning considerations that range from trailhead improvements that can accommodate trailers to trail design and surface requirements.

Despite their significant numbers and presence in Door County, Horse Enthusiasts (trail riders and drivers) have relatively few opportunities in Door County in terms of public trail facilities. Within or near the Ahnapee extension planning corridor there are few public horse trail sites.

The extension of the Ahnapee could provide additional permanent or seasonal “outside the park” routes that would be attractive to this user group and conveniently accessible to current users. Wisconsin DNR trail design standards indicate that trails should be 7 miles or longer in order to provide the best equestrian experience.

Route planning and facility considerations specific to equestrian use include trail surfacing, natural resource protection, and appropriate design for shared use facilities such as bridges and highway crossings.

The extension of the Ahnapee Trail is also an opportunity:

- To provide off street routes to minimized motorized vehicle vs. horse conflicts
- To facilitate equestrian travel throughout all of Door County
- For horse enthusiasts and equine-related businesses in the area to expand their sport with public outreach efforts and promotional events and activities.
- To expand the appeal and feasibility of Door County as a tourism destination for equestrians.

# Trail Design Considerations

## Shared Use Trails

### Need/Intent

The shared-use trail or path is the main component of the Ahnapee Trail and serves as both an extension of the surrounding communities' transportation network and as a recreation facility. As such, an extension of this facility will provide the framework for connecting communities, schools, parks, civic facilities, and workplaces for all levels of users.

### Trail Design Considerations

- **Materials:** Trails can be built out of a variety of materials, but should be constructed as a hard, smooth surface free of tread obstacles that makes travel by foot, bike, or horse easy and accessible.
- **Width:** Trail width shall be 12 feet where feasible, and a minimum of 10 feet. In cases of limited right-of-way, an 8-foot wide trail may be used.
- **Clear Zone:** A clear zone should occur on both sides of the shared-use path at a minimum of 2 feet wide. Area should be graded at a maximum slope of 6:1.
- **Vertical Clearance:** Clear height zone should be a minimum of 8 feet.
- **Drainage:** For drainage, slope should not exceed a uniform cross slope of 2 percent.
- **Design Criteria:** Shared-use path shall comply with all AASHTO requirements for design speed, surface type, sight lines, stopping distances, and grades.
- **Minimum Curve Radius:** 95' as per AASHTO guidelines.
- **Profile Grades:** Maximum recommended grade for shared-use paths is 5 percent. Grades steeper than 5 percent are possible, but should be restricted to distances as indicate in the AASHTO Guide.
- **Edge Protection:** Fencing or other barriers should be used along shared-use paths only in areas where safety is a concern. If fences or barriers are used, they should be a minimum of 42 inches high and should include rub-rails for the safety of bicyclists and wheelchair users.

## Trails and Natural Corridors

### Intent

When passing through natural and environmentally sensitive environments, such as the environment in which most of the Ahnapee is located, the shared-use path system should respect natural conditions, minimize disturbance to existing conditions, protect cultural resources, and minimize disturbance of biodiversity.

### Trail Design Considerations

- Where possible, shared-use path placement should avoid all naturally sensitive environments such as wetlands, streams, mature tree stands, and endangered flora and fauna. The shared-use path should be placed no closer than 30 feet from such areas. In areas where the shared-use path will impact sensitive areas, trail construction should be done in a manner to minimize disturbance and use sustainable methods for construction of shared-use path.
- The shared-use path and associated amenities should be designed to blend in with the natural context of the environment, and should not create a visual obstruction on the landscape.
- When designing a shared-use path, the path location should take advantage of significant scenic views.
- Shared-use paths should avoid direct impact of all known habitat areas to the greatest extent possible.
- Except in forested areas, shared-use path should be placed outside of the dripline of significantly-sized trees to protect roots from trail construction. In forested areas, shared-use path alignment should be designed to minimize impact to the forest.
- In natural areas, native plants and grasses should be used in landscaping along the shared-use path.
- 6-foot clear zones should be maintained/mowed in natural areas so as not to obscure potential obstructions.
- On sloped areas, uphill drainage as well as other standard drainage should be incorporated into the design to prevent trail damage.

## Trail / Roadway Crossings

### Intent

Shared-use paths need to be specially designed at all roadway intersections to create the safest solution for all users and vehicles.

### Design Considerations

- The greatest potential safety hazard to users is when a shared-use path crosses a roadway, driveway, railroad, watercourse, or another sidewalk or shared-use path. The best way to increase safety is to increase visibility. It is important that crossings are visible both to trail users and to motorized vehicles.
- At-grade crossings should be used when roadway traffic volumes are low, where shared-use paths cross roadways at existing traffic signals, or when local conditions restrict the ability to implement a grade-separated crossing.
- Mid-block crossings may be used with special design consideration that would include possible pedestrian crossing devices, pavement markings or striping, and signage.
- Shared-use paths should cross roadways at right angles. In cases where shared-use paths approach the roadway at a skewed angle, the shared-use path should be routed to achieve a right-angle crossing wherever possible.
- Visibility is very important for motorists and trail users so they will be able to see each other at roadway crossings. A motorist needs to be able to stop in time if a trail user is in the road, and a trail user needs to be able to judge his or her ability to cross the street safely.
- Signage, striping and other pavement markings, and signals are the three basic components of at-grade crossings. All regulatory signage shall comply with MUTCD's *Traffic Controls for Bicycle Facilities*.
- Where practical, curb radii of street intersections should be minimal to reduce the length of pedestrian and trail crossings. Determination of exact radii shall be dependent on design vehicle, width of the approach and receiving lanes, and the curb radius itself.



## Surface Material Selection

The most likely material to be used in the extension of the Ahnapée Trail is gravel, to match the existing segments of trail. Some sections subject to increased wear (such as regular heavy flooding, or high-use village areas) should be considered for construction out of asphalt or concrete, and where possible, provide an alternate surface for equestrian use.

With any pathway, it is extremely important to understand and compensate for the types of maintenance and emergency vehicles that will be used on the trail. If heavy equipment will be used to trim trees, mow grass, etc., then it is crucial to design the sub-base and surface to accommodate this loading. Moreover, it is important to understand the quality of the sub-grade (i.e., wet and/or poor material), and either stabilize the soil with lime, cement or geotextile, or strengthen the trail structure to compensate for the unstable soil.

The discussion and tables below summarize the available materials and relevant considerations for use on multi-use paths.



### Asphalt

Asphalt is the most common surface material for multi-use paths. Like concrete, asphalt has a higher construction cost, lower maintenance costs and requirements, and higher longevity. It also shares similar permeability properties with concrete, so proper drainage is necessary. Water damage due to runoff, erosion, and subsurface damage will necessitate periodic repair.

### Concrete

Concrete is the second-most expensive trail surface material, but it lasts the longest and has the lowest upkeep. It is highly impervious, and so sufficient drainage is necessary to avoid stormwater runoff, pooling, and erosion. Permeable concrete varieties are also available. Concrete is ideal for almost all trail uses, including pedestrians, bicycles, wheelchair/mobility devices, in-line skates, and ATVs, however it is not advisable for equestrian uses, unless a natural shoulder of sufficient width is provided alongside the concrete path.

### **Chip Seal**

Chip seal combines layers of asphalt and fine aggregate. It is cheaper than asphalt but also requires more maintenance/replacement. Chip seal surfaces provide a rougher surface for wheeled user types, including wheelchairs.

### **Pavers**

Pavers like concrete and asphalt provide a high level of firmness and stability, and when properly installed, provide a smooth and consistent surface for wheeled devices.

### **Crusher Fines**

Crusher fines/aggregate, rock/gravel, soil-binding/soil-stabilizer mix can provide varying degrees of firmness and stability. In some cases, this surface material may be sufficient for wheel chair/mobility device users.

### **Composites**

Composite (plastics, rubber) recycled materials offer durable, low cost alternatives to wood or impermeable surfaces such as concrete or asphalt. They have the added benefits of often being manufactured from recycled material. Information regarding cost and long-term maintenance is limited.

### **Wood Plank**

Wood plank pathways are typically constructed over wetlands or sand surfaces. They require ballast or other substructures for stability. Generally, the use of wood is limited to boardwalks and elevated segments of the path due to cost. Ties should be spaced so as not to create tripping hazards or impede wheeled devices including wheelchairs.

### **Bark/Wood Chip**

Bark/wood chip is ideal for joggers and equestrian uses, but is not suitable for bicyclists and other wheeled uses since it lacks the firmness and stability required by those uses. Bark/wood chip is not accessible by wheelchair or other mobility devices. Bark/wood chip trails degrade relatively quickly, and involve a high degree of maintenance and replacement. Wood planer shavings and Filbert shells are better suited for landscaping and not advisable as trail surface materials since they generally provide very low surface firmness and stability and requires constant maintenance.

### **Earthen Materials**

Earthen materials, such as soil and clay are lower cost and lower maintenance surface materials, but they are not often advisable for wheelchair/mobility device users. Like crushed/granular stone, this depends on the level of compaction and resulting surface firmness and stability. Sand is generally not recommended for most trail user types as it generally provides very low surface firmness and stability and constant maintenance.

**Table G-1: Surface Material Attributes**

Surface Material	User Types	Environmental Impacts	Costs	Longevity/ Maintenance	ADA Issues	Transportation Use
<b>Asphalt</b>	Pedestrians (including mobility devices and wheelchairs ), Bikes, ATVs/ and snowmobiles	Impervious – increased stormwater runoff. May require deeper excavation for subbase material, resulting in root removal/damage. Pervious asphalt provides for enhanced infiltration and reduced runoff.	Expensive \$200K- \$300K/mile	7-15 years, lower maintenance, however cracks/potholes will need ongoing maintenance	None	Yes
<b>Concrete</b>	Pedestrians (including wheelchairs and mobility devices), Bikes, in-line skates, ATVs/ snowmobiles	Impervious – increased stormwater runoff. Pervious concrete provides for enhanced infiltration and reduced runoff.	Expensive \$300K- \$500K/mile	25 years, low maintenance	None	Yes
<b>Chip Seal</b>	Pedestrians (including wheelchairs and mobility devices), Bikes, ATVs/ snowmobiles	Impervious – increased stormwater runoff. May require deeper excavation for subbase material, resulting in root removal/damage.	Moderately expensive	7-10 Years, lower maintenance however cracks and potholes will need ongoing maintenance	None	Yes
<b>Pavers</b>	Pedestrians, Bikes, Wheelchair/mobility devices (depends), ATVs/snowmobiles	Porous/Pervious types provide enhanced drainage properties	Varies	15 years	Surface should be smooth and continuous. Minimize gaps/cracks.	Yes
<b>Crusher fines</b>	Pedestrians, Bikes, Wheelchair/mobility devices (depends), equestrian, ATVs/ snowmobiles	Potential for runoff and erosion depends on size of surface and sub-base aggregate and level of compaction.	Moderate \$80K-\$120K	2-5 years depending on maintenance	For aggregate surfaces to be used by wheelchair/ mobility devices they must be sufficiently firm, stable, and smooth. Large, loose aggregate that can shift or sink under foot are not suitable or compliant with ADA guidelines.	Yes
<b>Composites</b>	Pedestrian ( including wheelchairs/mobility devices), bikes	None	Cost varies	Longevity/ maintenance unknown	None	Yes
<b>Wood</b>	Pedestrians, bikes, ATVs	Low/none	Most expensive \$1.5M- \$2M/mile	Moderate maintenance	Gaps between planks/ties should be closed or filled so as not to impede wheeled devices	Yes
<b>Bark/Wood chip</b>	Pedestrians, equestrians	Do not use in areas that experience regular flooding.	Moderate - high (\$65K- \$85K/2 years)	High maintenance, replace every 1-3 years, top dress annually	Not compliant with ADA guidelines	No
<b>Earthen materials</b>	Pedestrians, bike, equestrians, ATVs/ snowmobiles	Need to address drainage and erosion issues.	Low	Moderate maintenance, tree roots and stones should be removed	Not compliant with ADA guidelines	No

## ADA Considerations

General guidelines have been created in response to the American with Disabilities Act (ADA) for accessible trails. Constructing outdoor trails may have limitations that make meeting ADA guidelines difficult and sometimes prohibitive. Prohibitive impacts include: harm to significant cultural or natural resources, a significant change in the intended purpose of the trail, requirements of construction methods that are against federal, state or local regulations, or terrain characteristics that prevent compliance. The following standards serve to accommodate persons with disabilities in feasible situations.

**Table G-2: Accessible Trail Design Guidelines**

<b>Trail Feature</b>	<b>Guidelines</b>	<b>Purpose</b>
<b>Trail Surface</b>	Hard surface such as, asphalt, concrete, wood, compacted gravel	Provide smooth surface that accommodates
<b>Trail Gradient</b>	Trail Gradient Less than 5% maximum without landings. Less than 8.33% maximum with landings	Greater than 5% is too strenuous for wheelchair users
<b>Trail Cross Slope</b>	2% maximum	Provide positive trail drainage, avoid excessive gravitational pull to side of trail
<b>Trail Width</b>	5' minimum	Accommodate a wide variety of users and allows for the passage of two wheelchairs
<b>Trail Amenities, (phones, drinking fountains, and pedestrian- actuated buttons)</b>	Place no higher than 4' off ground	Provide access within reach of wheelchair users
<b>Detectable pavement changes at curb ramp approaches</b>	Place at top of ramp before entering roadways	Provide visual and/or tactile cues for visually impaired users
<b>Trailhead Signage</b>	Accessibility information such as trail gradient/ profile, distances, tread conditions, location of drinking fountains and rest stops	User convenience and safety
<b>Parking</b>	Provide at least one accessible parking area per every 25 vehicles spaces at each trailhead	User convenience and safety
<b>Rest Areas</b>	On trails specifically designated as accessible, provide rest areas or widened areas on the trail optimally at every 300 feet	User convenience and safety

## User Group Management

Specific attention needs to be paid to the definition of multi-use in the case of the Ahnapee Trail. Currently, equestrians are a designated user group and more information should be provided to other users as how to interact with horses on the trail. Specifically, when a bicyclist or walker/runner encounters a horse it is best to pull off to the side and wait for them to pass. Passing them quickly without warning can cause the animal to spook. Cyclists and pedestrians should call out loudly, clearly, and politely so the rider and horse acknowledge you. Equestrians may need to reposition their horse to see other users approaching, which is safer for all. Watch for hand signals and listen for the rider to guide the encounter as they may need cyclists to slow down or stop while they pass.

## Economic Impact

An integrated and consistent trail system can result in significant economic benefits to the region. The types of economic benefits include: increased property values, tourism revenue, increased consumer spending, local business expansion, public spending savings, and household savings.

A number of studies show that home prices near trails are higher than home prices farther away from trails. Along the Little Miami Scenic Trail in Ohio, an increased sales price of \$7.05 for each foot closer to the trail was recorded. This study was conducted in response to concerns by residents of property value decreases due to an increase of crime, traffic and noise resulting from the trail. In 2006, a study analyzed home values in seven Massachusetts towns near the Minuteman Bikeway and Nashua River Rail Trail. Homes near the trails sold at 99.3 percent of the listing price, compared to 98.1 percent for other homes in these towns. Additionally, homes near the trails sold an average of 20 days faster compared to other homes. Findings from the Trust for Public Land's Economic Benefits of Parks and Open Space (1999) and the Rails-to-Trails Conservancy's Economic Benefits of Trails and Greenways (2005) provide additional examples for how this value is realized in property value across the country. For example, in Apex, NC, the Shepard's Vineyard housing development added \$5,000 to the price of 40 homes adjacent to the regional greenway – and those homes were still the first to sell. In Salem, OR, land adjacent to a greenbelt was found to be worth about \$1,200 per acre more than land only 1000 feet away.

Bicycle-related tourism has been shown to bring in significant revenue to a region. Studies of bicycle tourism in Colorado, Maine, and the Outer Banks Region of North Carolina estimate annual bicycle tourism revenues ranging from \$15 million to \$193 million in 1999 dollars.

Bicycle and pedestrian facilities can also lead to increased spending by consumers. A 1991 National Park Service study found that long rural trails generated more revenue per person than shorter urban trails. The study estimated average expenditures of rail-trail users at \$1.90 per person to \$14.88 per person.

A high-quality bicycling environment can bring bicycle-related businesses to the region. Portland, Oregon's bicycle industry was worth approximately \$90 million in 2009. A study of the economic impact of bicycling in Colorado found that manufacturing contributes \$763 million, and retail sales and service contribute up to \$193 million to that region.

Bicycle and pedestrian infrastructure saves public dollars as well. A lane of roadway will accommodate five to ten times more pedestrian and bicycle traffic than driving and the cost of bicycling and pedestrian infrastructure is just a small fraction of that of building highways. Trails and paths can also be efficient connections to transit, reducing the need for expensive and land-gobbling park and-ride stations.

Household savings can be found by utilizing non-motorized transportation. Transportation is second to housing as a proportion of household budgets. Between 2002 and 2008, fuel costs rose from 3% of household expenditures to 8.5%. Walking and/or bicycling can help the community shave transportation expenses from their budgets.

## Property Acquisition and Funding

The Door County Parks & Open Space Plan 2011-2015 identifies key priorities for land acquisition projects:

- Projects involving acquisition of land adjacent to lake waters to increase public water access opportunities particularly on the Lake Michigan shore between Baileys Harbor and Sturgeon Bay.
- Projects to provide increased public access to Cana Island including additional parking facilities.
- Projects to expand present park lands either for reasons of satisfying additional space needs, protection of critical landforms or natural areas, or protecting the environmental integrity of a park.
- Projects involving lands capable of supporting multi-seasonal activities.

A northern extension of the Ahnapee State Trail has the potential to fulfill all identified priorities, and is a good candidate for land acquisition.

### Right-Of-Way Acquisition Strategies for Trails

The relationship of the parties in a trail corridor will be driven to a great extent by which entity holds the dominant property interest. The type of property acquisition influences both the ease of implementing the project and the liability burden. There are five types of property acquisition: donation, purchases, landowner incentive measures, conservation easements, and licenses.

#### Donation

A landowner may donate property for a trail.

#### Purchases

##### Market Value Purchase

Through a written purchase and sale agreement, a local government purchases land at the present market value based on an independent appraisal. Timing, payment of real estate taxes, and other contingencies are negotiable.

##### Partial Value Purchase (or Bargain Sale)

In a bargain sale, the landowner agrees to sell for less than the property's fair market value. A landowner's decision to proceed with a bargain sale is unique and personal; landowners with a strong sense of civic pride, long community history or concerns about capital gains are possible candidates for this approach. In addition to cash proceeds upon closing, the landowner may be entitled to a charitable income tax deduction based on the difference between the land's fair market value and its sale price.

##### Option to Purchase Agreement

This is a binding contract between a landowner and the local government that would only apply according to the conditions of the option and limits the seller's power to revoke an offer. Once in place and signed, the Option Agreement may be triggered at a future, specified date or upon the completion of designated

conditions. Option Agreements can be made for any time duration and can include all of the language pertinent to closing a property sale.

### **Right of First Refusal**

In this agreement, the landowner grants the local government the first chance to purchase the property once the landowner wishes to sell. The agreement does not establish the sale price for the property, and the landowner is free to refuse to sell it for the price offered by the government agency. This is the weakest form of agreement between an owner and a prospective buyer.

### **Life Estates & Bequests**

In the event a landowner wishes to remain on the property for a long period of time or until death, several variations on a sale agreement exist. In a life estate agreement, the landowner may continue to live on the land by donating a remainder interest and retaining a “reserved life estate.” Specifically, the landowner donates or sells the property to the local government, but reserves the right for the seller or any other named person to continue to live on and use the property. When the owner or other specified person dies or releases his/her life interest, full title and control over the property will be transferred to the local government. By donating a remainder interest, the landowner may be eligible for a tax deduction when the gift is made.

In a bequest, the landowner designates in a will or trust document that the property is to be transferred to the local government upon death. While a life estate offers the local government some degree of title control during the life of the landowner, a bequest does not. Unless the intent to bequest is disclosed to and known by the local government in advance, no guarantees exist with regard to the condition of the property upon transfer or to any liabilities that may exist.

## **Landowner Incentive Measures**

The following tools should be considered by the County and local municipalities as a means to incentivize developer participation in the development of the Ahnapee State Trail expansion.

### **Density Bonuses**

Density bonuses are a planning tool used to encourage a variety of public land use objectives, usually in urban areas. They offer the incentive of being able to develop at densities beyond current regulations in one area, in return for concessions in another. Density bonuses are applied to a single parcel or development. An example is allowing developers of multi-family units to build at higher densities if they provide a certain number of low income units or public open space. For density bonuses to work, market forces must support densities at a higher level than current regulations.

### **IRC 1031 Exchange**

If the landowner owns business or investment property, an IRC Section 1031 Exchange can facilitate the exchange of like-kind property solely for business or investment purposes. No capital gain or loss is recognized under Internal Revenue Code Section 1031 (see [www.irc.gov](http://www.irc.gov) for more details).

### **Conservation Easements**

In most instances, full ownership acquisition is not necessary for trail development, and, in many cases, is not really an option. Easements typically are acquired when the landowner is willing to forego use of the property and development rights for an extended period. Through a conservation easement, a landowner voluntarily

agrees to sell or donate certain rights associated with his or her property – often the right to subdivide or develop – and a private organization or public agency agrees to hold the right to enforce the landowner’s promise not to exercise those rights. In essence, the rights are forfeited and no longer exist. This is a legal agreement between the landowner and the local government (or private organization) that permanently limits uses of the land in order to conserve a portion of the property for public use or protection.

Typically, this approach is used to provide trail corridors where only a small portion of the land is needed or for the strategic protection of natural resources and habitat. The landowner still owns the property, but the use of the land is restricted. Conservation easements may result in an income tax deduction and reduced property taxes and estate taxes. The preservation and protection of habitat or resources lands may best be coordinated with the local land trust or conservancy, since that organization will likely have staff resources, a systematic planning approach and access to non-governmental funds to facilitate aggressive or large scale transactions.

The list below provides an overview of easement agreement issues.

### **Easement Agreement**

A model easement agreement should:

- Guarantee exclusive use or uses compatible.
- Be granted in perpetuity.
- Include air rights if there is any possible need for a structure.
- Broadly define purpose of the easement and identify all conceivable activities, uses, invitees, and vehicular types allowed to avoid any need to renegotiate with fee interest owner in future.
- State that all structures and fixtures installed as part of a trail are property of grantee.
- Include subsurface rights for use by utility franchises.

It is also understood that major landowners would want an easement agreement to address issues on their side. Through cooperative negotiation, the following issues should be addressed in an easement agreement:

- Access needs related to maintenance, etc.
- Trail management plan.
- Future improvements or modifications to the trail.

### **Licenses**

A license is usually a fixed-term agreement that provides limited rights to the licensee for use of the property. Typically, these are employed in situations when the property cannot be sold (e.g., a publicly owned, active electrical utility corridor), or the owner wants to retain use of and everyday control over the property. The trail management authority obtains permission to build and operate a trail. However, it will have little control over the property, and may be subject to some stringent requirements that complicate trail development and operation. The list below provides an example of model license agreement language.

### **License Agreement**

A model license agreement should:



- Provide an acceptable term length with an option to renew.
- Identify all conceivable activities, uses, invitees, and vehicular types.
- Provide clarity on maintenance responsibilities.
- Specify limits on other uses of license property.

As with easement agreements, property owners would want a license agreement to address issues on their side. Through cooperative negotiation, the following issues should be addressed in a license agreement:

Access needs related to maintenance, etc.

- Trail management plan.
- Future improvements or modifications to the trail.

### Condemnation of Property

Condemnation of property is typically a last resort for obtaining property for a project. Under this process, property is appropriated for public use under the right of eminent domain. This is typically done if it is determined that it is a public necessity. Condemnation can be of an entire lot (i.e., a full taking), or a portion thereof (i.e., a partial taking). The owner is compensated for the property condemned based on a fair valuation.

### Funding Opportunities

A variety of potential funding sources are available to help pay for the Ahnapee State Trail extension in Door County, including private, local, State, regional, and Federal funding programs. Many of these involve the completion of extensive applications with clear documentation of the project need, costs, and benefits, and which compete with similar applications from other communities.

A summary of potential public funding sources for trail projects is provided in Chapter 7 of this plan. Some are restricted to specific types of improvements. It is important to note that many of the funding sources are highly competitive and it is impossible to determine exactly which projects will be funded by which funding sources. It is also difficult to pinpoint the timing of projects, due to dependence on competitive funding sources, timing of related infrastructure and development projects, and the overall economy. The section below briefly highlights those programs most appropriate for funding trail construction.

### Rivers, Trails and Conservation Assistance Program

The Rivers, Trails and Conservation Assistance Program (RTCA) is a National Park Service program which provides technical assistance via direct staff involvement to establish and restore greenways, rivers, trails, watersheds and open space. The RTCA program provides only for planning assistance—there are no implementation funds available. Projects are prioritized for assistance based on criteria that include conserving significant community resources, fostering cooperation between agencies, serving a large number of users, encouraging public involvement in planning and implementation, and focusing on lasting accomplishments.

## Land and Water Conservation Fund

The Land and Water Conservation Fund (LWCF) is a Federally-funded program that provides funding to assist in preserving, developing, and assuring accessibility to outdoor recreation resources including but not limited to parks, trails, wildlife lands, and other lands and facilities desirable for individual active participation. Funds can be used for right-of-way acquisition and construction. These funds are administered by the Wisconsin Department of Natural Resources.

## Local Funding Sources

### Door County Capital Improvement Plan

Funding for trail and greenway projects could be provided by the Door County Capital Improvement Plan. Funding in the Transportation and/or Parks and Recreation components of the plan should be pursued.

### Local Bond Measures

Local bond measures, or levies, are usually initiated by voter-approved general obligation bonds for specific projects. Bond measures are typically limited by time based on the debt load of the local government or the project under focus. Funding from bond measures can be used for right-of-way acquisition, engineering, design and construction of pedestrian and bicycle facilities.

### Wisconsin Room Tax

A room tax is a tax that may be authorized by a municipality on the renting of sleeping rooms at hotels, motels, resorts, inns, bed & breakfasts and other lodging facilities in the local area. The tax rate can be set from 0 – 8%, with limited exceptions. Expenditure decisions are made locally by either

State law requires that at least 70% of Room Tax revenue must be spent on “tourism promotion and development”, which is now also defined in the statute. The remaining revenue (0 – 30%) is available for the municipality to spend as determined. This may include infrastructure or services supporting both those visiting the community and residents (such as police staffing at local parades or fireworks), or for other purposes determined by the municipality. In simplified language, the portion designated for “tourism promotion and development” must be spent on marketing projects to attract tourists, tourist informational services, or municipal development significantly used by tourists.

### Private Funding Sources and Volunteer Services

Local businesses can help defray some of the costs associated with trail and greenway development and operation. Some examples include:

- Cash donations
- Donations of services, equipment, and labor
- Discounted materials
- Contribution of employee volunteer time

### Foundations

Many trail elements, particularly if they have a focus on education, civic issues, health or the environment, can be funded through private foundations. Funding opportunities are better from local foundations and should

be approached before national foundations. It is important to keep in mind that many foundations only solicit grant proposals from non-profit organizations.

### **Land Trusts**

Land trusts are local, regional, or statewide nonprofit conservation organizations directly involved in helping protect natural, scenic, recreational, agricultural, historic, or cultural property. Land trusts work to preserve open land that is important to the communities and regions where they operate. Land trusts are typically more nimble than government agencies and can act more quickly on opportunities to acquire property. Some land trusts actively manage land, others recover properties to hand over to land management agencies. The Door County Land Trust should be involved in the extension of the Ahnapee trail from the beginning of the process.

### **Service Clubs**

Community organizations can be very successful at hosting fundraisers and providing volunteer labor for trail building and maintenance activities. Local examples include the Door County Silent Sports Alliance, 4-H, Boy and Girls Scouts of America, Rotary Club, equestrian groups like the Thumbs Up Riders, cycling groups and others.

### **Individual Sponsors**

Individuals, businesses, or corporations can contribute donations to sponsor sections of trail or project elements. Plaques or other forms of recognition are typically placed on constructed pieces in the trail corridor or at a prominent entry point. Sponsorship is a good way to fund trail elements, like benches, trash receptacles, and interpretive areas.

Sections of trail can also be sponsored through a “Buy a Foot” program. Community members can purchase a section of trail at a fixed cost per linear foot and have their names (or dedication) listed on a plaque, sign, or inscription.

*This Page Intentionally Left Blank*

## Appendix H: Education, Encouragement, Enforcement and Evaluation Strategies

### Introduction

Door County is already known as a great destination for bicycling and other recreational activities. The infrastructure recommendations in the *Door County Bicycle, Pedestrian and Recreational Facilities Master Plan* (the Plan) are intended to provide safer, more comfortable facilities for further growth in bicycling and trail use. However, while improving infrastructure is critical to increasing cycling and recreational opportunities, it is essential to support that work through education, encouragement, enforcement, and evaluation strategies (sometimes called the “Four E’s”).

The education, encouragement, enforcement, and evaluation programs recommended in this appendix will help residents and visitors learn about the benefits of bicycling and walking, connect them to existing opportunities like the weekly night rides with the Door County Silent Sports Association (DCSSA), and create community support for bicycling and walking as part of everyday life.

Also included are a summary of existing program efforts and ideas for expansion; these ideas may be more fully developed as Plan implementation strategies are finalized. The recommendations in this section should be considered along with infrastructure investments.

### Summary of Existing Programs

Residents of and visitors to Door County already benefit from a number of programmatic efforts conducted by county staff, cycling and walking enthusiasts, and volunteers. The listing below presents a sampling of these efforts.

- Annual Door County Silent Sports Association (DCSSA) Bicycle Summit
- Alliances between Door County and local business that focus on the economic potential of cycling-related businesses and bicycle tourism
- Loaner bikes provided in several locations including the Ellison Bay Visitor Center and Ephraim Airport
- Community events that highlight bicycling and walking, such as those sponsored by the DCSSA, an alliance of individuals that promotes participation in running, bicycling, cross-country skiing, snowshoeing, hiking, and paddling. Typical events include:
  - Annual Door County Bicycle Summit
  - Occasional bike safety rodeos for youth
  - Weekly recreational rides
- Door County Silent Sports Map, sponsored by the Door County Visitor Bureau

- Numerous bicycling and walking/running related races and fun rides that encourage these activities as fun and enhance the economic vitality of Door County. These events may have partial sponsorship through Door County or other related agencies, such as the Door County Visitor Bureau. Representative events include :
  - Door County Century Rides
  - Door County Triathlon
  - Ride for Nature
  - Door County Bicycle Tour(s)
  - Door County Half Marathon
  - The Fall 50
  - Multiple local fun runs and rides

## **Recommended Education, Encouragement, Enforcement, and Evaluation Programs**

These recommendations, based on best practices used nationwide, provide a robust suite of bicycling and walking opportunities that enhance recreational opportunities and provide economic benefits within the county. Each recommendation provides suggested time frame, the program purpose, the intended audience, potential partners, and a sample program or resource guide. Short-term recommendations focus on tracking bicycling and walking usage, tracking plan implementation throughout the county, providing a comprehensive resource repository, and expanding educational opportunities for youth. Other programmatic recommendations may be implemented as resources become available and opportunities arise.

Short-Term Recommendations

Hire a Full- or Part-Time Bicycle and Pedestrian Coordinator

Purpose	Provide coordination and bicycle/pedestrian programming expertise for Door County and municipalities
Target audience	Citizen advocates, County and municipal staff
E's	Education, Encouragement, Evaluation
Primary agency	Door County
Potential partners	Municipalities
Time frame	Ongoing
Sample program	Madison, Wisconsin

Hiring or formally designating a bicycle and pedestrian coordinator for Door County would provide a centralized point of contact for planning, programs, and policies related to both on- and off-street facilities. Typical job duties may include:

- Plan and manage cycling and walking programs and materials related to safety, education, enforcement, routes, and recreation.
- Develop safety and promotional information such as quarterly newsletters and route maps.
- Develop, review and implement Plan projects and updates.
- Serve as principal contact with Federal, state and local agencies on matters relating to bicycling and walking.
- Seek funding for implementation of bicycle facilities.
- Work with appropriate offices to fully integrate bicycle and pedestrian projects in programming decisions.
- Serve as the bicycle and pedestrian advisory committee staff liaison.
- Develop priorities for special studies in areas such as:
  - Location and cause of crashes
  - Effectiveness of new facility designs
  - Barrier removal analysis
  - Economic impact of investments
- Monitor pedestrian and bicycle use.
- Coordinate bicycle- and pedestrian-related education, encouragement and enforcement actions.

A bicycle and pedestrian coordinator position could be a part-time or full-time position, based on available resources. At a minimum, coordination and oversight of pedestrian and bicycle projects and programs should be officially recognized as part of one person’s job description in order to provide continuity and increase the success of Plan implementation.

**Website Promoting Local Events and Bicycle/Trail Tourism**

Purpose	Provide enhanced and centralized communication channels for bicycling and walking information
Target audience	Door County residents and visitors
E's	Education, Encouragement, Evaluation
Primary agency	Door County
Potential partners	DCSSA, Municipalities, Door County Visitor Bureau, Door County Economic Development Corporation, Business Associations
Time frame	Short term / Ongoing
Sample website	Bike the Keweenaw: <a href="http://www.bikethekeweenaw.com/index.html">http://www.bikethekeweenaw.com/index.html</a>

Many people do not know where to find information about walking and cycling, including laws, events, maps, tips, and clubs or organizations. Door County and other agency and municipal partners may want to collaborate on a “one stop shopping” website that contains links to local community groups such as DCSSA, periodic updates about Plan implementation, simple evaluation metrics tracking progress towards infrastructure implementation, and information about current projects and how to get involved (e.g. public meetings, comment periods).

Bicycle and trail tourism related resources should be prominently featured on this site. Any brochures and bicycle maps created and maintained by the Door County Visitor Bureau should be linked to this site, as well as a list of bike-friendly hotels and local bike stores.

Other content should include contact information, a local event calendar, walking and bicycling safety resources and (if desired) a blog or other social media portal. A one-stop website will not be difficult to set up, but it will only be successful if the site is both easy to use and updated regularly. Site content should be reviewed at least quarterly for accuracy.

A good example website is Bike the Keweenaw, which is highly graphic and easy to navigate. This type of site may require a small to moderate investment in web design, but there is potential to develop and maintain this type of resource through partnerships between Door County and other interested agencies or communities.



Apply for Bicycle Friendly Community Designation

Purpose	Provide community recognition and a benchmarking system to track Plan implementation
Target audience	n/a
E's	Encouragement, Evaluation
Primary agency	Door County
Potential partners	DCSSA, Municipalities, Door County Visitor Bureau, Door County Economic Development Corporation
Time frame	Short to medium term
More information	<a href="http://www.bikeleague.org/programs/bicycelfriendlyamerica/communities">http://www.bikeleague.org/programs/bicycelfriendlyamerica/communities</a>

The League of American Bicyclists (LAB) has a well-respected Bicycle Friendly Communities (BFC) award program. The League recognizes five tiers of bicycle friendly communities: bronze, silver, gold, platinum and diamond. Communities fill out a detailed application that covers bike-related facilities, plans, education and promotion efforts, and evaluation work to be completed by the jurisdiction. The award is designed to recognize progress that has been made as well as assist communities in identifying priority programs to improve bicycling conditions. Receiving the award is a media-worthy event, and may give elected officials media coverage for the positive work they are doing.

Door County should consider applying for BFC designation upon making strides to implement the recommendations in this plan. The application can be completed by County staff, with support of Working Group members.



### Establish Bicycle and Pedestrian Counts

Purpose	Provide evidence of bicycle and pedestrian facility use
Target audience	Grant funders, decision makers, Door County cyclists and pedestrians
E's	Evaluation
Primary agency	Door County
Potential partners	DCSSA, Municipal partners
Time frame	Ongoing
Sample program	San Jose, CA: <a href="http://www.sanjoseca.gov/index.aspx?NID=2888">http://www.sanjoseca.gov/index.aspx?NID=2888</a>

Many jurisdictions, including Door County, do not perform regular bicycle, pedestrian, or trail user counts. As a result, they do not have a mechanism for tracking bicycle, pedestrian or trail-use trends over time.



It is recommended that the County perform annual bicycle and pedestrian counts according to national best practices. The National Bicycle and Pedestrian Documentation Project (NBPDP) has developed a recommended methodology with resources available for download on the NBPDP website. Resources include count and survey forms, training materials, and recommendations for selecting count locations. The results of the counts should be reported each year. NBPDP hosts a national collection of data where the County can share its results.

The results of the counts should be reported each year. NBPDP hosts a national collection of data where the County can share its results.

It is recommended that the County create a program that is scalable by initially prioritizing count efforts at pinch points in the transportation system. For example, the Michigan Street Bridge in Sturgeon Bay would be an ideal count location. For future expansion, bicycle and pedestrian traffic on local ferries could be counted by service providers for one or two weeks of the year to develop an understanding of cross-lake travel patterns.

Establish a Permanent Pedestrian and Bicycle Advisory Committee

Purpose	Advise Door County on bicycle and pedestrian issues
Target audience	Citizen advocates, agency staff, and decision makers
E's	Education, Encouragement, Enforcement, and Evaluation
Primary agency	Door County
Potential partners	Municipalities, Door County Visitor Bureau, Door County Economic Development Corporation
Time frame	Ongoing
Sample program	Beaver Creek, OH: <a href="http://ci.beavercreek.oh.us/boards-commissions/bikeway-advisory/">http://ci.beavercreek.oh.us/boards-commissions/bikeway-advisory/</a>

The Plan Working Group has been a valuable resource for developing the network recommendations of this plan. Based on this experience, the project team recommends formalizing this group and creating a permanent Pedestrian and Bicycle Advisory Committee (PBAC) in order to continue reaping the benefits of citizen involvement. The PBAC should focus on non-motorized transportation in the public right-of-way, including shared use paths. Formalizing the PBAC emphasizes the County's commitment to making walking and bicycling safer and more appealing, and has the potential to assist the County in securing funding for bicycle and pedestrian projects, as well as providing a channel of communication and coordination between Door County and local municipalities.



The charges of the PBAC may include some or all of the following:

- Review and provide citizen input on capital project planning and design as it affects bicycling and walking (e.g., corridor plans, sidewalk improvements, trail crossing and street improvement projects, signing or signal projects, and parking facilities)
- Working with economic development and tourism agencies to support bicycle and trail tourism
- Review and comment on changes to zoning, development code, comprehensive plans, and other long-term planning and policy documents
- Participate in the development, implementation, and evaluation of the Plan and facility standards

## Door County Countywide Bicycle, Pedestrian and Recreational Facilities Comprehensive Plan

- Provide a formal liaison between local and county government, staff, other advisory bodies (e.g., the newly formed Bicycle and Pedestrian Advisory Board in Sturgeon Bay) and the public
- Develop and monitor goals and indices related to bicycling and walking
- Promote bicycling and walking, including safety and education

Because PBAC members are volunteers, its success will be dependent on strong staffing support. The County should designate a formal liaison to the PBAC to manage the agendas and minutes, schedule meetings, bring agency issues to the PBAC, and report back to the agency and governing body about the PBAC's recommendations and findings. Inviting a law enforcement representative to sit on the PBAC is recommended in order to foster opportunities for understanding and partnership between cyclists, pedestrians and the law enforcement community. Likewise, inviting an economic development or tourism representative could provide for enhanced promotion of cycling and trail use.

The committee should be created formally through action by the County Board, and documentation developed that defines the committee's charge, responsibilities, municipal partnerships, member composition, member selection process, decision-making structure, and meeting schedule.

### Youth Bicycling and Walking Safety Education

Target	School-age children
Primary agency	Door County
Potential partners	Parent groups at schools, community volunteers or youth oriented groups including the YMCA
Purpose	In-school and/or after-school on-bike skills and safety training
Time frame	Ongoing
Sample programs	LAB's Kids I and Kids II curriculum: <a href="http://www.bikeleague.org/programs/education/courses.php#kids1">http://www.bikeleague.org/programs/education/courses.php#kids1</a> BTA's Bike Safety Education Program: <a href="http://www.portlandoregon.gov/transportation/article/379918">http://www.portlandoregon.gov/transportation/article/379918</a>

Many American children never learn about the legal rights and responsibilities of all road users (pedestrians, bicyclists, and drivers) related to walking and bicycling. At a Plan public engagement event in August 2012, a number of meeting attendees expressed support for youth education programs that teach safety skills and encourage bicycling and walking as fun, active, healthy activities.

Door County should consider launching an on-bike education program for kids. Curriculum would cover:

- Parts of a bicycle
- Flat tire fixing
- How a bike works
- Rules of the road

## APPENDIX H: EDUCATION AND ENCOURAGEMENT STRATEGIES

- Bicycling in the right-of-way
- Road positioning
- On-bike skills lessons (braking, turning, steering)
- On-bike community ride



At the time that this program is planned, the County should decide whether to start a program from scratch or modify an existing program. Two excellent model programs are the League of American Bicyclists' Kids I and Kids II classes, and the Bicycle Transportation Alliance's Bike Safety Education Program (see "sample program" links, above, for more information). A number of potential project partners exist including the YMCA, school districts, and DCSSA, which already sponsors Bike Rodeos and other events on request.

The County may also choose to launch a program that covers walking education, such as how to safely cross the street. Alternatively, the County may choose to integrate this into a bicycle education program or standard physical education classes taught through the elementary school system. This program may be implemented in conjunction with a Safe Routes to School Plan.



### Create a Countywide Safe Routes to School Plan

Purpose	Encourage and educate students and their parents about walking and biking to school; improve safety through physical improvements and programs
Target audience	Students, Schools, families
E's	Education, Encouragement, Evaluation, Engineering, Evaluation
Primary agency	Southern Door County School District, Gibraltar School District, Sevastopol School District, Washington Island Schools
Potential partners	Door County, school districts
Time frame	Short term
Resource Guide	National Center for Safe Routes to School: <a href="http://www.saferoutesinfo.org/">http://www.saferoutesinfo.org/</a>

Helping children walk and bicycle to school is good for children's health and can reduce congestion, traffic dangers and air pollution caused by parents driving children to school. Safe Routes to School programs use a "5 E's" approach (Engineering, Education, Enforcement, Encouragement, and Evaluation) to improve safety and encourage children to walk and bicycle to school. The programs are usually run by a coalition of city/county government, school and school district officials, and teachers, parents, students, and neighbors.

A Safe Routes to School plan should include a review of existing conditions near schools, a review of safety programs within the district, and a jurisdictional policy analysis. Recommendations should address locations of concern at each participating school that may be solved through short term and long term engineering solutions and provide supportive recommendations that address education, encouragement, enforcement and evaluation needs. A phasing plan can help the jurisdictional partners to break projects into realistic bundles. Youth Bicycling and Walking Safety Education programs may be part of the recommended SRTS Plan implementation. Regular counts of children participating in encouragement activities or in classroom hand tally surveys of the journey to school mode could be used to gauge the success of cycling and walking initiatives in Door County. Rural school districts can modify plans to simply encourage more walking and bicycling in the daily lives of their students.

One school district within the County, the School District of Sturgeon Bay, has been implementing their SRTS plan for the last few years. This planning effort has been successful in improving infrastructure and educational curriculum at participating schools and could be used as a model for plan development at the county level.

### Medium to Long-Term Recommendations

#### Implement a Media Campaign

Purpose	To raise awareness of cycling and walking as healthy, fun and everyday activities for visitors and residents of Door County
Target audience	General public
E's	Encouragement, Education
Primary agency	Door County
Potential partners	DCSSA, Wisconsin Bike Federation
Time frame	Ongoing
Sample program	Community Cycling Center's "I Ride" campaign: <a href="http://www.communitycyclingcenter.org/index.php/i-ride/">http://www.communitycyclingcenter.org/index.php/i-ride/</a> Get Lit Campaign: <a href="http://www.uselightsatnight.info/">http://www.uselightsatnight.info/</a>

Oftentimes the public thinks of negative stereotypes when they hear about cyclists. A media campaign that shows a wide range of ordinary residents using their bicycles for a variety of purposes will help break down those stereotypes and raise awareness of cycling and empathy for people who ride bicycles. One excellent example is the "I Ride" campaign from the Community Cycling Center (CCC) in Portland, Oregon. The CCC created high quality posters showing people of a wide variety of ages, races, body types, and with many different bicycle types, and each person has been invited to complete the sentence "I ride." The images are being distributed as bus stop and bus bench ads, as well as online.



In Door County, the “I Ride” slogan may be considered, or another slogan could be created. The County may choose to take the lead on this effort, or it may wish to seek to partner with another group. Health or economic development partners may be interested in funding this campaign as it increases awareness of cycling and walking for both purposes. For example, an ‘I Ride’ campaign that profiles bicyclists using the Door County Coastal Byway could be jointly sponsored by Door County and the Door County Economic Development Corporation.

A second type of media campaign could specifically target safety. For example, a number of communities across the country run ‘Get Lit’ campaigns that remind bicyclists about the importance of properly equipping a bicycle for nighttime use. In addition to public service announcements, some agencies will stop cyclists riding at night without proper equipment provide them with donated headlights and rear lights on the spot. Wisconsin Bike Fed has assisted with previous safety-related campaigns and would be an ideal partner for a PSA campaign in Door County. Currently, the Bike Fed’s Share and Be Aware campaign is being utilized in the County.



### Report Card

Purpose	Share information about walking and bicycling metrics and track progress towards plan implementation
Target audience	County staff, elected officials, general public
E's	Evaluation, Education
Primary agency	Door County
Potential partners	DCSSA, Bicycle and Pedestrian Advisory Committee
Time frame	Annually
Sample program	City of San Francisco - <a href="http://www.sfbike.org/download/reportcard_2006/SF_bike_report_card_2006.pdf">http://www.sfbike.org/download/reportcard_2006/SF_bike_report_card_2006.pdf</a>

This Plan has developed goals, objectives, and performance measures related to bicycling, walking and trails. An annual report is a useful benchmarking activity to publish accomplishments and performance relative to these targets.

An annual report should include relevant bicycling metrics (new facility miles, major completed projects, bicycle-involved crashes, number of organized events) and may include information on knowledge/attitudes/behaviors, public perception of safety, or other qualitative data related to cycling.

The report can be assembled annually by staff, or by volunteers using information provided by county staff.

### Bicycle-Sharing Programs

Purpose	To provide 'last mile' access for transportation links (at marinas and airports) as well as expand the transportation options of Door County visitors
Target audience	Door County visitors and residents
E's	Encouragement, Education
Primary agency	Door County
Potential partners	Marinas, transportation providers, municipal partners that operate marinas (e.g., Village of Egg Harbor, Fish Creek, Baileys Harbor and Sister Bay), Door County Visitors Bureau
Time frame	Seasonal
Example Program	Loaner bicycle programs at Ellison Bay and Ephraim Airport

Small shared bicycle fleets can provide many benefits. Typically, these bicycles can be used to accommodate the 'last mile' of a trip (e.g., allowing a user to get from the marina to a commercial area), providing transportation for seasonal workers, allowing tourists to get to and from an airport for free, or providing transportation to overflow parking at boat ramps. Most of these 'last mile' trips in Door County are within a reasonable bicycling distance (e.g., less than three miles) and reduce the cost and complication of short trips by providing day use bicycles for one way or round trip journeys.

Many municipal marinas in Door County would benefit from a small bicycle fleet such as the one at located at the Ellison Bay Visitor Center, which provides a small fleet of bicycles for public use. Bikes are signed out at the desk during daytime hours, but not locked at night. The bicycles are free for users, and require little management aside from periodic safety checks and maintenance that can be provided by knowledgeable staff or interested volunteers. There is potential for each interested location to maintain its own small loaner fleet, or create a larger shared system that would allow a user to leave a bicycle at any participating location. While this would provide greater flexibility for the user, it may require more effort on behalf of the marina or other system partners to ensure that bicycles are reliably available from each departure point. Also, consideration of potential liability should a user be injured while using a bike should be considered; this problem may simply be solved by requiring a user's signature at checkout absolving the bicycle provider of potential liability.

Potential locations that could benefit from a small bike share program include:

- Peninsula State Park boat launch
- Bailey’s Harbor Marina
- Egg Harbor Marina
- Stone Harbor Marina
- Fish Creek Marina
- Sister Bay Marina
- Ephraim Bay Marina
- Sturgeon Bay Marina



If desired, this program could be flexible and expand to include other interested partners. If a larger system is desired in the future, a more formal bicycle sharing program, such as those in Chattanooga, Tennessee or Miami, Florida could be considered.

#### Develop a Regional Wayfinding Sign Program

Purpose	Help bicyclists and trail users reach desired destinations
Target audience	Current and potential bicycle riders and trail users
E's	Encouragement
Primary agency	Door County
Potential partners	Door County Visitor Bureau, Door County Economic Development Corporation, municipal partners
Time frame	Medium
Additional information	Door County Bicycle, Pedestrian and Recreational Facilities Master Plan Design Appendix F – Bicycle and Pedestrian Design Guidelines

A wayfinding sign program can significantly enhance the bicycling experience in Door County. Wayfinding serves a variety of purposes including:

- Helping to familiarize users with the bikeway system and reduce reliance on maps
- Helping users identify the safest or most comfortable routes to significant destinations

- Helping to address misperceptions about time and distance
- Raising the visibility of bicycling to all road users

Signs should indicate direction of travel, location of destinations, and anticipated travel time and distance. Wayfinding signs also provide visual cues to motorists that they are driving along a bicycle route and should use caution. Signs should be placed at key locations leading to and along bicycle routes, including the intersection of multiple routes. A coordinated countywide wayfinding sign program provides particular value for users who know what to expect, and feel confident they can rely on the sign system as they cross jurisdictional boundaries.

### Law Enforcement Training

Purpose	Provide bicycle and pedestrian specific training to law enforcement officials
Target audience	Law enforcement officials
E's	Education, Enforcement
Primary agency	Door County Sheriff's Department
Potential partners	Other local law enforcement agencies (e.g. Sturgeon Bay Police Department), Wisconsin Department of Transportation
Time frame	Annually
Sample materials	Wisconsin Department of Transportation: <a href="http://www.dot.wisconsin.gov/safety/vehicle/bicycle/education.htm">http://www.dot.wisconsin.gov/safety/vehicle/bicycle/education.htm</a>

Most law enforcement professionals do not receive training specific to bicycle laws, handling, or safety. Police education courses and/or training videos can help officers improve public safety and enforce existing laws more effectively by providing them with the training they need. This is particularly important after laws are changed or added that pertain to bicycle safety. In 2012, Wisconsin Department of Transportation (WisDOT) sponsored a series of workshops on bicycle safety education aimed at children, adults and law enforcement professionals. It is recommended that local law enforcement officers take advantage of these state run classes on a regular basis to enhance their knowledge of bicycle and pedestrian related enforcement practices.



### Programs to Expand or Maintain

As mentioned previously, a number of programmatic efforts are already underway in Door County. There is potential to build on existing programs. Several ideas are provided below and may be developed in more detail in Plan implementation recommendations:

## APPENDIX H: EDUCATION AND ENCOURAGEMENT STRATEGIES

- Partner with DCSSA to expand the reach of the annual Bicycle Summit. Door County and other municipal partners could take this opportunity to discuss bicycling and pedestrian challenges or ideas that affect multiple parties (e.g., coordinating bicycle facilities between jurisdictions to provide for continuity, or applying for a cross-jurisdictional grant). As an enhancement to the summit, an invitation-only policymakers ride could be organized to educate policy makers about the ‘good, the bad, and the ugly’ of bicycling in Door County. Additional activities geared more towards the general public could include informational sessions on advocacy, children’s activities, a bicycle parade, a bicycling fashion show, and/or a celebration of any new bicycle facilities installed in the previous year.
- Door County has created strong alliances with local businesses that focus on fully developing the economic potential of cycling-related businesses, and attracting cycling tourists. One strategy to enhance this activity is to ensure that adequate bicycle parking is available at businesses. The County would allow business owners and the public to request bicycle racks, and then track the economic impact with an annual survey. This effort could be complemented by a lecture series on the impacts of bicycling, or published as op-eds to the local newspaper or bicycle and pedestrian resources website.

*This Page Intentionally Left Blank*

## Appendix I: CTH A Bike Route Analysis

As part of a county-wide initiative to provide bicycle routes, the project team was asked to provide input on bicycle accommodation alternatives along CTH A from STH 57 at Jacksonport to STH 42 at Ephraim. It also includes a small portion of CTH V in Jacksonport that serves as a connection between STH 57 and CTH A. The CTH A Bicycle Route map is attached. Door County's preferred alternative for consideration was a side path to accommodate both bicyclists and pedestrians. For this engineering review, we evaluated two side path alternatives and two paved shoulder alternatives.

### Existing Conditions

CTH A is a rural county highway extending, essentially, from STH 57 in Jacksonport to STH 42 south of Ephraim in Door County. The roadway has 11-foot wide traffic lanes with gravel shoulders ranging in width from 2-4 feet. The right of way is 66-feet and generally exists by state statute rather than by plat. Overhead and underground utilities exist within the right of way. From Peninsula Players Road to the north project limit, the county provided a 3-foot paved lane for bicycles. Significant crossroad intersections exist with CTH V, CTH E, CTH EE, CTH F, and Peninsula Players Road.

In general, the area is surrounded by residential properties and farmland. Residential development is denser north of Peninsula Players Road. Some commercial development exists near major intersections. At several locations, there are wetlands near the edge of the roadway. In many areas, there are dense trees near the right of way line. At three locations, the dense trees are part of managed forests. A snowmobile trail runs parallel to the highway in the right of way between Fairview Road (just north of Fairview) and Wooded Lane; and just east of the right of way from Wooded Lane to CTH E. The land east of CTH A at STH 42 is part of the Ephraim-Fish Creek Airport.

Traffic volumes along the route, measured as annual average daily traffic (AADT), are variable, as shown in *Table 1: 2009 Door County Traffic Counts*.

*Table 1: 2009 Door County Traffic Counts*

Route	Location	Count (AADT)
CTH A	CTH V to Junction Road (approximately)	550
	Junction Road (approximately) to Peninsula Player Road	1100
	Peninsula Player Road to Gibraltar Road	1700
	Gibraltar Road To STH 42	1200
CTH V	STH 57 to CTH A	1000

## Alternatives for Bicycle and Pedestrian Accommodations

Door County is planning a county-wide system for non-motorized transportation. CTH A is a local, north-south connecting highway between STH 42 on the west side of the Door Peninsula and STH 57 on the east. Traffic on CTH A is significantly less than on STH 42 (4100-4500 AADT) or STH 57 (2500 – 3500 AADT) in this northern part of the peninsula. The lower volume road directly connecting communities on both sides of the peninsula offers an ideal location for non-motorized transit (bicyclists and pedestrians).

For this study, four alternative designs were considered.

1. Side path with a full highway drainage ditch between the path and the roadway
2. Side path between the roadway and drainage ditch
3. 5-foot wide paved shoulder
4. 3-foot wide paved shoulder

The alternatives were designed based on the recommendations of the 2009 Wisconsin Bicycle Facility Design Handbook (Handbook).

### Alternative 1 and 2: Side path

Alternatives 1 and 2 detail recreational side paths (shared use paths) that accommodate bicycles and pedestrians. According to the Handbook, a minimum pavement width of 10 feet is recommended for two way traffic. The minimum separation between the road shoulder and the path is 5 feet. Anything less than 5-feet should have a physical barrier to prevent path users and motorists from making unwanted movements between the road and path. For this analysis, a vertical barrier was not considered although one may be preferred at intersections or other areas where adequate separation is not possible.

As a rural road, CTH A currently does not meet design standards for roadside drainage. If alterations are made to the area, the proper grades and ditch depth should be considered. Alternative 1 includes a drainage ditch between the highway and the side path. The depth of the ditch is approximated to be equal to the depth of the pavement section including base aggregate plus 12 – 18 inches for drainage. The side slope of the highway is shown at the 4:1 recommended. A grade of 3:1 is acceptable on the backslope of the ditch. The side path includes 'shoulders'; an area with no obstructions and a slope of 6:1. For this alternative, 48-feet is required from the centerline of the highway. That is approximately 15 feet beyond the limit of the right of way. Figure 2 shows a typical side path section as detailed in the Handbook.

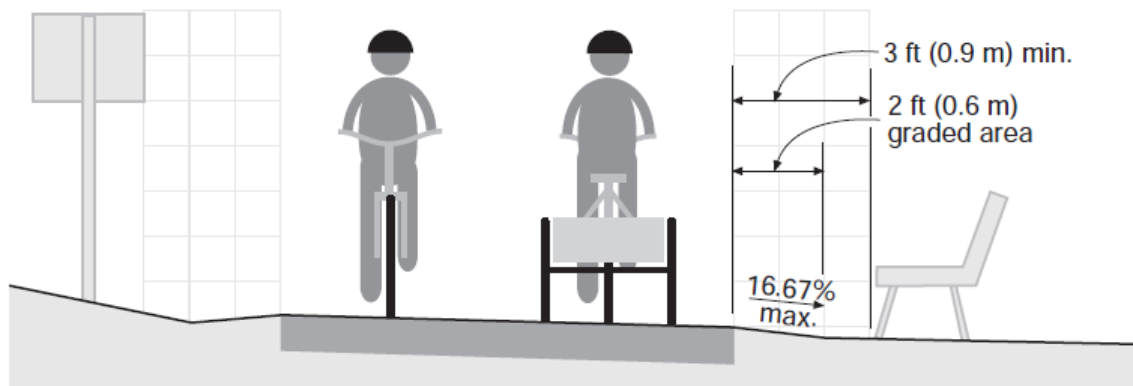


Figure 2: Shared Path Standard Clearances (Wisconsin Bicycle Facility Design Handbook)



The aerial plan sheets attached to this appendix show the approximate impact of the side path in Alternative 1. For this alternative, the side path is shown on the west side of CTH A because there are less conflicts with structures, environmentally sensitive areas, and utilities than on the east side. Items to note:

1. The Hibbards Creek crossing at STA 50 would require the lengthening and possible up-sizing of the entire culvert.
2. There are several locations where the path would be very close to the structures, i.e. STA 52, 80, 149, 248, 255, 272, 299, 484, 510, 524, 608.
3. At the intersections with CTH E and CTH F, the path is in conflict with business parking. At those locations, it is preferable that the path use a completely different alignment such as the west property line, allowing the path to tie into the side road and then be redirected back to CTH A.
4. A major conflict with structures at STA 608 would require the path to be rerouted off alignment and tie into STH 42 at an alternative location.
5. Right of way is required along the entire length of the project.

Alternative 2 is similar to Alternative 1 except that the drainage ditch is located on the outside of the side path. A minimal separation of 5 feet is required between the shoulder of the highway and the edge of the side path. By moving the ditch to the outside of the side path, the minimum required right of way width is reduced by 11.5 feet. However, it is still 3.5 feet beyond the current right of way limit. In both Alternative 1 and Alternative 2, if CTH A were reconstructed, the highway would be required to have a shoulder width of 6 feet, pushing the entire side path 3 additional feet beyond the current right of way. In the case of Alternative 2, the minimum right of way is shown to the centerline of the ditch. It may be the county's policy to require the entire ditch be within road right of way.

The aerial plan sheets attached to this appendix show the approximate impact of the side path in Alternative 2. The impacts are very similar to Alternative 1 except that they are less severe and therefore:

1. The distance to structures mentioned in item 2 above is increased.
2. The conflict with the structure at STA 608 would be reduced to a point that rerouting the path to a different alignment might not be necessary.
3. Realignment of the path at the intersection with CTH A might not be necessary as the path is not in direct conflict with the parking lot.
4. At the intersection with CTH F, the path may still require realignment. As an alternative, the parking lot for the business could be relocated to a different location on the lot (out of the apparent right of way) allowing the path to continue on alignment.
5. The Hibbards Creek crossing at STA 50 would require the lengthening and possible up-sizing of the entire culvert.
6. Right of way is required along the entire length of the project.

## Alternatives 3 and 4: Paved Shoulder

In general, the total shoulder width for county highways should be between 6 feet and 8 feet with the paved portion between 3 feet and 8 feet. In retrofit situations, where the roadway is not being reconstructed or re-ditched, desirable conditions are not always possible to achieve. In these cases, the Handbook recommends that the county provide as much width as possible to benefit the bicyclist. The width of paved shoulders for county highways is determined by the local government, using the same recommendations as for state highways.

For CTH A, with motor vehicle average daily traffic of 550-1700 vehicles per day (2009 traffic counts), a paved shoulder width of 4 feet to 5 feet is recommended. The wider paved shoulder as shown in *Table 2: Required Paved Shoulder Width to Accommodate Bicycles* is recommended when the route is on an adopted transportation plan or when bicycle traffic is anticipated to be 25 or more bicycles per day.

Table 2: Required Paved Shoulder Width to Accommodate Bicycles

Route	Location	Count (AADT)	Shoulder Width (ft)
CTH A	CTH V to Junction Road (approximately)	550	0
	Junction Road (approximately) to Peninsula Player Road	1100	4
	Peninsula Player Road to Gibraltar Road	1700	5/6
	Gibraltar Road To STH 42	1200	4
CTH V	STH 57 to CTH A	1000	4

Alternatives 3 and 4 for paved shoulders are shown in the attached Typical Sections. Since the intent is to have CTH A on a county designated bicycle route, and since Alternative 4 included a less than desirable shoulder width, only Alternative 3 with a 5-foot wide paved shoulder was reviewed further.

A paved shoulder alternative requires the county to widen the existing shoulder. Specific recommendations/concerns for the CTH A route:

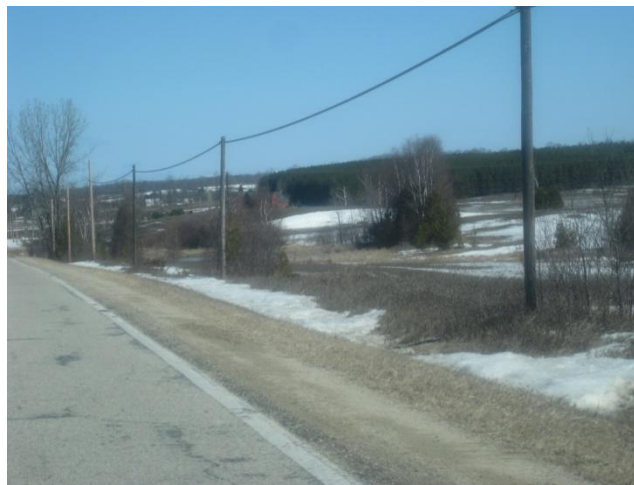
1. The existing roadway has 2-3 foot wide shoulders. For bicycle accommodations, the shoulders need to be widened to a minimum of 5 feet, preferably to 6 feet.
2. CTH A and CTH V do not have full ditches to accommodate roadway drainage. Ditches are generally a minimum of 1 foot deeper than the base of the roadway. Assuming a pavement width of 18 inches with a 4:1 maximum side slope to the ditch bottom, the ditch bottom would be at least 7.5 feet from the edge of the shoulder. The backslope on the ditch is variable. In theory, this section fits within a

standard 66-foot right of way. In practice, some temporary or permanent right of way is necessary to match existing grades.

3. The culvert crossing at Hibbards Creek (below) needs to be widened to accommodate the wider shoulder.



4. Utility lines would likely have to be relocated where the shoulders are widened and a full ditch is constructed.



5. Curb and gutter will likely be necessary where homes or wetlands are so close to the edge of the road that there is not sufficient room to develop a full ditch.

Door County Countywide Bicycle, Pedestrian and Recreational Facilities Comprehensive Plan



6. Modification of parking areas along with curb and gutter are necessary where businesses are very close to or encroach on the existing right of way.



7. The intersection at CTH A at CTH F will need to be modified to clearly identify bicycle lanes and traffic lanes.

Other general considerations for shoulder paving/widening:

1. Where there are guardrails, the preferred shoulder width is 6 – 8 feet to allow 2 – 3 feet between the edge of the paved shoulder and the guardrail. Where only 6-feet of should width is available, the entire shoulder width should be paved.
2. Unpaved driveway crossings should be paved a minimum of 15 feet from the edge of the traveled way to reduce the amount of gravel being scattered along the shoulder by motor vehicles.
3. Structures tend to form bottlenecks for the bicycle lanes. As structures are replaced, they should be widened to provide appropriate clearances for bicyclists.
4. The route should be designated as a bicycle route to alert motorists and to provide wayfinding for bicyclists with supplemental plaques that indicated the route’s end point and/or name. Showing mileage to particular destinations is also recommended. Refer to *Figure 2: Bicycle Route Signage* for an example as provided in the Handbook.

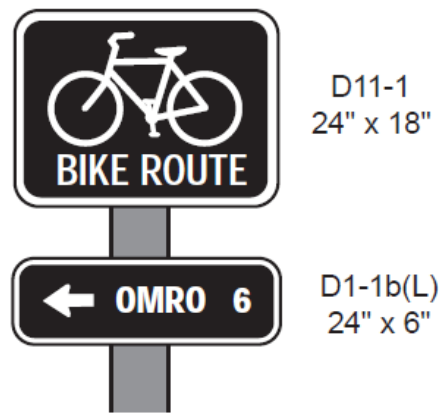


Figure 2: Bicycle Route Signage (Wisconsin Bicycle Facility Design Handbook)

## Conclusion

The development of bicycle and/or pedestrian accommodations along CTH A will be an investment. Both side paths and paved shoulder alternatives require some amount of right of way. A side path requires right of way along the entire route.

The Wisconsin Bicycle Facility Design Handbook cautions designers and community planners in the use of side paths (shared-use paths), “Separated shared-use should not substitute for on-road bicycle facilities, but, rather, supplement a system of on-road bike lanes, wide outside lanes, paved shoulders, and bike routes.” In general, shared-use paths are built along rivers, creeks, and lake fronts; on or next to railroad rights-of-way; within a within a campus or between parks, between cul-de-sacs. With that said, the Handbook also notes that side paths serve an important role in exercise and recreation, and provide an enjoyable travel opportunity for individuals and families.

In the short term, it is possible to provide bicycle accommodations along CTH A with substandard, paved shoulders 3 feet wide as allowed in retrofit situations. Pavement marking and signing for the bicycle route would help familiarize users of the route and alert motorists to the increased potential for bicycle traffic. While not ideal, the paved shoulders allow pedestrians a paved surface and increased recreational opportunities.

Long term, a side path can be implemented if right of way can be obtained along the route. The paths are safer for pedestrians and provide a unique recreational experience. The Handbook cautions that although a path is provided, bicyclists may still prefer to use the road. It states, “Even when the path is located adjacent to the highway, many bicyclists will avoid it. They may find it less convenient, difficult to access from the direction they are traveling, and, perhaps, even unsafe at their speed to ride on the paths compared with the streets...” For this reason, the best long term solution for CTH A may be full (5 to 6 foot wide) paved shoulders.

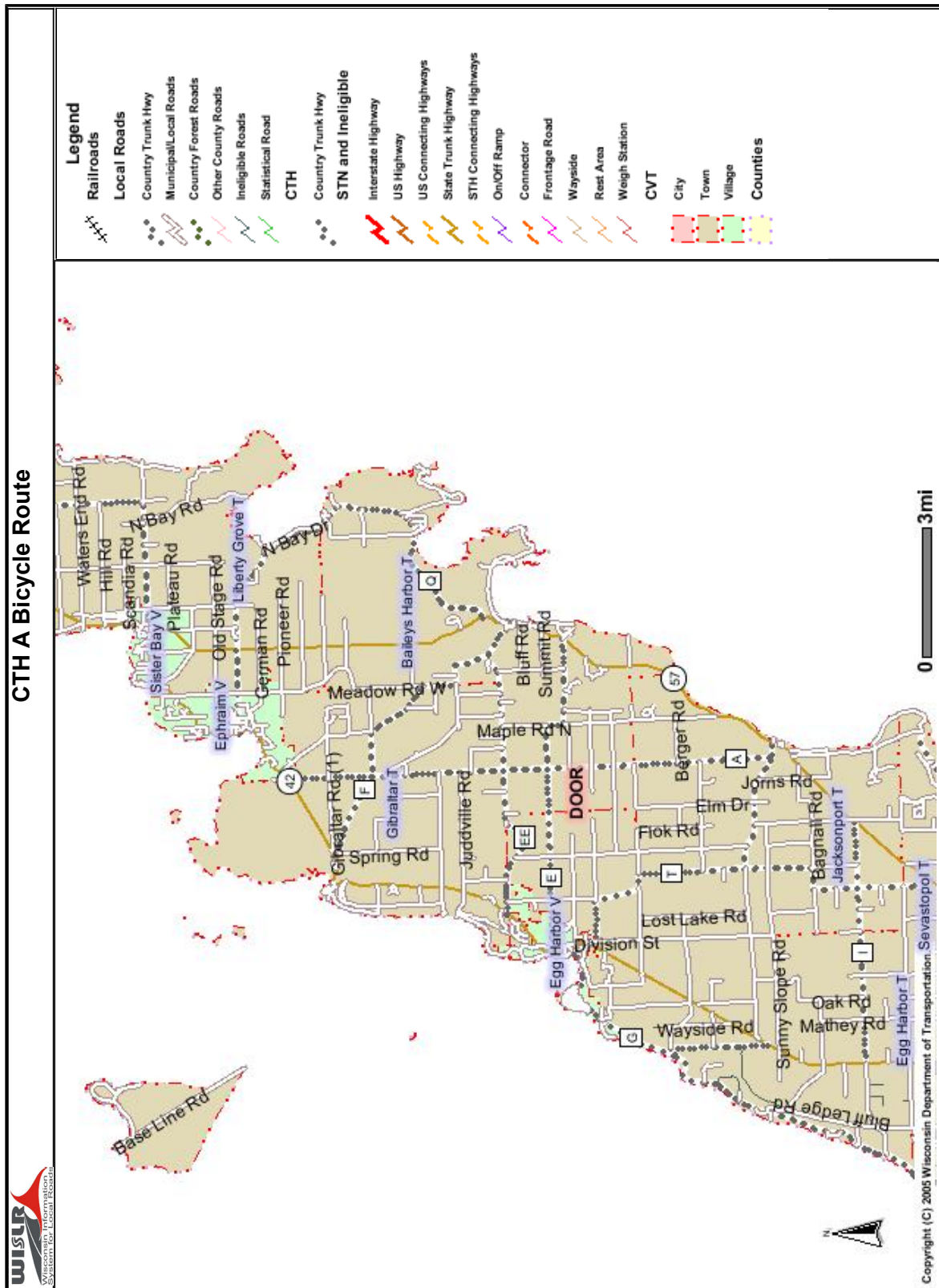
## **Attachments:**

### **CTH A Bicycle Route**

#### **Typical Sections for Side Path Alternatives**

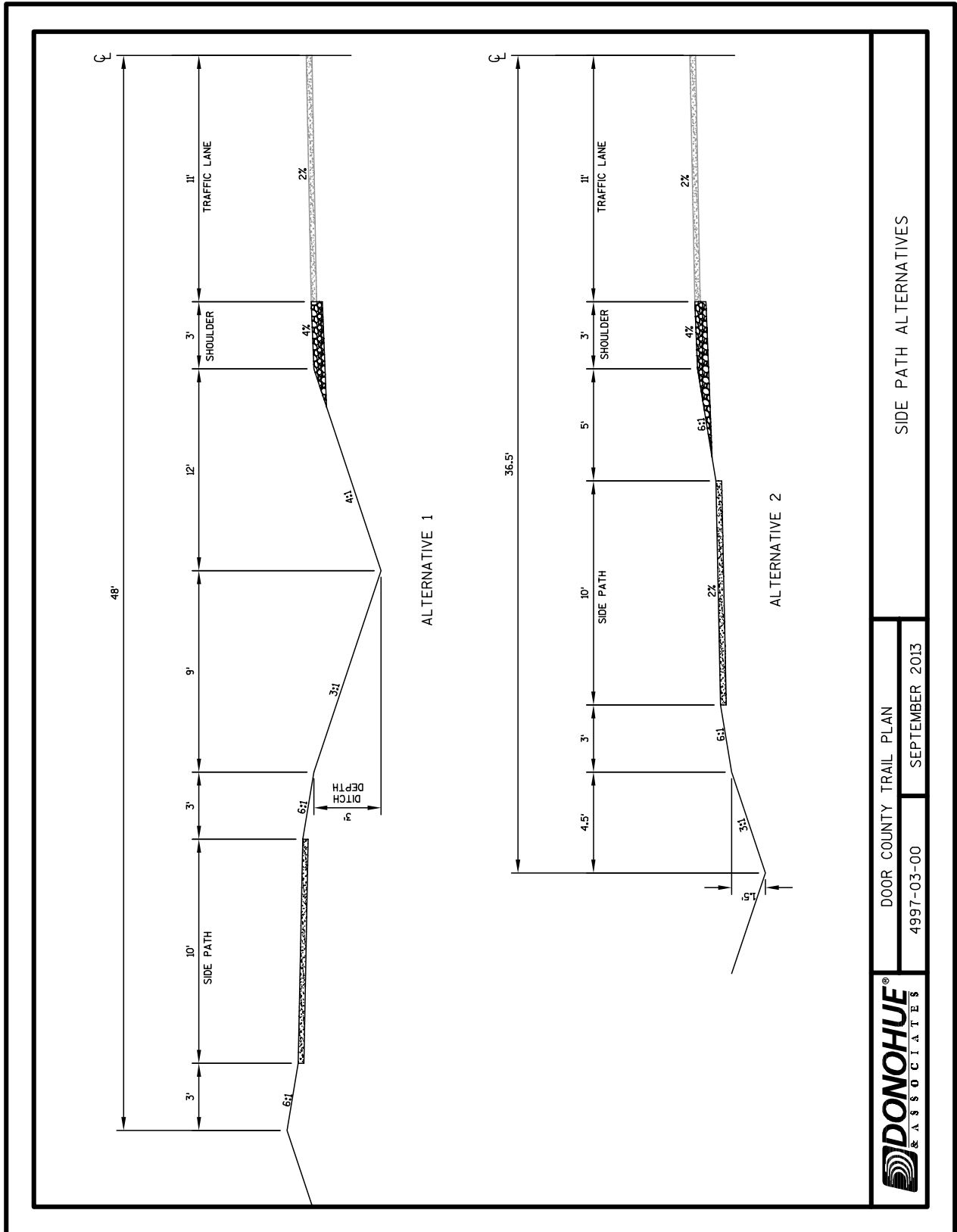
#### **Typical Sections for Paved Shoulder Alternatives**

Attachment: CTH A Bicycle Route



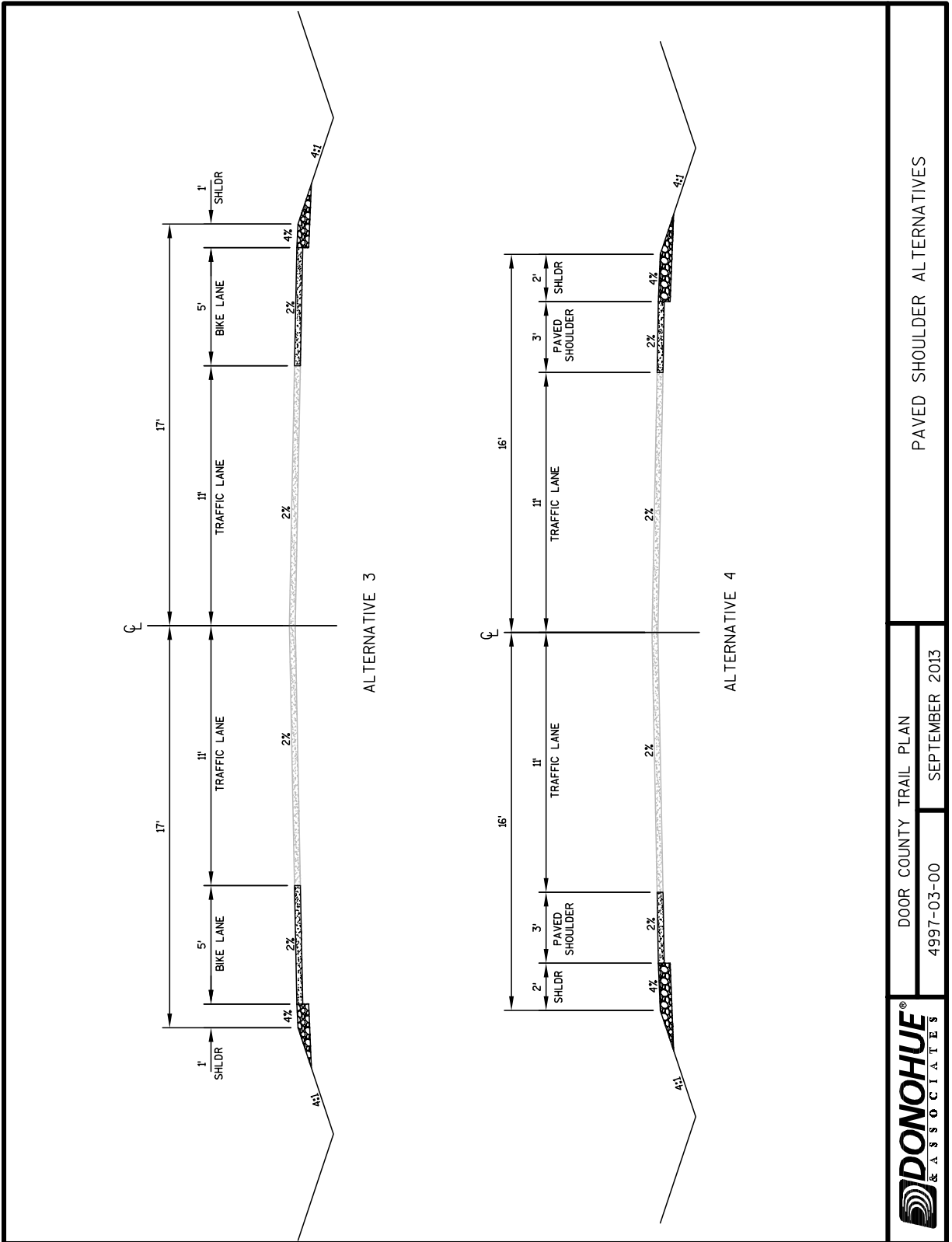
The information contained in this data set and information produced from this dataset were created for the official use of the Wisconsin Department of Transportation (WisDOT). Any other use while not prohibited the sole responsibility of the user. WisDOT expressly disclaims all liability regarding fitness of use of the information for other than official WisDOT business.


# Attachment: Typical Sections for Side Path Alternatives





Attachment: Typical Sections for Paved Shoulder Alternatives



	DOOR COUNTY TRAIL PLAN	PAVED SHOULDER ALTERNATIVES
	4997-03-00	

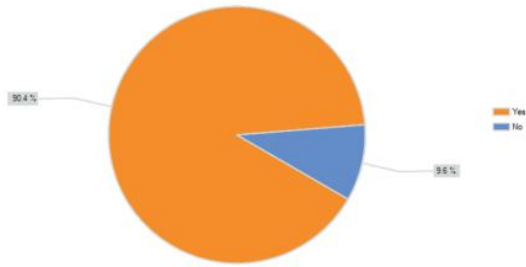


## Appendix J: Online Survey Results

The following pages include the results of the online survey, used to inform the development of this plan. A quick summary used in the outreach efforts of this plan is included in graphic form below and on the next page. A full summary of survey responses follows.

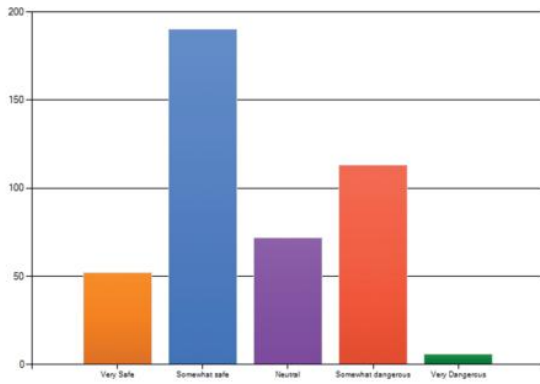
### DOOR COUNTY BICYCLE, PEDESTRIAN, & RECREATIONAL FACILITIES PLAN

#### DO YOU HAVE ACCESS TO A BICYCLE?

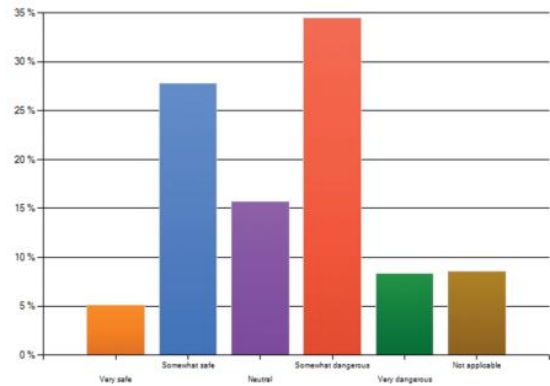


# SURVEY RESULTS

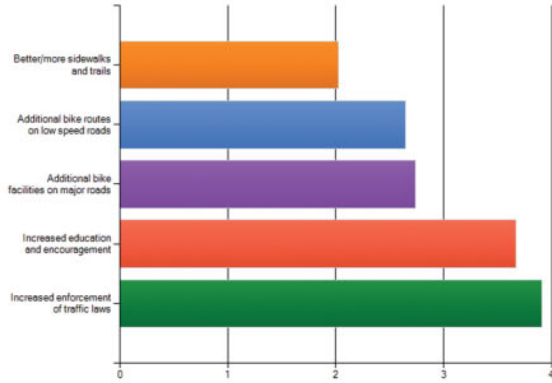
#### DO YOU FEEL THAT BICYCLING FOR RECREATION IN DOOR COUNTY IS:



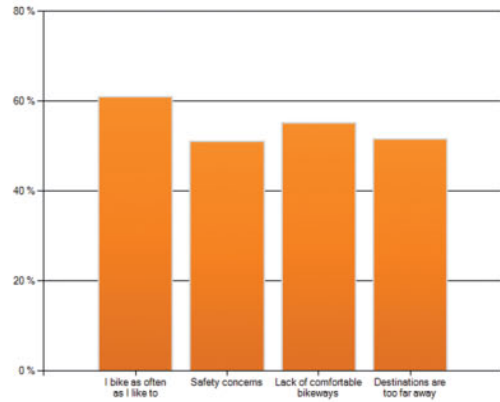
#### DO YOU FEEL THAT BICYCLING FOR TRANSPORTATION IN DOOR COUNTY IS:



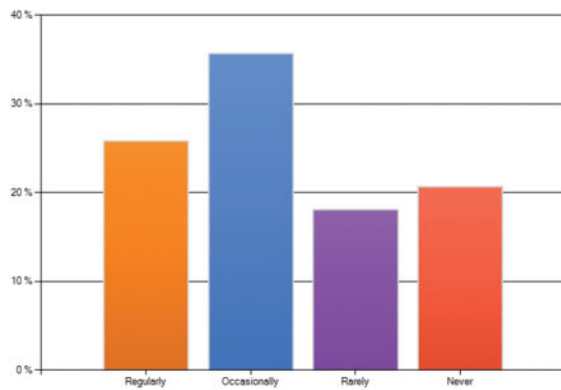
**P** WHAT IMPROVEMENTS ARE YOUR HIGHEST PRIORITIES FOR ENCOURAGING MORE WALKING AND BICYCLING IN DOOR COUNTY? (RANK YOUR TOP THREE IMPROVEMENTS.)



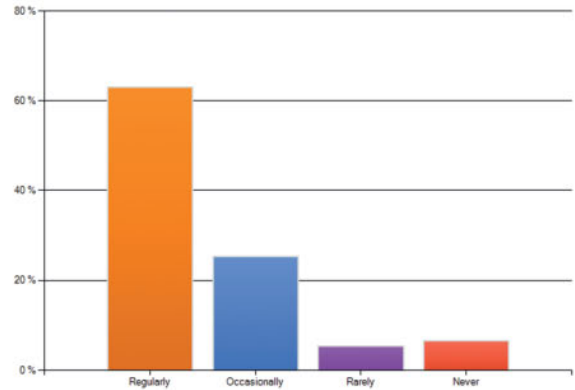
**T** WHAT PREVENTS YOU FROM BICYCLING MORE OFTEN IN DOOR COUNTY?



**I** IF THERE WERE SAFE, CONVENIENT BIKE ROUTES AVAILABLE IN DOOR COUNTY, HOW OFTEN WOULD YOU USE THEM TO RUN ERRANDS?





**I** IF THERE WERE SAFE, CONVENIENT BIKE ROUTES AVAILABLE IN DOOR COUNTY, HOW OFTEN WOULD YOU USE THEM FOR RECREATION?



# Door County Bicycle, Pedestrian and Recreational Facilities Plan Public Input Survey

## 1. Do you have access to a bicycle?



		Response Percent	Response Count
Yes		90.8%	631
No		9.2%	64
answered question			695
skipped question			0

## 2. In which season(s) do you bicycle in Door County and how frequently?

	Nearly every day	Few times per week	Few times per month	Rarely	Rating Count
Spring	10.0% (38)	30.8% (117)	<b>34.5% (131)</b>	24.7% (94)	380
Summer	20.9% (88)	<b>32.2% (136)</b>	29.1% (123)	17.8% (75)	422
Fall	12.2% (48)	30.5% (120)	<b>36.8% (145)</b>	20.6% (81)	394
Winter	3.4% (9)	1.1% (3)	3.8% (10)	<b>91.7% (243)</b>	265
answered question					430
skipped question					265

# Door County Bicycle, Pedestrian and Recreational Facilities Plan Public Input Survey

## 1. Do you have access to a bicycle?

		Response Percent	Response Count
Yes		90.8%	631
No		9.2%	64
answered question			695
skipped question			0

## 2. In which season(s) do you bicycle in Door County and how frequently?

	Nearly every day	Few times per week	Few times per month	Rarely	Rating Count
Spring	10.0% (38)	30.8% (117)	<b>34.5% (131)</b>	24.7% (94)	380
Summer	20.9% (88)	<b>32.2% (136)</b>	29.1% (123)	17.8% (75)	422
Fall	12.2% (48)	30.5% (120)	<b>36.8% (145)</b>	20.6% (81)	394
Winter	3.4% (9)	1.1% (3)	3.8% (10)	<b>91.7% (243)</b>	265
answered question					430
skipped question					265







**3. How often do you make the following trip(s) by bicycle (mark all that apply)?**

	Regularly	Occasionally	Rarely	Never	N/A	Rating Count
To work	10.4% (37)	12.9% (46)	7.6% (27)	<b>43.4% (155)</b>	25.8% (92)	357
To school	1.7% (6)	2.6% (9)	2.3% (8)	42.7% (147)	<b>50.6% (174)</b>	344
For errands	7.6% (28)	27.5% (101)	19.3% (71)	<b>32.7% (120)</b>	12.8% (47)	367
For recreation/exercise	<b>56.8% (243)</b>	29.4% (126)	8.2% (35)	3.5% (15)	2.1% (9)	428
<b>answered question</b>						<b>430</b>
<b>skipped question</b>						<b>265</b>






**4. If you bicycle to work/school, approximately how far is the one-way trip in miles?**

	Response Count
	123
<b>answered question</b>	<b>123</b>
<b>skipped question</b>	<b>572</b>

**5. Do you feel that bicycling for TRANSPORTATION in Door County is:**

		Response Percent	Response Count
Very safe		5.1%	23
Somewhat safe		27.9%	126
Neutral		16.2%	73
<b>Somewhat dangerous</b>		<b>34.1%</b>	<b>154</b>
Very dangerous		8.0%	36
Not applicable		8.8%	40
<b>answered question</b>			<b>452</b>
<b>skipped question</b>			<b>243</b>

**6. Do you feel that bicycling for RECREATION in Door County is:**



		Response Percent	Response Count
Very Safe		11.9%	54
<b>Somewhat safe</b>		<b>44.0%</b>	<b>199</b>
Neutral		16.4%	74
Somewhat dangerous		26.3%	119
Very Dangerous		1.3%	6
<b>answered question</b>			<b>452</b>
<b>skipped question</b>			<b>243</b>








**7. How often do you use each of the following when bicycling?**

	Regularly	Occasionally	Rarely	Never	Rating Count
Helmet	<b>64.0% (283)</b>	9.7% (43)	6.8% (30)	19.5% (86)	442
Headlight	21.6% (92)	13.6% (58)	17.6% (75)	<b>47.1% (200)</b>	425
Taillight	29.3% (126)	13.7% (59)	13.5% (58)	<b>43.5% (187)</b>	430
Bright or reflective clothing	<b>41.7% (182)</b>	29.6% (129)	11.5% (50)	17.2% (75)	436
<b>answered question</b>					<b>442</b>
<b>skipped question</b>					<b>253</b>

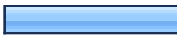


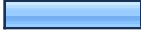
**8. Do you regularly drive to your favorite bicycling destinations in Door County?**

		Response Percent	Response Count
Yes		38.7%	175
No		61.3%	277
	If yes, please tell us why.		172
<b>answered question</b>			<b>452</b>
<b>skipped question</b>			<b>243</b>





**9. If there were safe, convenient bike routes available in Door County, how often would you use them to bike to work?**

		Response Percent	Response Count
Regularly		20.6%	92
Occasionally		15.0%	67
Rarely		8.5%	38
Never		19.7%	88
<b>N/A</b>		<b>36.2%</b>	<b>162</b>
<b>answered question</b>			<b>447</b>
<b>skipped question</b>			<b>248</b>




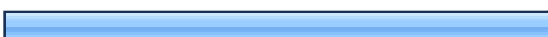


**10. If there were safe, convenient bike routes available in Door County, how often would you use them to run errands?**

		Response Percent	Response Count
Regularly		26.0%	116
<b>Occasionally</b>		<b>36.5%</b>	<b>163</b>
Rarely		17.4%	78
Never		20.1%	90
<b>answered question</b>			<b>447</b>
<b>skipped question</b>			<b>248</b>

**11. If there were safe, convenient bike routes available in Door County, how often would you use them for recreational purposes?**

		Response Percent	Response Count
Regularly		63.5%	287
Occasionally		25.2%	114
Rarely		5.1%	23
Never		6.2%	28
<b>answered question</b>			<b>452</b>
<b>skipped question</b>			<b>243</b>

**12. What type of facilities are you comfortable bicycling on? Check all that apply.**

		Response Percent	Response Count
Off-street paths or trails		83.2%	376
Streets with bike lanes or wide shoulders (3+ feet)		71.2%	322
Streets signed as designated bicycle routes		54.9%	248
Low traffic neighborhood streets or town roads		81.9%	370
County highways		30.3%	137
State highways		6.0%	27
<b>answered question</b>			<b>452</b>
<b>skipped question</b>			<b>243</b>








### 13. What prevents you from bicycling more often in Door County?

	yes	no	Rating Count
I bike as often as I like to	<b>61.1% (242)</b>	38.1% (151)	396
Safety concerns	<b>50.7% (193)</b>	48.6% (185)	381
Lack of skills or knowledge to ride confidently	8.2% (29)	<b>91.0% (323)</b>	355
Lack of comfortable bikeways	<b>55.6% (210)</b>	43.7% (165)	378
Lack of information about routes to destinations	31.5% (113)	<b>67.7% (243)</b>	359
Lack of secure bicycle parking at destinations	35.4% (129)	<b>63.7% (232)</b>	364
Destinations are too far away	<b>52.2% (194)</b>	47.0% (175)	372
Poor weather	<b>57.7% (211)</b>	41.5% (152)	366
Other	35.4% (64)	<b>64.6% (117)</b>	181
		<b>answered question</b>	<b>452</b>
		<b>skipped question</b>	<b>243</b>









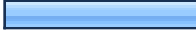

**14. Please rank the following list of bicycle improvements in order of importance to you.**

	1	2	3	4	5	6	7	8	9	Rating Average
More bicycle education	9.5% (43)	10.6% (48)	8.6% (39)	7.3% (33)	6.0% (27)	6.4% (29)	10.8% (49)	11.5% (52)	<b>29.2%</b> <b>(132)</b>	5.8
Providing bike lanes in urban areas and wide shoulders in rural areas	<b>39.6%</b> <b>(179)</b>	16.4% (74)	15.3% (69)	7.3% (33)	5.8% (26)	5.1% (23)	3.1% (14)	3.1% (14)	4.4% (20)	2.9
More bike routes with signs to destinations	5.8% (26)	15.5% (70)	19.0% (86)	<b>20.1%</b> <b>(91)</b>	15.5% (70)	11.9% (54)	6.4% (29)	4.0% (18)	1.8% (8)	4.1
Removal or repair of hazards such as potholes or grates	10.8% (49)	<b>15.7%</b> <b>(71)</b>	15.0% (68)	14.8% (67)	12.2% (55)	10.2% (46)	10.0% (45)	9.3% (42)	2.0% (9)	4.3
Designated Bike routes to Door County communities	8.8% (40)	11.5% (52)	16.2% (73)	17.5% (79)	<b>18.4%</b> <b>(83)</b>	15.5% (70)	9.1% (41)	2.2% (10)	0.9% (4)	4.2
Designated Bike routes to recreational areas	7.3% (33)	11.1% (50)	8.8% (40)	15.3% (69)	<b>18.1%</b> <b>(82)</b>	17.5% (79)	12.4% (56)	7.5% (34)	2.0% (9)	4.7
Improved bike parking in commercial areas	2.2% (10)	3.8% (17)	4.4% (20)	6.0% (27)	10.2% (46)	14.8% (67)	22.8% (103)	<b>23.0%</b> <b>(104)</b>	12.8% (58)	6.4
Map of bicycle routes and destinations in Door County	4.4% (20)	5.5% (25)	7.3% (33)	6.9% (31)	9.7% (44)	13.1% (59)	16.6% (75)	<b>22.8%</b> <b>(103)</b>	13.7% (62)	6.1
Increased enforcement of rules of the road for all road users	11.5% (52)	10.0% (45)	5.3% (24)	4.9% (22)	4.2% (19)	5.5% (25)	8.8% (40)	16.6% (75)	<b>33.2%</b> <b>(150)</b>	6.1
<b>answered question</b>										
<b>skipped question</b>										



**15. How do you feel drivers in Door County typically behave around bicyclists? (Please check all that apply.)**

		Response Percent	Response Count
Courteous, willing to yield and give bicyclists space		35.4%	160
Drive too fast		47.6%	215
<b>Pass bicyclists too closely</b>		<b>51.5%</b>	<b>233</b>
Tolerate bicyclists not following the rules of the road		24.8%	112
Harass bicyclists		4.2%	19
Fail to yield to bicyclists crossing a street		23.5%	106
Other		8.4%	38
	Other (please specify)		46
		<b>answered question</b>	<b>452</b>
		<b>skipped question</b>	<b>243</b>





**16. How do you feel bicyclists in Door County typically behave? (Please check all that apply.)**

		Response Percent	Response Count
Courteous, obeying all traffic laws		32.7%	148
Fail to comply with traffic laws		48.5%	219
Ride too slowly and block traffic		13.7%	62
Are young and/or inexperienced		18.8%	85
<b>Ride abreast with other bicyclists in the same travel lane</b>		<b>56.2%</b>	<b>254</b>
Behave rudely		9.5%	43
Don't signal turns or stops		48.5%	219
Ride against traffic on street		22.6%	102
Ride on sidewalks		28.8%	130
Ride at night without lights		23.2%	105
	Other (please specify)		51
<b>answered question</b>			<b>452</b>
<b>skipped question</b>			<b>243</b>



**17. Do you think Door County should include bicycles when planning for transportation projects?**

		Response Percent	Response Count
Yes		88.6%	395
No		11.4%	51
<b>answered question</b>			<b>446</b>
<b>skipped question</b>			<b>249</b>

**18. How important is improving bicycling in Door County to you?**






		Response Percent	Response Count
Very important		45.8%	207
Somewhat important		33.0%	149
Neutral		12.4%	56
Not important		8.8%	40
		Why?	194
<b>answered question</b>			<b>452</b>
<b>skipped question</b>			<b>243</b>

**19. Whenever possible, the County will seek grants for development of bicycle infrastructure including routes, lanes and trails. Would you be willing to support these endeavors with tax dollars?**





		Response Percent	Response Count
Yes		76.5%	342
No		23.5%	105
<b>answered question</b>			<b>447</b>
<b>skipped question</b>			<b>248</b>






**20. Where do you feel safe walking in Door County? (Check all that apply.)**

		Response Percent	Response Count
Off-street paths or trails		92.0%	403
Sidewalks in urbanized areas		90.6%	397
Shoulders of town roads		51.8%	227
Shoulders of County Highways		18.3%	80
Shoulders of State Highways		4.3%	19
<b>answered question</b>			<b>438</b>
<b>skipped question</b>			<b>257</b>

**21. In general, do you find that motor vehicle traffic yields to pedestrians in crosswalks in Door County as required by law?**

		Response Percent	Response Count
Traffic yields most of the time		50.7%	222
Traffic yields about half of the time		32.2%	141
Traffic yields occasionally		12.1%	53
Traffic rarely yields		5.0%	22
Other (please specify)			20
<b>answered question</b>			<b>438</b>
<b>skipped question</b>			<b>257</b>




## 22. Have you noticed an increase in yielding at crosswalks in communities that have posted "State Law: Yield to Pedestrians in Crosswalk" signs?

		Response Percent	Response Count
Yes - drivers seem to yield more often		69.4%	304
No - drivers do not seem to yield more often		12.3%	54
I haven't noticed		18.3%	80
<b>answered question</b>			<b>438</b>
<b>skipped question</b>			<b>257</b>

## 23. What prevents you from walking more often?

	Yes	No	Rating Count
I walk as often as I want to	<b>83.8% (325)</b>	14.7% (57)	388
Safety concerns (crime/personal safety)	15.5% (49)	<b>82.3% (261)</b>	317
Lack of comfortable walkways	38.6% (125)	<b>58.0% (188)</b>	324
Lack of information about routes to destinations	15.2% (45)	<b>82.2% (244)</b>	297
Destinations are too far away	<b>57.5% (187)</b>	40.3% (131)	325
I have to carry things	48.1% (150)	<b>49.0% (153)</b>	312
Poor weather	<b>57.1% (178)</b>	40.7% (127)	312
		Other (please specify)	34
<b>answered question</b>			<b>425</b>
<b>skipped question</b>			<b>270</b>

**24. How important is improving pedestrian conditions in Door County to you?**

		Response Percent	Response Count
Very important		43.2%	189
<b>Somewhat important</b>		<b>47.8%</b>	<b>209</b>
Not important		8.9%	39
	Why?		112
	<b>answered question</b>		<b>437</b>
	<b>skipped question</b>		<b>258</b>







**25. What Door County activities do you participate in? (Check all that apply.)**

	Frequently in season	Occasionally in season	Rarely in season	Never	Rating Count
Horseback riding	15.5% (60)	7.0% (27)	13.4% (52)	<b>64.6% (250)</b>	387
Cross county skiing	18.6% (73)	32.1% (126)	17.1% (67)	<b>32.7% (128)</b>	392
Snowmobiling	4.0% (15)	9.8% (37)	7.7% (29)	<b>78.6% (298)</b>	379
Riding ATVs	7.4% (28)	5.3% (20)	4.0% (15)	<b>83.8% (315)</b>	376
Running on roadways	18.5% (70)	16.9% (64)	7.9% (30)	<b>57.8% (219)</b>	379
Running on trails	13.1% (50)	22.3% (85)	8.7% (33)	<b>56.4% (215)</b>	381
Hiking on trails	<b>46.9% (195)</b>	38.5% (160)	7.9% (33)	7.9% (33)	416
				<b>answered question</b>	<b>428</b>
				<b>skipped question</b>	<b>267</b>

**26. Do you feel there are enough opportunities/facilities to participate in your preferred recreational activities in Door County?**

	Yes	No	Rating Count
Horseback riding	55.1% (162)	44.9% (132)	294
Cross county skiing	88.7% (314)	11.3% (40)	354
Snowmobiling	91.0% (244)	9.0% (24)	268
Riding ATVs	66.2% (172)	33.8% (88)	260
Running on roadways	78.0% (234)	22.0% (66)	300
Running on trails	85.3% (266)	14.7% (46)	312
Hiking on trails	88.4% (351)	11.6% (46)	397
		Comment	64
		<b>answered question</b>	<b>428</b>
		<b>skipped question</b>	<b>267</b>

**27. Do you ever use the Ahnapee State Trail for any of the following activities?**


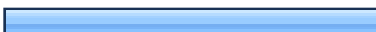
		Response Percent	Response Count
Horseback riding		12.4%	53
Bicycling		38.1%	163
Hiking		22.4%	96
Running		8.4%	36
Snowmobiling		8.2%	35
<b>I do not use the Ahnapee State Trail.</b>		<b>42.5%</b>	<b>182</b>

Other (please specify) 35

**answered question 428**

**skipped question 267**

**28. Would you like to receive periodic updates on the Plan?**

		Response Percent	Response Count
Yes		44.1%	177
<b>No</b>		<b>55.9%</b>	<b>224</b>

If yes, please provide your email address 137

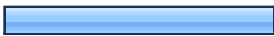


**answered question 401**

**skipped question 294**

**29. What improvements are your highest priorities for encouraging more walking and bicycling in Door County? (Rank your top three improvements.)**

	1	2	3	4	5	Rating Average	Rating Count
Better/more sidewalks and trails	<b>44.4%</b> <b>(190)</b>	23.4% (100)	19.6% (84)	8.4% (36)	4.2% (18)	2.05	428
Additional bike facilities on major roads	19.6% (84)	<b>26.6%</b> <b>(114)</b>	26.4% (113)	15.7% (67)	11.7% (50)	2.73	428
Additional bike routes on low speed roads	17.8% (76)	27.8% (119)	<b>32.9%</b> <b>(141)</b>	15.0% (64)	6.5% (28)	2.65	428
Increased education and encouragement	8.2% (35)	11.2% (48)	10.5% (45)	<b>46.7%</b> <b>(200)</b>	23.4% (100)	3.66	428
Increased enforcement of traffic laws	10.0% (43)	11.0% (47)	10.5% (45)	14.3% (61)	<b>54.2%</b> <b>(232)</b>	3.92	428
<b>answered question</b>							<b>428</b>
<b>skipped question</b>							<b>267</b>

**30. What is your gender?**

		Response Percent	Response Count
Male		40.4%	172
Female		<b>59.2%</b>	<b>252</b>
Other		0.0%	0
Prefer not to answer		0.5%	2
<b>answered question</b>			<b>426</b>
<b>skipped question</b>			<b>269</b>

31. What is your age?										
	<20	21-29	30-39	40-49	50-59	60-69	70+	prefer not to answer	Rating Count	
Age	0.9% (4)	4.9% (21)	11.5% (49)	22.5% (96)	<b>29.8%</b> <b>(127)</b>	23.7% (101)	4.9% (21)	1.6% (7)		426
									<b>answered question</b>	<b>426</b>
									<b>skipped question</b>	<b>269</b>

### 32. Where do you live/vacation in Door County (choose one)?

	Live	Vacation	Rating Count
Town of Baileys Harbor	46.2% (24)	<b>53.8% (28)</b>	52
Town of Brussels	30.0% (3)	<b>70.0% (7)</b>	10
Town of Clay Banks	<b>57.1% (4)</b>	42.9% (3)	7
Town of Egg Harbor	38.9% (21)	<b>61.1% (33)</b>	54
Village of Egg Harbor	26.5% (13)	<b>73.5% (36)</b>	49
Village of Ephraim	5.9% (2)	<b>94.1% (32)</b>	34
Town of Forestville	27.3% (3)	<b>72.7% (8)</b>	11
Village of Forestville	25.0% (2)	<b>75.0% (6)</b>	8
Town of Gardner	<b>57.1% (4)</b>	42.9% (3)	7
Town of Gibraltar	<b>55.6% (20)</b>	44.4% (16)	36
Town of Jacksonport	30.0% (9)	<b>70.0% (21)</b>	30
Town of Liberty Grove	<b>71.8% (28)</b>	33.3% (13)	39
Town of Nasewaupsee	<b>82.1% (23)</b>	17.9% (5)	28
Town of Sevastopol	<b>75.5% (37)</b>	28.6% (14)	49
Village of Sister Bay	26.8% (15)	<b>75.0% (42)</b>	56
City of Sturgeon Bay	<b>82.4% (103)</b>	20.0% (25)	125
Town of Sturgeon Bay	<b>55.0% (22)</b>	47.5% (19)	40
Town of Union	<b>62.5% (5)</b>	37.5% (3)	8
Town of Washington	5.6% (1)	<b>94.4% (17)</b>	18
Unincorporated Area	42.1% (8)	<b>57.9% (11)</b>	19

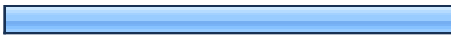




Other 17

answered question 428



**skipped question**      **267**

**33. How much time do you spend in Door County each year?**

		Response Percent	Response Count
<b>Full-year resident</b>		<b>67.3%</b>	<b>288</b>
Partial-year resident (4+ months)		8.2%	35
1-4 months		9.3%	40
2-4 weeks		7.2%	31
Less than 2 weeks		7.9%	34

Other (please specify)      9

**answered question**      **428**

**skipped question**      **267**

**34. Please provide any additional information below. We welcome your comments.**

**Response  
Count**

104

**answered question**      **104**

**skipped question**      **591**



## Appendix K: 2013 Estimated Bicycle Tourism Events Financial Impact

Estimated lodging and tourism impact using figures from post-race participant surveys.

	<b>ALL EVENTS</b>
<b>ACTUAL FINISHERS (a)</b>	2,009
<b>SURVEY RESPONDENTS</b>	555
<b>% STAYING IN HOTELS/B&amp;B'S/CAMPGROUNDS (b)</b>	55.9%
<b>ESTIMATED TRIATHLETES IN HOTELS (a x b) = (c)</b>	<b>1,123</b>
<b>NUMBER OF ROOMS</b>	
- One	66.6%
- Two	16.2%
- Three	7.3%
- Four or more	9.9%
Total %	100.0%
Weighted Average Rooms per Runner (d)	1.61
<b>TRIATHLETES IN TRAVEL PARTY (SHARED ROOMS)</b>	
- One	39.7%
- Two	32.8%
- Three	9.5%
- Four or more	18.0%
Total %	100.0%
Weighted Average Triathletes in Travel Party (e)	2.06
<b>ADJUSTED AVERAGE ROOMS PER TRIATHLETE (d divided by e) = (f)</b>	0.78
<b>ESTIMATED TOTAL HOTEL ROOMS BOOKED (c x f) = (g)</b>	<b>876</b>
<b>NUMBER OF NIGHTS</b>	
- One	9.3%
- Two	39.7%
- Three	33.4%
- Four or more	17.6%
Total %	100.0%
Weighted Average Room Nights (h)	2.59
<b>ESTIMATED TOTAL ROOM NIGHTS (g x h)</b>	<b>2,271</b>
<b>PEOPLE IN TRAVEL PARTY</b>	
- One	3.9%
- Two	34.8%
- Three	8.2%
- Four or more	53.1%
Total %	100.0%
Weighted Average People in Travel Party (i)	3.11
Net Party Size per Triathlete (i divided by e) = (j)	1.51
<b>TOTAL TOURISTS (c x j) = (k)</b>	<b>1,694</b>
<b>TOTAL TOURIST DAYS (k x h) = (l)</b>	<b>4,393</b>
Multiplied by Daily Spending Per Person Per Day* (j)	\$ 140.00
*From <i>Wisconsin Visitor Survey 2008</i> (Wisconsin Dept. of Tourism)	
<b>ESTIMATED TOURISM SPENDING (i x j)</b>	<b>\$ 615,090</b>

# 2013 DOOR COUNTY CENTURY ESTIMATED LODGING & TOURISM IMPACT

(using figures from post-race participant surveys)

	CALCULATIONS	NUMBER OF NIGHTS	CALCULATIONS
<b>ACTUAL FINISHERS (a)</b>	2,968	- One	32.7%
<b>SURVEY RESPONDENTS</b>	657	- Two	42.2%
<b>% STAYING IN HOTELS/B&amp;B'S/CAMPGROUNDS (b)</b>	52.6%	- Three	15.6%
		- Four or more	9.5%
		Total %	100.0%
		Weighted Average Room Nights (h)	2.02
<b>ESTIMATED RIDERS IN HOTELS (a x b) = (c)</b>	<b>1,561</b>	<b>ESTIMATED TOTAL ROOM NIGHTS (g x h)</b>	<b>1,569</b>

<b>NUMBER OF ROOMS</b>			
- One	86.8%		
- Two	9.7%		
- Three	1.8%		
- Four or more	1.7%		
Total %	100.0%		
Weighted Average Rooms per Rider (d)	1.18		
<b>RIDERS IN TRAVEL PARTY (SHARED ROOMS)</b>			
- One	21.8%		
- Two	43.4%		
- Three	10.0%		
- Four or more	24.8%		
Total %	100.0%		
Weighted Average Riders in Travel Party (e)	2.38		
<b>ADJUSTED AVERAGE ROOMS PER RIDER (d divided by e) = (f)</b>	0.50		
<b>ESTIMATED TOTAL HOTEL ROOMS BOOKED (c x f) = (g)</b>	<b>777</b>		

<b>PEOPLE IN TRAVEL PARTY (SHARED ROOMS)</b>			
- One	6.2%		
- Two	46.6%		
- Three	12.1%		
- Four or more	35.1%		
Total %	100.0%		
Weighted Average People in Travel Party (i)	2.76		
Net Party Size per Rider (i divided by e) = (j)	1.16		
<b>TOTAL TOURISTS (c x j) = (k)</b>	<b>1,813</b>		
<b>TOTAL TOURIST DAYS (k x n) = (l)</b>	<b>3,660</b>		
Multiplied by Daily Spending Per Person Per Day \$	140.00		
<b>ESTIMATED TOURISM SPENDING (i x j)</b>	<b>\$ 512,352</b>		

\*From Wisconsin Visitor Survey 2008 (Wisconsin Dept. of Tourism)