Achieving Multimodal Networks: Applying Design Flexibility and Reducing Conflicts

- **All Crash Fatalities**
  - 2005: 43,510
  - 2015: 35,092

- **Pedestrians**
  - 2005: 4,892
  - 2015: 5,376

- **Bicyclists**
  - 2005: 786
  - 2015: 818

Source: Fatality Analysis Reporting System (FARS)
Note: *2005-2014 Final File, 2015 Annual Report File*
Key National Roles

- Policy and Guidance
- Planning and Design Guidance
- Decision Support Tools and Capacity Building
- Research
National Context

FHWA

• Execute sustainable transportation policies and practices and **deliver more integrated multi-modal solutions**
• Advance policies and practices that support an integrated surface transportation system for **all users** that is efficient, equitable, safe, and environmentally sustainable

Background

• Safety for all users
• Connected pedestrian and bicycle networks
• Design flexibility
• Accelerated project delivery
• Data to improve the planning process
Aspirational Goals

- Achieve an 80 percent reduction in pedestrian and bicycle fatalities and serious injuries in 15 years and zero pedestrian and bicycle fatalities and serious injuries in the next 20 to 30 years.
- Increase the percentage of short trips represented by bicycling and walking to 30 percent by the year 2025. This will indicate a 50 percent increase over the 2009 value of 20 percent. Short trips are defined as trips 5 miles or less for bicyclists and 1 mile or less for pedestrians.
This memorandum expresses the Federal Highway Administration’s (FHWA) support for taking a flexible approach to bicycle and pedestrian facility design. The American Association of State Highway and Transportation Officials (AASHTO) bicycle and pedestrian design guides are the primary national resources for planning, designing, and operating bicycle and pedestrian facilities. The National Association of City Transportation Officials (NACTO) Urban Bikeway Design Guide and the Institute of Transportation Engineers (ITE) Designing Urban Walkable Thoroughfares guide builds upon the flexibilities provided in the AASHTO guides, which can help communities plan and design safe and convenient facilities for pedestrian and bicyclists. FHWA supports the use of these resources to further develop nonmotorized transportation networks, particularly in urban areas.

AASHTO Guides
Pedestrian and Bicycle Funding Opportunities
U.S. Department of Transportation Transit, Highway, and Safety Funds
Revised August 12, 2016

This table indicates potential eligibility for pedestrian and bicycle projects under U.S. Department of Transportation surface transportation funding programs. Additional restrictions may apply. See notes and basic program requirements below, and see program guidance for detailed requirements. Project sponsors should fully integrate nonmotorized accommodation into surface transportation projects. Section 1404 of the Fixing America’s Surface Transportation (FAST) Act modified 23 U.S.C. 109 to require federally-funded projects on the National Highway System to consider access for other modes of transportation, and provides greater design flexibility to do so.

<table>
<thead>
<tr>
<th>Activity or Project Type</th>
<th>TIGER</th>
<th>TIFIA</th>
<th>FTA</th>
<th>ATI</th>
<th>CMAQ</th>
<th>HSIP</th>
<th>NPPP</th>
<th>STBG</th>
<th>RA</th>
<th>RTP</th>
<th>SRTS</th>
<th>PLAN</th>
<th>NHTSA 402</th>
<th>NHTSA 405</th>
<th>FLTTP</th>
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<tr>
<td>Access enhancements to public transportation (includes benches, bus pads)</td>
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<td>ADA/504 Self Evaluation / Transition Plan</td>
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<td>Bicycle plans</td>
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<td>Bicycle helmets (project or training related)</td>
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<td>Bicycle parking</td>
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<td>Bicycle share (capital and equipment; not operations)</td>
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<td>Bicycle storage or service centers at transit hubs</td>
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<td>Bridges / overcrossings for pedestrians and/or bicyclists</td>
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<td>Bus shelters and benches</td>
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<td>Coordinator positions (State or local)</td>
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<td>Crosswalks (new or retrofit)</td>
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<td>Curb cuts and ramps</td>
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<td>Counting equipment</td>
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<td>Data collection and monitoring for pedestrians and/or bicyclists</td>
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<td>Historic preservation (pedestrian and bicycle and transit facilities)</td>
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<tr>
<td>Landscaping, streetscoping (pedestrian and/or bicycle route; transit access); related amenities (benches, water fountains); generally as part of a larger project</td>
<td>~$</td>
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<tr>
<td>Lighting (pedestrian and bicyclist scale associated with pedestrian/bicyclist project)</td>
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</tbody>
</table>

Key: $ = Funds may be used for this activity (restrictions may apply). $* = See program-specific notes for restrictions. -$ = Eligible, but not competitive unless part of a larger project.

Available at www.fhwa.dot.gov/environment/bicycle_pedestrian
Recent FHWA Pedestrian and Bicycle Resources

Available at www.fhwa.dot.gov/environment/bicycle_pedestrian
FIGURE 4: Sample illustration of a street before a Lane Diet.

FIGURE 5: Sample illustration of a street after a Lane Diet and the installation of bike lanes.
### Table 2: Estimated cost to add bike lanes to a roadway by reducing four travel lanes to three travel lanes as a standalone project.

<table>
<thead>
<tr>
<th>Item</th>
<th>Unit</th>
<th>Quant.</th>
<th>2015 Est. Unit Cost</th>
<th>Total Cost per Mile</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eradication</td>
<td>LF</td>
<td>15,000</td>
<td>$1.50</td>
<td>$22,500</td>
<td>Assume 3 lines entire length</td>
</tr>
<tr>
<td>Bike Lane Lines: Thermoplastic (6&quot;)</td>
<td>LF</td>
<td>10,000</td>
<td>$1.50</td>
<td>$15,000</td>
<td>Assume 2 solid lines entire length</td>
</tr>
<tr>
<td>Travel Lane Lines: Thermoplastic (4&quot;)</td>
<td>LF</td>
<td>15,000</td>
<td>$1.00</td>
<td>$15,000</td>
<td>Assume two solid lines entire length and two striped lines at 50% coverage entire length</td>
</tr>
<tr>
<td>Bike Lane Thermoplastic Pavement Marking Symbol</td>
<td>EA</td>
<td>40</td>
<td>$300.00</td>
<td>$12,000</td>
<td>Assume 1 Symbol every 250’ each side of road (bike lane)</td>
</tr>
<tr>
<td>Bike Lane Sign</td>
<td>EA</td>
<td>20</td>
<td>$250.00</td>
<td>$5,000</td>
<td>Assume 1 Sign every 500’</td>
</tr>
<tr>
<td>Left-Turn Thermoplastic Pavement Marking Symbol</td>
<td>EA</td>
<td>20</td>
<td>$300.00</td>
<td>$6,000</td>
<td>Assume 1 symbol every 250’ (Left-Turn arrows)</td>
</tr>
</tbody>
</table>

**Lump Sum Items**

| Maintenance of Traffic (10%) | LS   | 1.00 | $7,500 | $7,500 |

**Subtotal** $83,000

20% Contingency $17,000

**Total Estimated Cost** $100,000

### Table 3: Estimated cost to add bike lanes to a roadway by reducing four travel lanes to three travel lanes during a resurfacing project.

<table>
<thead>
<tr>
<th>Item</th>
<th>Unit</th>
<th>Quant.</th>
<th>2015 Est. Unit Cost</th>
<th>Total Cost per Mile</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eradication</td>
<td>LF</td>
<td>15,000</td>
<td>$1.50</td>
<td>$0</td>
<td>Not necessary with resurfacing</td>
</tr>
<tr>
<td>Bike Lane Lines: Thermoplastic (6&quot;)</td>
<td>LF</td>
<td>10,000</td>
<td>$1.50</td>
<td>$15,000</td>
<td>Assume 2 solid lines entire length</td>
</tr>
<tr>
<td>Travel Lane Lines: Thermoplastic (4&quot;)</td>
<td>LF</td>
<td>15,000</td>
<td>$1.00</td>
<td>$0</td>
<td>Included with resurfacing project</td>
</tr>
<tr>
<td>Bike Lane Thermoplastic Pavement Marking Symbol</td>
<td>EA</td>
<td>40</td>
<td>$300.00</td>
<td>$12,000</td>
<td>Assume 1 Symbol every 250’ each side of road (bike lane)</td>
</tr>
<tr>
<td>Bike Lane Sign</td>
<td>EA</td>
<td>20</td>
<td>$250.00</td>
<td>$5,000</td>
<td>Assume 1 Sign every 500’</td>
</tr>
<tr>
<td>Left-Turn Thermoplastic Pavement Marking Symbol</td>
<td>EA</td>
<td>20</td>
<td>$300.00</td>
<td>$0</td>
<td>Included with resurfacing project</td>
</tr>
</tbody>
</table>

**Lump Sum Items**

| Maintenance of Traffic (10%) | LS   | 1.00 | $3,922 | $0      |

**Subtotal** $32,000

20% Contingency $6,400

**Total Estimated Cost** $38,400
Recently Released

• Provide a bridge between existing guidance on bicycle and pedestrian design and rural practice.
• Encourage innovation in development of safe and appealing networks for bicycling and walking in small towns and rural areas.
• Provide examples of peer communities and project implementation that is appropriate for rural communities.
Connected Networks

- **SIOP Path**
- **School Loop**
- **Town Center**
- **Neighborhood**

**Biwabik, MN**
- Local connections to schools (low speed and short distances)

**Aurora, MN**
- Connections between communities (high speed corridors and long distances)
- Main Street or commercial area with high demand for all modes
- Need for connections from residential areas to main street
Common Challenges in Small Town and Rural Areas

**Agricultural Uses**
Small towns and rural areas near agricultural operations need to consider the needs of wide and slow-moving farm equipment.

**Public Lands Access**
Many small town and rural communities are located near public lands that serve as popular destinations. Creating comfortable linkages, in effect, extends these public lands into their surrounding communities.

**Constrained Terrain**
Rural highways often have physical constraints that make the provision of cost-effective facilities for bicycling and walking difficult.

**Safety**
Pedestrian crossings are often not defined and may be difficult to warrant based on low existing use; however, not providing pedestrian crossings makes streets act as barriers that divide communities.

**Auto-Oriented Roadways**
With lower densities and greater distances, many small towns and rural areas have developed in a more auto-oriented fashion than urban areas.

**Lack of Transportation Options**
A singular focus on automobile mobility results in a lack of facilities for people walking and bicycling, making travel by these modes difficult and less safe.

**Highway as a Main Street**
State highways often pass through the heart of small towns and may punctuate through traffic over local streets. Some may be wide and over designed, and some may be constrained and hard to change.

**Climate and Maintenance**
Winter maintenance is a significant constraint in much of the country. Many small towns and counties do not have adequate resources to pay for special equipment to clear certain types of active transportation facilities.
Guide Structure

1. Introduction
   1-5 Why a Rural and Small Town Focused Guide?
   1-7 Building a Rural and Small Town Multimodal Network
   1-8 Who Uses the Rural Network?
   1-9 How to Use this Guide
   1-11 Creating Networks
   1-13 Common Challenges in Small Town and Rural Areas
   1-15 Reference Guide
   1-16 Accessibility Standards

2. Mixed Transportation Facilities
   2-3 Yield Roadway
   2-9 Bicycle Boulevard
   2-17 Advisory Shoulder

3. Visually Separated Facilities
   3-3 Paved Shoulder
   3-11 Bike Lane

4. Physically Separated Facilities
   4-3 Shared Use Path
   4-11 Sideway
   4-19 Sidewalk
   4-25 Separated Bike Lane

5. Key Network Linkages
   5-3 Speed Management
   5-7 Pedestrian Lane
   5-9 School Connections
   5-15 Multimodal Main Streets
   5-21 Bridges
   5-27 Access to Public Lands

6. Planning and Project Development
   6-3 The Transportation Planning Process
   6-4 Steps in the Transportation Planning Process
   6-5 Key Products in the Transportation Planning Process
   6-6 What are the Key Products of the Transportation Planning Process?
Facility Categories

Mixed Traffic

Visually Separated

Physically Separated
Mixed Traffic  Visually Separated  Physically Separated
Miles City, Montana

Case Study: Sidewalk

PROJECT DESCRIPTION

Miles City is the largest city in the county of Custer, Montana. It is the county seat and largest city in Custer County. Miles City is located in the foothills of the Northern Rockies, and is served by the Great Northern and Northern Pacific Railroads. The city is located in a region known for its scenic beauty, and is a popular destination for outdoor enthusiasts.

The Miles City Active Living Taskforce is an involved group working to encourage residents of Miles City to be more physically active. It was the catalyst for starting a Safe Routes to School (SRTS) program in Miles City. With support from the Montana Department of Transportation's SRTS program, a bicycle and pedestrian safety program was started at Garfield Elementary School. The program is taught by the health enhancement staff and the school resource officer.

The Garfield School sidewalk project was funded through SRTS efforts in Miles City and included the installation of approximately 1/2 mile of sidewalk. The northeast portion of Miles City is an area of mostly low income residential development, while most streets in this part of town lack accommodation for bicycles and pedestrians. Many children in the area walk or bike to Garfield Elementary. Garfield is the largest of four elementary schools in Miles City with 67 percent of students eligible for free or reduced lunch.

The sidewalks were installed along Lincoln Street, North Lake Avenue, and Riverside Street. This route functions as a collector for a number of neighborhood streets and is in the connection to the school. In addition to a walking route to the school, the sidewalk project provides access from these neighborhoods to the park along the south side of Lincoln Street.

Multimodal Main Streets

FOUR-LANE STREET SCENARIOS

EXISTING CONDITIONS

A four-lane to three-lane road diet can balance the needs of through travel and local community access, while increasing safety. Road diets are on FHWA Proven Safety Countermeasures. For more information on road diets, refer to the FHWA Resurfacing Guide 2014 and the FHWA Road Diet Guide 2014.

STREETSCAPE EXPANSION WITH BIKE LANES

Narrowing and consolidating excess space dedicated to motor vehicles can provide room to expand sidewalk areas. Road diets are on FHWA Proven Safety Countermeasures. For more information on roadway reconfigurations, refer to the FHWA Road Diet Guide 2014. Refer to the ITE Walkable Urban Thoroughfares Guide 2010 for more information on sidewalk configuration.
Bridges

Existing Conditions

Some bridges may be so narrow (25 ft or less) as to make any reconfiguration option impossible or too narrow to be of value. Sufficient existing space is only provided for a single travel lane in each direction. No functional sidewalks or shoulders are present.

Markings, Signs, and Beacons

Active warning beacons, R4-11 signs, and SMs may be used to alert bridge users to the likely presence of bicyclists on the roadway. For increased bicyclist comfort, consider reduced or advisory speed limits on the bridge.

Advisory Shoulders

Establishing advisory shoulders on the bridge creates dedicated pedestrian and/or bicycle space within the same roadway width. Refer to the guidance on advisory shoulders for additional context.

One Lane Bridge

Along roadways with low motor vehicle volumes and adequate sight distance, confining the structure as a one-lane bridge can provide an exclusive separated space for pedestrians and bicyclists. Refer to the FHWA MUTCD section 2C.21.

Access to Public Lands

Public lands make up a significant portion of the nation's land area. Federal lands alone make up almost 30 percent of the U.S. national parks, forests, wildlife refuges, and the Bureau of Land Management (BLM) lands, state and county parks, and other forms of public lands play important roles in the economies of many rural communities and on trails across America. Improved walking and bicycling access to public lands can also provide opportunities for physical activity in communities. There is increasing interest from public land managers and pathway communities in providing more options for people to access and experience public lands by foot and bike—creating more seamless multimodal transportation networks.

The Transportation Planning Process

This chapter is intended to encourage the reader to understand that local, regional, and state processes seek to determine what the entry points are for improvements. It is also intended to emphasize the ultimate goal of "mainstreaming" bike and pedestrian planning so that these projects can be systematically and independently considered alongside motorized enhancements.

Transportation planning is a continuing, cooperative, and comprehensive process that uses a performance-driven approach for decision-making. Public agencies that are responsible for the operation, maintenance, and development of transportation systems and facilities work cooperatively to determine long and short-range investments. Public agencies at all levels, from small towns to metropolitan areas, work together to improve conditions for all people in the community. This includes those with disabilities. The transportation planning process must consider all users of the transportation system, including those who are not drivers. Figure 5-1 illustrates the development of products and activities within the transportation planning process.

Figure 5-1. The Transportation Planning Process

- Regional Needs and Issues
- Evaluation and Prioritization of Strategies
- Development of Transportation Plans
- Implementation of Transportation Programs
- Development of Infrastructure Improvement Program
- Project Development
- Systems Operations
- Protective Measures and Incentives
Achieving Multimodal Networks: Applying Design Flexibility and Reducing Conflicts

• Highlights ways to apply design flexibility, while focusing on reducing multimodal conflicts and achieving connected networks

• Help practitioners address topics such as:
  – Intersection design
  – Road diets
  – Pedestrian crossing treatments
  – Transit and school access
  – Freight
  – Accessibility

Available at www.fhwa.dot.gov/environment/bicycle_pedestrian
### Achieving Multimodal Networks: Applying Design Flexibility and Reducing Conflicts

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- 99 SHARED USE PATHS
- 103 MIDBLOCK PATH INTERSECTIONS
- 107 SHARED STREETS

Available at [www.fhwa.dot.gov/environment/bicycle_pedestrian](http://www.fhwa.dot.gov/environment/bicycle_pedestrian)
Available at www.fhwa.dot.gov/environment/bicycle_pedestrian
MAP BASICS

Common approaches for bicycle infrastructure planning maps are highlighted below. The maps that follow demonstrate these general approaches to varying degrees.

(1) COMMON INFORMATION LAYERS

BIKE NETWORK LAYERS
- Specific Facility Types
  - Bike path, bike lane, buffered bike lane, bike boulevard, separated bike lane, greenway, etc.
- OR
- Flexible Facility Types
  - On-street vs. off-street bikeway systems

LOCAL CONTEXT LAYERS
- Transit lines & stations
- Bikeshare stations
- Community amenities: Schools, universities, libraries, community centers, hospitals etc.
- Building footprints
- Specific land use functions, such as commercial use
- Study areas or corridors

BASE LAYERS
- Parks & open space
- Streets
- Waterbodies
- City boundaries
- Labels

(2) REPRESENTING DIFFERENT TYPES OF INFORMATION

PROPOSED VS. EXISTING NETWORK
- Identity ways to clearly denote what is existing and what is being proposed.
- Outline
  - existing
  - proposed
  - new

COLOR SCHEME
- Consider how color will play a role in highlighting the bicycle network. Bright, saturated colors stand out against sober and more subdued

LEVEL OF INFORMATION
- Carefully consider the amount of information used to tell the story. More information can help, but it can also be overwhelming if not

HENNEPIN COUNTY, MN

LOCATION | YEAR | PUBLICATION | RESPONSIBLE AGENCY
---------|------|-------------|---------------------
HENNEPIN COUNTY | 2018 | HENNEPIN COUNTY BIKE PLAN | HENNEPIN COUNTY

KEY MAP FEATURES

- Simple symbology: Two colors and two line types
- Map focuses on county and state trails, urban paths and greenways
-Broadwalk area is shown in more detail for closer inspection

[Image of map and legend]
Decision Support Tools and Capacity Building

**PEDSAFE**

Pedestrian Safety Guide and Countermeasure Selection System

**GUIDE**

- Background: Understand what is needed to create a viable pedestrian system.
- Analysis: How crash typing can lead to the most appropriate countermeasures.
- Statistics: Learn about factors related to the pedestrian crash problem.

**COUNTERMEASURES**

- Selection Tool: Find countermeasures based on desired objectives.
- Countermeasure List: A comprehensive list of all countermeasures.
- Selection Matrices: Find countermeasures based on crash types and performance objectives.

**BIKESAFE**

Bicycle Safety Guide and Countermeasure Selection System

**GUIDE**

- Background: How crash typing can lead to the most appropriate countermeasures.
- Analysis: Needed components for treatments.

**COUNTERMEASURES**

- Selection Tool: Find countermeasures based on desired objectives.
- Countermeasure List: A comprehensive list of all countermeasures.
- Selection Matrices: Find countermeasures based on crash types and performance objectives.

Authors and Acknowledgements

Keys to connected ped/bike networks

Study identifies key principles of ped/bike networks and highlights strategies used by communities across the U.S. to enhance nonmotorized travel.

Search the PBIC Website

Insert search terms here

FHWA debunks misconceptions

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