Case Studies in Delivering Safe, Comfortable, and Connected Pedestrian and Bicycle Networks

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Exemplary pedestrian and bicycle networks reflect, to varying degrees, the following principles:

Cohesion: How connected and linked together is the network?

Directness: Does the network provide access to destinations along a convenient path?

Accessibility: Does the network provide access to destinations for persons of all abilities?

Alternatives: Does the network enable a range of route choices?

Safety and Security: Does the network reduce risk of injury, danger, or crime?

Comfort: Does the network appeal to a broad range of age and ability levels and is consideration given to user amenities?

The Federal Highway Administration (FHWA) is committed to documenting and promoting connected pedestrian and bicycle networks in communities throughout the U.S. Networks are interconnected pedestrian and/or bicycle transportation facilities that allow people of all ages and abilities to safely and conveniently get where they want to go.

This report provides an overview of pedestrian and bicycle network principles and highlights examples from communities across the country. The Appendix provides a complete listing of projects highlighted in the report and additional projects that were identified in the study process.

FHWA's support for connected pedestrian and bicycle networks builds off of the 2010 United States Department of Transportation Policy Statement on Bicycle and Pedestrian Accommodation Regulations and Recommendations,[1] which identifies the Department's goal to support an "increased commitment to and investment in bicycle facilities and walking networks."

The FHWA Performance Year (PY) 2015 Strategic Implementation Plan (SIP) included a National Performance Measure to identify and promote examples provided by partners (local governments, Metropolitan Planning Organizations (MPOs), States) of created and/or significantly improved pedestrian and bicycle transportation networks that provide functional connections and enhance transportation choice. The purpose of the PY 2015 SIP measure was to demonstrate leadership in the area of advancing pedestrian and bicycle networks at the national level.

FHWA's PY 2016 SIP includes the same performance measures and another measure that emphasizes assessing and bridging gaps in multimodal transportation connectivity. The PY 2016 SIP performance measure will build upon this initial inventory and focus on examples of specific projects that filled gaps between existing facilities. These activities will continue to build upon FHWA's longtime support for pedestrian and bicycle transportation through policy, planning, and funding.

FHWA Division Offices identified a total of 86 pedestrian and bicycle network examples throughout the U.S. Of the project examples identified, 21 of them are regional in scope and 6 are statewide projects. The remaining local examples represent a range of community sizes, from those with populations under 600 people (Ray, North Dakota) to cities with nearly 2.7 million residents (Chicago, Illinois).

Examples were identified, evaluated, and categorized into several key project types, including:

- **Planning and Prioritization** – How agencies are planning their transportation systems and prioritizing improvements so that projects result in a connected network.
- **Shared Use Paths** – Using shared use paths and the off-roadway network to link the transportation system together and allow for more direct pedestrian and bicycle travel.
- **Corridor Improvements** – Changes to high speed, high volume corridors to improve safety, accessibility, and comfort for nonmotorized users.
- **Bridges** – Addressing pinch points and bottle necks in the network to ensure safe and comfortable accommodation for pedestrians and bicyclists to/from and across bridges and underpasses.
- **On-Road Facilities** – Improvements that can be made within the existing street right-of-way to create space for more bicycle and pedestrian travel.
- **Intersections and Crossing Improvements** – Addressing the safety of intersections and other crossings that may serve as barriers to the pedestrian and bicycle network.

By collecting these examples and sharing them, this report is intended to provide inspiration to agencies interested in making improvements to their pedestrian and bicycle networks. The discussion of network principles will help communities better understand the variety of goals and outcomes they should seek to achieve through their projects. The report's conclusion highlights work that is still needed to better understand networks.

Though challenges remain in the measurement and tracking of pedestrian and bicycle network connectivity, the information provided here will support agencies, partners, and stakeholders as they plan, design, implement, and maintain connected pedestrian and bicycle networks that meet the needs of everyone.

Introduction and Background

How is FHWA supporting the advancement of pedestrian and bicycle networks?

The Federal Highway Administration (FHWA) has demonstrated leadership in advancing pedestrian and bicycle networks through policy, planning, and funding. The 2010 United States Department of Transportation Policy Statement on Bicycle and Pedestrian Accommodation Regulations and Recommendations[1] identified the role of networks in promoting livable communities that encourage active transportation and guides priorities for FHWA and other agencies within the U.S. Department of Transportation. Specifically, the statement noted that "increased commitment to and investment in bicycle facilities and walking networks can help meet goals for cleaner, healthier air; less congested roadways; and more livable, safe, cost-efficient communities."

This Policy Statement made recommendations for actions that all transportation agencies can pursue, such as building safe and convenient bicycle and pedestrian facilities into transportation projects and looking beyond minimum standards when providing accommodations for pedestrians and bicyclists. All of these recommendations, at their core, seek to establish connected networks for pedestrians and bicyclists—transportation systems that allow trips by foot or bike throughout an area, so that a person can safely and conveniently access destinations without driving.

To better understand the different ways in which communities are improving their pedestrian and bicycle networks, FHWA Division Offices gathered and compiled examples of pedestrian and bicycle network improvement projects initiated by State DOTs, MPOs, counties, cities, and other local entities. The purpose of this effort was to support the Performance Year (PY) 2015 Strategic Implementation Plan (SIP), to identify specific examples of network improvements throughout the U.S. and to share these examples with those communities interested in enhancing their networks. FHWA Division Offices in each State worked with local stakeholders and agencies to compile examples of projects that made improvements to pedestrian and bicycle networks. The effort identified a total of 86 projects from all States, the District of Columbia, and Puerto Rico, each of which highlighted a project that was intended to improve the transportation network for pedestrians and bicyclists.

The network examples were used to develop brief case studies of successful projects, which will be highlighted later in this report. Projects included a range of improvements, including planning and prioritization strategies, intersection improvements, corridor redevelopment, and others. The examples provide agencies with ideas about how they can improve networks for pedestrians and bicyclists and will serve as a source of inspiration for communities who are interested in making network improvements.

Federal Funding for Pedestrian and Bicycle Network Projects

Federal funding sources are available to make improvements to pedestrian and bicycle networks like the ones discussed in this report.

FHWA has developed the resource **Bicycle and Pedestrian Funding Opportunities**[2] – a complete list of project types on its website, along with information about which sources of Federal funding can be used for those particular projects.

As noted on the FHWA website, there are specific requirements that must be met depending on the funding source, and eligibility can be determined on a case by case basis.

Further guidance on funding questions can be found in the FHWA report, **Bicycle and Pedestrian Funding, Design, and Environmental Review: Addressing Common Misconceptions.**[3]

What are safe, comfortable, and connected networks and why are they important to pedestrians and bicyclists?

A pedestrian and bicycle transportation network consists of a series of interconnected facilities that allow nonmotorized road users of all ages and abilities to safely and conveniently get where they need to go. A connected network is not established by a standalone bike lane project, new sidewalk, or curb ramp upgrade. Rather, a network will use these types of projects to deliver a transportation system that prioritizes the needs of pedestrians and bicyclists to safely and conveniently access the destinations they need to reach. By providing connected networks, communities are helping to facilitate all of the following types of bicycling and walking trips:

- Access to work from residential areas;
- Active transportation to and from school;
- Bicycling and walking links to transit;
- Recreation and physical activity opportunities; and
- Access to grocery stores, government buildings, health care, and other essential services.

A well-connected pedestrian and bicyclist network recognizes that trips vary in purpose and nature. In the same way, a connected network will facilitate travel for a number of different types of users. A bicycle commuter who needs access to a place of employment may not want to travel along the same shared use path that is used by dog walkers and other recreational users. A system of low volume, low speed streets that provide a comfortable bicycling environment may not provide a direct walking route between a person's house and the nearest grocery store.

Understanding that different users have different needs, pedestrian and bicycle networks should be designed to provide options for continuous, safe, seamless, and convenient travel between all possible destinations.

Network Principles

What are the principles of exemplary pedestrian and bicycle networks?

There are varying levels of connected networks in communities across the United States. Some of these networks are comprehensive in nature, providing all of the necessary connections for a variety of user groups.

To help evaluate the state of a pedestrian and bicycle network, it is useful to examine how the network meets a variety of network principles. The following principles, adapted from the Dutch CROW (Centre for Research and Contract Standardization in Civil and Traffic Engineering) manual,[4] provide a useful method for assessing how well a pedestrian and bicycle network meets its intended purpose.

An exemplary pedestrian and bicycle network will satisfy each of these principles. The following sections illustrate each of these principles and provide some examples of how they can be achieved through network development.

These principles include:

- **Cohesion** – How connected is the network in terms of its concentration of destinations and routes?
- **Directness** – Does the network provide direct and convenient access to destinations?
- **Accessibility** – How well does the network accommodate travel for all users, regardless of age or ability?
- **Alternatives** – Are there a number of different route choices available within the network?
- **Safety and Security** – Does the network provide routes that minimize risk of injury, danger, and crime?
- **Comfort** – Does the network appeal to a broad range of age and ability levels and is consideration given to user amenities?

Cohesion

There are examples in nearly every community of safe, comfortable places to walk and bike. Bicycling and walking facilities like sidewalks, shared use paths, bicycle lanes, and others are becoming more prevalent as cities recognize the value in supporting nonmotorized transportation. In contrast, there are also many examples of these facilities that serve more as standalone projects rather than pieces of a comprehensive network. These include:

- Bicycle lanes that begin at one intersection only to end a quarter of a mile down the road.
- Sidewalks that run the length of a new development, but stop abruptly at the property line.
- Shared use paths around lakes or natural areas that can only be comfortably accessed by motor vehicle.

These projects may signal a community's desire to promote walking and bicycling, but the disconnected nature of the network still requires pedestrians and bicyclists to traverse potentially high volume, high speed roads to get from one place to another.

Network cohesion is a key principle that illustrates how these different types of facilities can be integrated so that longer-distance travel by foot or bike can be accommodated and even encouraged. In a cohesive network, opportunities for direct travel between destinations are made possible by focusing on links between existing infrastructure and destinations.

The Link, a strategy to connect bicycling and walking facilities in Springfield, Missouri, provides a number of facilities that work together to fill gaps and improve the cohesion of the City's nonmotorized network. The Washington Bridge Bikeway links the nonmotorized networks in Providence and East Providence, Rhode Island, by providing a critical connection. Network cohesion ensures that facilities will operate as a transportation system rather than standalone facilities.

Figure 1. The sidewalk stops short of the bus stop location. Image courtesy of the PBIC Image Library (Photographer: Laura Sandt)

Directness

One of the key determining factors in a person's decision to walk or bike is trip distance: how far must a person travel to reach a destination? The 2009 National Household Travel Survey revealed that 88 percent of walking trips are less than one mile in length. Bicyclists tend to cover more ground, but the vast majority of those trips (74 percent) are not greater than two miles.[5] By minimizing the distance that pedestrians and bicyclists need to travel out of their way to reach destinations, agencies can promote nonmotorized trips as alternatives to driving.

Directness is a key principle of a connected pedestrian and bicycle network. An exemplary network will minimize the distance a person must travel to reach a destination, prioritizing a convenient path between destinations. The following example of two neighborhoods with different development patterns represents this concept. The distance from home to school in each example is the same; however, the travel distance is quite different. The neighborhood on the right has a much more direct route to school, while the neighborhood on the left requires travel to a main road, significantly increasing the travel distance.

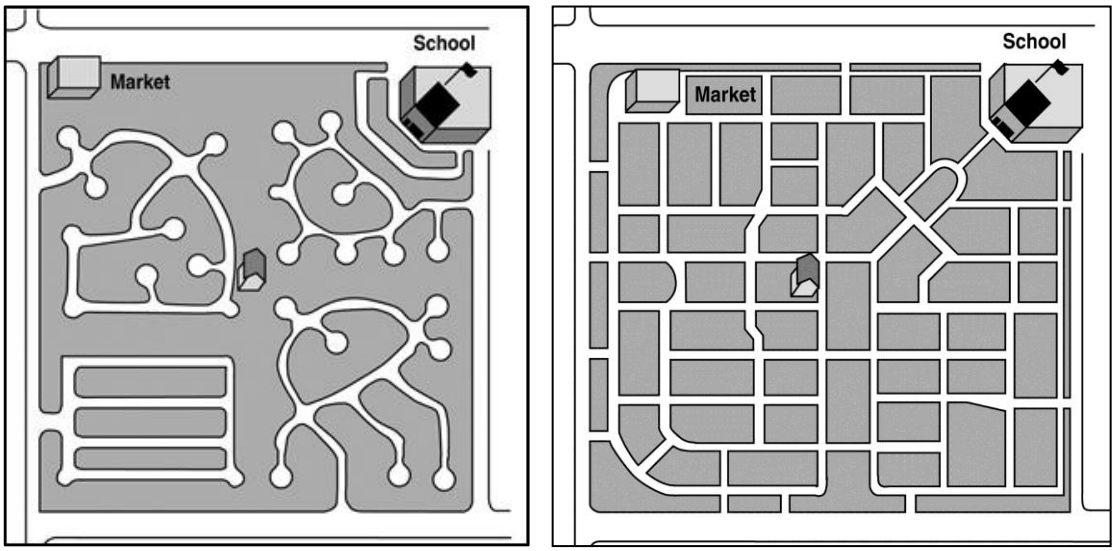

Figure 2. The more connected network on the right provides a more direct connection between destinations than the example on the left. Images taken from FHWA training materials.

Numerous project examples discussed later in this report enhanced the pedestrian and bicycle network by providing direct routes from one place to another and by enhancing access to destinations. Improvements to Esplanade Avenue in New Orleans, Louisiana, reestablished that route as a direct link between neighborhoods and key destinations within the City. The Fennel Creek Trail in Bonney Lake, Washington, connects neighborhoods to an elementary school across a watershed, and has reduced demand for 8 to 10 school bus routes.

Accessibility

In a discussion of connected networks, the principle of accessibility refers to the ability of a network to serve all of its users regardless of age or ability. Creating bicycling and walking routes that serve only a subset of the population, and that do not comply with the Americans with Disabilities Act (ADA), ignore the needs of users who may be more reliant on nonmotorized travel on a daily basis. A discontinuous sidewalk like the one shown below might be an inconvenience for some pedestrians, but for an individual in a wheelchair this can be a significant barrier.

Figure 3. Sidewalks that end abruptly can be significant barriers for individuals with disabilities. Image courtesy of PBIC Image Library (Photographer: Laura Sandt).

An exemplary network recognizes and accommodates a range of user needs, and prioritizes those users who are unable to drive. Focusing on accessibility further reinforces concepts and goals like universal design and complete streets. Designing networks to meet accessibility requirements is not only in a community's best interest – it is also a requirement. These facilities must comply with ADA and Section 504 of the Rehabilitation Act of 1973. The FHWA policy statement, Accommodating Bicycle and Pedestrian Travel: A Recommended Approach, acknowledged that "failure to provide an accessible pedestrian network for people with disabilities often requires the provision of costly paratransit service."[6] Communities are also encouraged to tie their network planning effort in with their ADA Transition Plan and Self-Evaluation to ensure an integrated approach. Thinking about a transportation network's ability to serve all populations from the earliest point of planning and design can ensure that it will meet the needs of all users.

Alternatives

Within a particular transportation system, there are typically multiple options for routes between two potential destinations. This is especially true for travel by motor vehicle. By entering directions from one place to another in any web-based mapping service, driving directions will typically return a number of options: these options can allow drivers to avoid obstacles like heavy traffic or tolls, and may also help drivers identify routes that prioritize comfort over directness or travel time.

Though the importance of route choice is clear to most users of the road, it is often not prioritized for bicyclists or pedestrians. If there exists a safe, comfortable, and continuous bicycling or walking route, it is sometimes the only option. The presence of alternate routes that provide choices to nonmotorized road users is a sign of a well-connected, comprehensive transportation network. Alternatives are a key consideration for providing route options to different types of users, who may be traveling for different purposes. For example, researchers from Portland State University examined route preferences for utilitarian (not recreational) bicycle trips. Among the findings in their report "Where Do Cyclists Ride? A Route Choice Model Developed with Revealed Preference GPS Data," it was revealed that route preference varied depending on the purpose of the trip: commuters tended to prioritize a more direct route, reducing overall distance, than those taking other utilitarian bicycle trips.[7] This illustrates the important fact that a range of users exist within each group, and a number of different types of trips may influence route selection.

Trip-chaining can play a significant role in the ability of a network to support alternatives routes and modes of transportation. This concept refers to the completion of trips by using multiple modes of travel. In terms of nonmotorized transportation, this often means walking or riding a bike to and from a transit station, then using a bus or rail line to complete longer distance travel. Focusing on trip chaining can allow agencies to make network improvements by focusing on improving pedestrian and bicycle access to transit hubs, therefore increasing the likelihood that a person can travel long distances without using an automobile.

The Farmington River Trail in Connecticut provides an alternative option for pedestrians and bicyclists who would rather not travel along a busy highway. The Fort Collins, Colorado, bicycle

network is being developed from a system wide plan of connections that provide alternatives to reaching key destinations by bike. A focus on providing alternatives for nonmotorized transportation is a key component of any transportation system. A successful pedestrian and bicycle network will prioritize the ability for its users to select routes from a number of alternatives, rather than focusing all travel along one particular route.

Safety and Security

As some of the most vulnerable users of the road, pedestrian and bicyclist safety is a top priority for transportation agencies. Unsafe locations can serve as barriers in the network for pedestrians and bicyclists.

Safety plays an important role in a transportation network, and it is important to acknowledge the roles of actual safety and perceived safety. While a particular location may not have a history of crashes or even observed conflicts involving pedestrians and bicyclists, nonmotorized users may perceive it to be unsafe. This type of location may not be identified by a crash analysis, but it may still serve as a barrier to pedestrian or bicycle travel along the network.

Personal security is another area of emphasis. A connected network that is intended to support pedestrian and bicycle travel should provide a safe route to a variety of destinations. Fear of crime and concerns for personal security may deter pedestrians and bicyclists from traveling in certain locations. As an example, perception of safety will determine a parent's decision to allow his or her child to walk to school.

To improve networks, agencies can make changes to address safety concerns – both real and perceived. Countermeasures intended to improve pedestrian and bicycle safety are outlined in resources like the FHWA Pedestrian and Bicycle Safety Guide and Countermeasure Selection Systems, known as PEDSAFE and BIKESAFE. Some of these treatments have been highlighted by FHWA as Proven Safety Countermeasures, known to reduce crashes among road users. Using these types of resources to address traffic safety concerns is one way to break down these safety barriers that prevent access to the network.

There are also many tools to help address personal security and crime-related problems. Improving lighting along a corridor can go a long way toward improving the personal security of pedestrians and bicyclists using that route. The conversion of an intersection in Shakopee, Minnesota, to a roundabout slowed vehicle speeds and reduced crossing distances for pedestrians. The complete streets improvements along Fletcher Avenue in Hillsborough County, Florida, included numerous enhancements to crosswalks along the corridor to improve pedestrian safety. These projects and others highlighted in this report demonstrate how network improvements can be made by improving safety for nonmotorized users.

By addressing safety within a network, agencies can work proactively to build connections through these formerly problematic locations and increase opportunities for trips by foot or bike.

Comfort

While trip directness, safety, and accessibility are critical to pedestrian and bicycle networks, the importance of comfort is often underappreciated. The comfort of a particular route builds off of many of the other principles discussed previously. The perceived safety of a route, in particular, can impact a pedestrian's or bicyclist's comfort level and can heavily influence whether they will choose to travel in a certain location.

When agencies prioritize providing a bicycle or pedestrian facility, comfort may seem like a "bonus" feature, but agencies should not lose sight of the importance of comfort in a person's decision to walk or bike. Creating more welcoming environments, for example through streetscape improvements, can be one place to start. Promoting human scale development and orienting buildings toward the street, so that pedestrians and bicyclists aren't required to traverse large parking lots to reach the front door, can transform the look and feel of a corridor. Some improvements are low cost and relatively easy to implement. For example, bicycle boulevards are a system of low-volume streets that have been designated to prioritize bicycle traffic. These streets offer a simple solution where the street network allows for a bicycle route to run along neighborhood streets.

The Indianapolis Cultural Trail in Indianapolis, Indiana, used separated facilities for bicyclists and pedestrians, as well as improvements like landscaping and wayfinding, to provide a comfortable route for pedestrians and bicyclists of all abilities. The buffered bicycle lanes installed in Minneapolis, Minnesota, provide additional separation from traffic for bicyclists traveling along those corridors.

The images on this page are drawn from pedestrian and bicycle safety assessments convened and led by U.S. DOT in 2015. They show examples of connected pedestrian and bicycle networks along routes and corridors.

The images on this page are drawn from pedestrian and bicycle safety assessments convened and led by U.S. DOT in 2015. They show examples of crossing facilities that can create connected pedestrian and bicycle networks.

Strategies to Advance Networks

Network Examples

This report's Appendix includes descriptions of all 86 projects, including:

- 38 shared use path and trail projects
- 19 examples of planning and prioritization efforts
- 10 corridor and streetscape improvements
- 6 examples of on-road facility improvements
- 6 bridge projects
- 3 intersection improvements
- 4 other projects, including bike share programs and a rail station enhancement

Agencies across the country are using a variety of methods to evaluate their existing networks, prioritize areas where improvements are needed, and make improvements to enhance network connectivity. Instead of completing standalone projects, these agencies are implementing targeted improvements that are contributing to systemwide networks for bicycle and pedestrian transportation.

The following sections highlight project types that can contribute to network connectivity, ranging from shared use path connections to intersection improvements.

- **Planning and Prioritization** – How agencies are planning their transportation systems and prioritizing improvements so that projects result in a connected network.
- **Shared Use Paths** – Using shared use paths and the off-roadway network to link the transportation system together and allow for more direct pedestrian and bicycle travel.
- **Corridor Improvements** – Changes to high speed, high volume corridors to improve safety, accessibility, and comfort for nonmotorized users.
- **Bridges** – Addressing pinch points and bottle necks in the network to ensure safe and comfortable accommodation for pedestrians and bicyclists to and across bridges and underpasses.
- **On-Road Facilities** – Improvements that can be made within the existing street right of way to create space for more bicycle and pedestrian travel.
- **Intersections and Crossing Improvements** – Addressing the safety of intersections and other crossings that may serve as barriers to the pedestrian and bicycle network.

Each project type addresses different elements of a connected pedestrian and bicycle network and, to varying degrees, the network principles outlined in the previous section. These project types are explored in more detail on the following pages, and specific case study examples are provided. Further examples can be found in the Appendix.

Planning and Prioritizing Networks

Before making network improvements, agencies must first develop an understanding of the existing network's gaps and deficiencies. Planning processes, prioritization methods, and public input strategies can be used to identify improvements to pedestrian and bicycle networks. All of these inputs are critical in understanding the network and making difficult decisions about where to invest in improvements. FHWA provides planning regulations that agencies can use to ensure that bicyclists and pedestrians are considered throughout the planning process.

The Appendix of U.S. DOT's Policy Statement on Bicycle and Pedestrian Accommodation Regulations and Recommendations outlines *Key Statutes and Regulations Regarding Walking and Bicycling*, which agencies should consider when developing plans. It specifically provides regulations for performing public outreach and receiving input into transportation projects and related efforts.

Project planning and prioritization activities provide agencies with the opportunity to evaluate how their future investments can work to achieve the principles of connected pedestrian and bicycle networks. Relying upon public input and ensuring that these processes are inclusive of all perspectives, agencies can develop comprehensive network-improving plans that reflect the vision and needs of the community. Several planning and prioritization examples are highlighted below and on the following pages.

Springfield's Pedestrian and Bicycle Network (Springfield, Missouri)

The City of Springfield created a comprehensive bicycle and pedestrian network connecting greenways, bicycle routes, and sidewalks through a series of improvements. Project leaders used an interactive tool to identify priority sidewalk corridors and complete gaps in the network. A system called The Link was established as an on-street bicycle and pedestrian connection between the city's predominantly east-to-west trails.

Public feedback gathered from the Ozark Transportation Organization's Journey 2035 Long Range Transportation Plan revealed that new and improved sidewalks, bike paths, and roadway designs were among the top priorities for residents of Springfield, MO. On-street improvements implemented in The Link project were identified during project scoping as the most cost-effective way to expand Springfield's entire system, creating a safer environment for pedestrians and bicyclists until more bike and pedestrian infrastructure could be developed.

Today, The Link is a six-mile network that connects Cox South Hospital to Doling Park, as well as the east-west greenway trails in between, for those traveling both on foot and by bicycle.

Figure 4. The system map shows how The Link connects established activity centers and destinations with existing trails and roadways throughout Springfield. Image courtesy of City of Springfield.

Partners and project sponsors included The Ozarks Transportation Organization and its Bicycle Pedestrian Advisory Committee, which includes Ozark Greenways and the local jurisdictions of Christian and Greene Counties, and the Cities of Battlefield, Nixa, Ozark, Republic, Springfield, Strafford, and Willard.

Indianapolis Cultural Trail (Indianapolis, Indiana)

Leaders in Indianapolis wanted to make it easier for people to visit the city's cultural districts, which were disconnected from the heart of downtown and didn't get the attention they merited. In a city with a successful trail system but no on-street bicycle facilities, leaders envisioned a bicycle and pedestrian trail through the heart of downtown Indianapolis. Through a public-private partnership, the city constructed an eight-mile trail network that forms a loop around downtown with spurs to connect Indianapolis' five cultural districts and neighborhoods, as well as the city's greenway system.

Figure 5. A section of the Cultural Trail being shared by pedestrians and bicyclists. Image courtesy of the Indianapolis Convention and Visitors Association.

Brian Payne at the Central Indiana Community Foundation conducted over 100 individual meetings from 2001–2004 to raise support for what would become the city's first set of on-road bicycle facilities. After conducting a feasibility study and a small charrette process that gained the support of the Mayor's office, project management and trail design teams were selected and the trail route was finalized. The project's pilot phase, which was completed in 2007, used high-quality materials and design practices that would serve as a model for the rest of the trail and helped foster enthusiasm and consensus. Over the next six years, public engagement was maintained through each of the project's seven phases in a campaign that included monthly brown bag lunches, district-wide public meetings, and a dedicated project website with up-to-date content.

Opened in May 2013, the Indianapolis Cultural Trail helps connect a trail network that is part of over 85 miles of bicycle lanes and other facilities in the city. The Cultural Trail enhances access to many destinations within Indianapolis by walking and biking, and its proximity to neighborhoods and commercial districts provides users with a broad range of amenities from which to choose.

Figure 6. An aerial view of one section of the project shows the new pedestrian and bicyclist facilities alongside the existing roadway. Image courtesy of Rundell Ernstberger Associates, LLC.

Project costs totaled $63 million, of which $27.5 million was private and $35.5 million was Federal, including a $20.5 million TIGER grant awarded in 2010. Project costs also included $20 million for utility relocation and infrastructure upgrades such as sewers and roadways. In addition, a $6 million annual maintenance endowment was established for landscaping, snow and ice removal, and electrical maintenance along the trail.

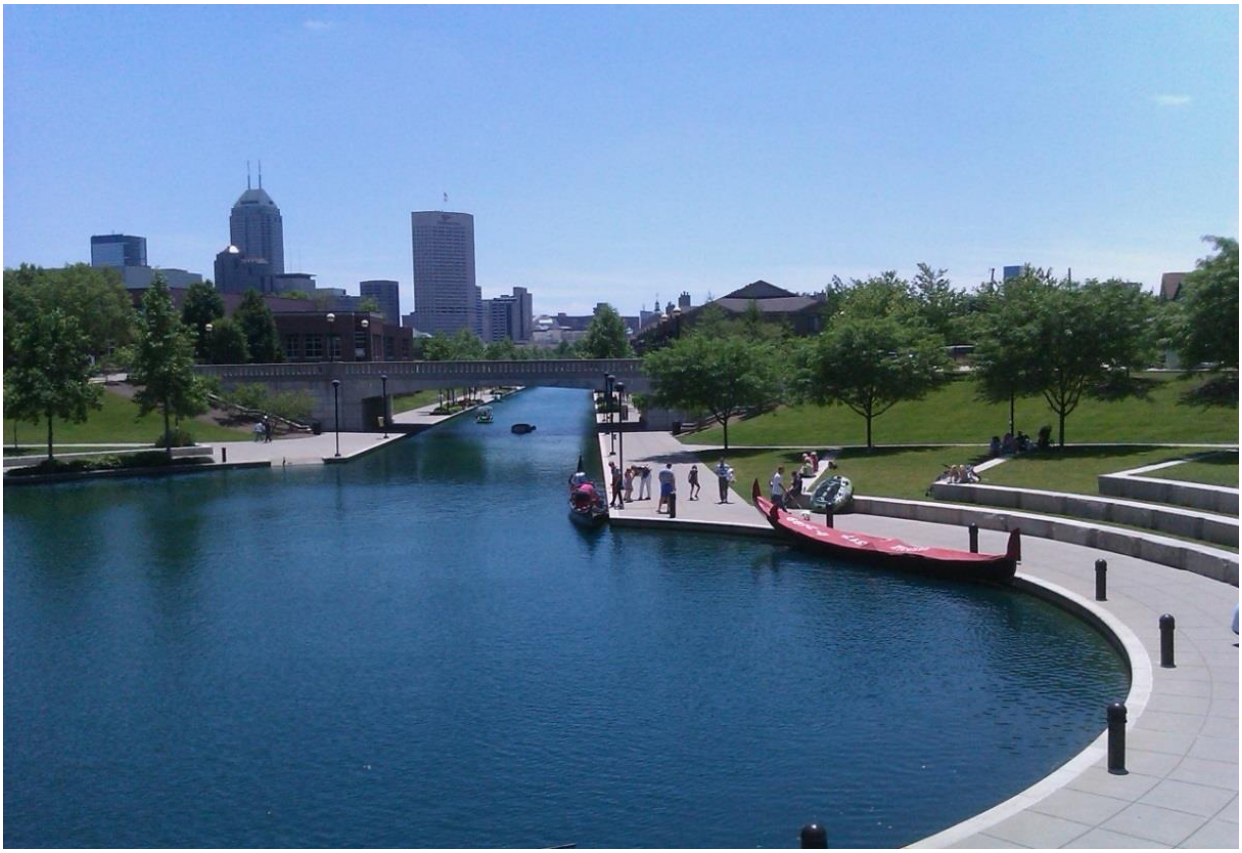

Figure 7. The end of the trail provides a scenic area and park for trail users to enjoy. Image courtesy of Rundell Ernstberger Associates, LLC.

Fort Collins Bicycle Network (Fort Collins, Colorado)

Ranked as one of the best places in the country to ride a bike, the City of Fort Collins striped its first bike lane and began to plan for and build its bicycle infrastructure in the 1970s. The city developed its first comprehensive bicycle plan in 1995, which established a foundation for subsequent plans, including the Bicycle Master Plan, Bicycle Safety Education Plan, and the Paved Recreational Trail Master Plan. Each of these separate efforts helped to lay the groundwork for the current bicycle network.

The 2014 Bicycle Master Plan begins from a place of strength—building on the city's previous plans—and seeks to create a safer and more inviting bicycling environment in Fort Collins where people of all ages and abilities can safely and comfortably ride a bicycle. The city incorporated the 2013 North Front Range MPO Regional Bicycle Plan and 2012 Colorado Department of

Transportation (CDOT) Statewide Bicycle and Pedestrian Plan into its 2014 Bike Plan. The Bike Plan included a public participation process where an online interactive map allowed users to mark their preferred locations for bicycle facilities, policies for developing snow removal procedures along separated bike lanes, and an assessment of planning-level cost estimates for new bicycle facilities per mile or by facility. Alongside the corridor prioritization, the cost estimate assessment resulted in targeted implementation phasing for bicycle infrastructure across the city.

Combined with education programs like *Fort Collins Bikes*, bicycling encouragement, enforcement policies, and innovative engineering efforts, this approach to planning demonstrates the city's continued resolve to improve bicycling networks in the Fort Collins area for people of all ages and abilities.

Partners and project sponsors included City of Fort Collins, CDOT, North Front Range Metropolitan Planning Organization, Kaiser Permanente, and the Colorado Lottery.

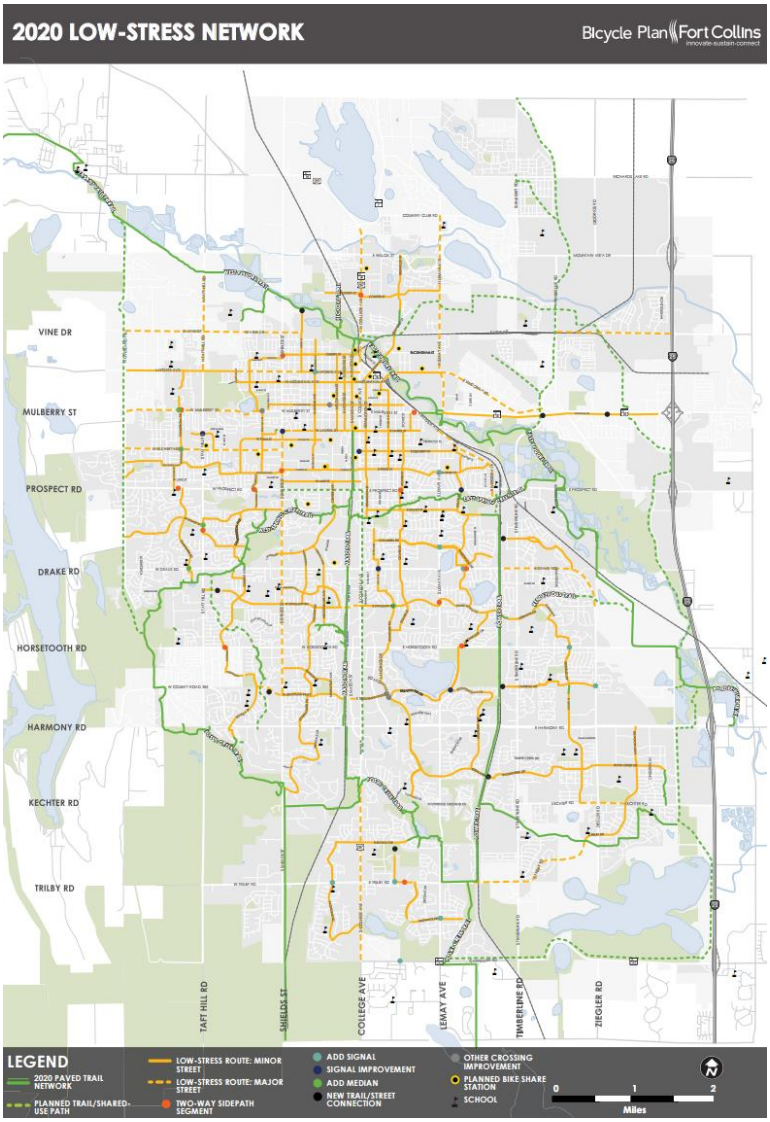

Figure 8. The Fort Collins 2014 Bicycle Master Plan seeks to establish a network of low stress facilities to facilitate bicycle travel for users of all abilities. Image courtesy of the City of Fort Collins.

Shared Use Paths and Trails

Shared use paths and trails are one of the most common ways to address barriers in a pedestrian and bicycle network. In locations where the street network lacks overall connectivity, such as locations without a traditional grid network, shared use paths can be used to create direct routes between destinations. Shared use paths are also useful for developing routes that increase comfort by creating more space between motorists and nonmotorized users. This can be especially true along high speed, high volume corridors where creating space within the right of way is not feasible. Providing additional buffer and separation from traffic allows a variety of users to access the network.

Path and trail projects can exist in a variety of settings and at a number of different scales. In urban areas, shared use paths can provide valuable short-distance connections between two facilities and cut through parks or other off-roadway areas. In more rural and suburban settings, long-distance shared use paths can connect homes to places of employment, or even provide links between multiple municipalities.

In locations where direct routes limit network connectivity, paths can be constructed to allow a shorter-distance link for pedestrians and bicyclists. In terms of comfort, paths are sometimes the only facilities where novice or inexperienced cyclists feel comfortable riding. Providing these facilities ensures a comfortable, low stress trip by foot or bike when compared to sharing the road with motor vehicle traffic. Shared use paths are able to help agencies accomplish many of the goals of developing connected pedestrian and bicycle networks.

The following examples explore some of these projects, and highlight the different ways in which shared use paths and trails can be used to provide connections for bicyclists and pedestrians.

Farmington River Trail (Connecticut)

The Farmington Canal was originally constructed in 1835 to provide a water transportation route from New Haven, CT, into the interior of Connecticut, Massachusetts, and beyond. The railroad built alongside it nearly a decade later reflected the shift in travel mode choice. Unable to retain steady ownership, the railroad operated under various owners for more than 130 years until service was discontinued entirely in the mid-1980s, leaving an unused corridor through several communities in central Connecticut. By 2011, the final section of the unused rail bed was converted into a rail-trail which serves the communities of Collinsville, Unionville, and Burlington.

In 1992, the Farmington Valley Trails Council was formed to preserve the historic Farmington Canal by converting the abandoned transportation corridor into a park, complete with a shared use path which today serves as a regional multimodal network connecting five towns across the region.

Figure 9. A section of the Farmington River Trail. Image courtesy of FHWA Connecticut Division Office.

Completed in 2011 as part of the larger Farmington Canal Heritage Trail, the third and final phase of the Farmington River Trail runs from Collinsville to Unionville. This new 2.5-mile, inter-town linkage provides safe transportation by walking or biking on a dedicated, paved shared use path, thus avoiding a 50-mile per hour posted two-lane State highway. Dedicated parking lots along the trail attract users from a broad range of abilities, ages, and trip purposes. Tunnels and bridges provide safe crossing of roadways and waterways. The $907,000 project links the Trail to sidewalk networks in both towns, and in Unionville, connects with public transit access points that extend the accessibility and mobility potential of all users of the system. The entire length of the trail is now 18 miles.

Partners and project sponsors included the Connecticut Department of Transportation, Capitol Region Council of Governments, and the Towns of Canton (which includes Collinsville), Farmington (which includes Unionville), and Burlington.

Figure 10. The route of the trail and the location of a crossing, near Collinsville. Image courtesy of FHWA Connecticut Division Office

Fennel Creek Trail (Bonney Lake, Washington)

In 1997, a citywide survey by the City of Bonney Lake showed that trail networks were a community priority. Building on this input, a trail plan was created in 2007 that proposed a network of shared use paths to provide access to a nonmotorized transportation corridor for the surrounding area.

By connecting a large concentration of residential neighborhoods to schools on the other side of a watershed, this shared use path allowed the Bonney Lake School District to adjust school boundary lines thereby reducing the need for an estimated 8-10 school bus routes.

Opened in April 2013, the Fennel Creek Trail project is part of a $2.5 million Safe Routes to School pedestrian safety grant. The Trail connects Allan Yorke Park, Lake Tapps, Downtown Bonney Lake,

the Midtown Commercial District, the regional Park-and-Ride for Sound Transit, and the Bonney Lake School District to the thousands of homes in the surrounding residential neighborhoods.

Partners and project sponsors included the City of Bonney Lake, Washington State Department of Transportation, and Bonney Lake Elementary School.

Figure 11. The Fennel Creek Trail links a number of destinations including some in more natural settings. Image courtesy of FHWA Washington Division Office.

Bloomington B-Line Trail (Bloomington, Indiana)

An abandoned railroad corridor in the heart of Downtown Bloomington, IN, was transformed into a 3.1-mile shared use path and urban greenspace. Opened in September 2011 and serving as a "backbone" for the city's bicycle and pedestrian network, the B-Line Trail enables users of all ages and abilities to more readily access downtown by bicycling and walking.

Figure 12. The abandoned rail corridor through Bloomington that was selected for the B-Line Trail development. Image courtesy of FHWA Indiana Division Office.

The B-Line Trail begins on the northwest side of downtown, turns south through the Switchyard Property, and connects to the trailhead of the Bloomington Rail Trail.

The downtown sections of the B-Line Trail incorporate streetscape design features such as street name paver treatments at each crossing, drinking fountains, benches, and landscaping. Some sections also feature energy-efficient LED fixtures. Small plaza areas throughout the Trail's downtown portions allow space for art installations, bicycle maintenance stations, and places to rest and people watch. The trail features several fitness stations where trail users can stop to stretch and exercise.

The features provided along the trail are made possible in part by a B-Line Backers program that allows different groups to sponsor various elements of the trail.

Existing and new development adjacent to the trail such as hotels, grocery stores, coffee shops, single family homes and retail stores have popularized the use of the trail as a cornerstone piece of the city transportation network.

Partners and project sponsors included the City of Bloomington, Bloomington Metropolitan Planning Organization, Indiana DOT, Indiana Department of Natural Resources, Indiana Department of Environmental Management, Bloomington Redevelopment Commission, and B-Line Backers.

Figure 13. The same rail corridor after the trail was completed. Image courtesy of FHWA Indiana Division Office

San Francisco Bay Trail (California)

When completed, the San Francisco Bay Trail will provide a 500-mile continuous regional network around the San Francisco Bay, connecting 9 counties, 47 cities, and crossing 7 toll bridges. Over 340 miles of Bay Trail are complete, with segments existing in all cities and counties and the longest continuous stretches ranging from 15 to 26 miles. Of the 7 toll bridges in the region, 4 bridges and half of another bridge have a separated bicycle and pedestrian pathway on the structure that is part of the network.

Figure 14. A completed section of the Bay Trail in San Francisco, near the Golden Gate Bridge. Image courtesy of Laura Thompson.

The foundation of the Bay Trail Plan is to create a continuous shared use path open to the widest range of users. The Trail provides an alternative commute route for bicyclists and connects to numerous public transportation facilities including ferry terminals and bus stops and stations for regional rail systems. It is also a place where children learn to ride bikes and groups of seniors walk to stay active. Trail amenities and design elements such as playgrounds, adjacent parking areas, directional signs, drinking fountains, restrooms, and benches are integrated into the construction of trail segments.

Figure 15. The trail is being designed to prioritize accessibility for the accommodation of all users. Image courtesy of Josh Maddox.

The Bay Trail offers access to commercial, industrial, and residential neighborhoods; points of historic, natural, and cultural interest; recreational areas like beaches, marinas, fishing piers, boat launches, and over 130 parks and wildlife preserves totaling 57,000 acres of open space. It passes through highly urbanized areas like downtown San Francisco as well as remote natural areas like the San Francisco Bay National Wildlife Refuge.

Partners and project sponsors included the FHWA California Division Office, the Association of Bay Area Governments, the National Park Service, U.S. Fish and Wildlife Service, California Coastal Conservancy, Caltrans District 4, Bay Area Conservation & Development Commission, The Metropolitan Transportation Commission, and over 50 advocacy groups.

Corridor Improvements

Corridors with high speeds and traffic volumes can be significant barriers to the pedestrian and bicycle network, even if facilities like sidewalks and bike lanes are present. Safety may be a concern along and across these types of corridors and it is not always feasible or desirable to build an off-street shared use path. Making improvements to the corridor itself, whether through access management, sidewalk gap closing, median projects, or other large-scale roadway redevelopment projects can improve corridors and enhance the pedestrian and bicycle network.

Improving corridors through streetscaping, resurfacing and other methods can improve the qualities of a pedestrian and bicycle network. In locations where safety is a concern, a corridor improvement can address problematic crossings while also improving comfort through the addition of features like landscaping, wayfinding and street furniture. Building a cohesive network sometimes requires agencies to place additional emphasis on these higher volume corridors and make improvements that will allow for a variety of routes by bicycling and walking.

The following projects improved network connectivity and cohesion by addressing corridors in need of greater safety, comfort, and accessibility for pedestrians and bicyclists. Through a number of different methods, these agencies took steps to improve safety, comfort, and accessibility along these roads to create links between destinations for pedestrians and bicyclists.

Figure 16. Road diet project on Main Street in Urbana, Illinois. Image courtesy of Champaign County Regional Planning Commission.

Fletcher Avenue Complete Streets (Hillsborough County, Florida)

Strip retail located along a 3.1 mile section of Fletcher Avenue between Nebraska Avenue and North 50th Street in Hillsborough County had attracted high volumes of pedestrian traffic from the South Florida University campus and Florida Hospital Tampa and resulted in one of the highest crash rates in the Tampa Bay region. The corridor was programmed for a road widening from a 4-lane to a 6-lane facility, which triggered an opportunity to make changes that would improve mobility for nonmotorized users. To increase safety and mobility for all roadway users, Hillsborough County officials applied for Federal funds to assist in implementing a complete streets retrofit project along the corridor.

In 2014, the Florida Department of Transportation awarded Hillsborough County $3 million in Safety Enhancement Grant funding for a complete streets project on Fletcher Avenue. The $5 million project added crosswalks, bus shelters, and bike lanes to provide system users with multimodal access throughout the corridor. Other safety improvements included the construction of a sidewalk on the south side of Fletcher Avenue between Bruce B. Downs Blvd and N 50th Street with five midblock marked crosswalks incorporating overhead warning beacons, one marked crosswalk with a new traffic signal, raised pedestrian refuge islands, and energy efficient LED street lighting in the medians, additional sidewalks near the University of South Florida, upgraded curb ramps at crossings and intersections, and a reduced speed limit from 45 to 35 miles per hour. An additional 1.5 miles of bicycle lanes also created a 3-mile continuous segment along Fletcher Avenue.

Figure 17. One of the new signalized pedestrian crossings installed on Fletcher Avenue. Image courtesy of David Conner and Associates.

Esplanade Avenue Corridor Improvements (New Orleans, Louisiana)

Roughly 10,000 vehicles per day use Esplanade Avenue, a 19th-century boulevard running from the Mississippi River to City Park in New Orleans. The corridor is an important connection within the central city and it is also a heavily trafficked route for people walking and bicycling. Over time, travel lanes and parking were added as traffic along the road increased, but because of the area's historical significance, widening the road was never an option. So despite its narrow lanes and numerous intersections, drivers often traveled on Esplanade Avenue at high speeds with aggressive lane changes in a narrow right-of-way, making the Esplanade Avenue corridor among the most hazardous in New Orleans.

Figure 18. Prior to the project, Esplanade Avenue's narrow lanes and frequent driveways, combined with high speeds, made the corridor uncomfortable for pedestrians and bicyclists. Image courtesy of FHWA Louisiana Division Office.

Project leaders responded to a request for a bike lane as part of the contract to resurface Esplanade Avenue with the Paths to Progress Program, a coordinated transportation improvement program between the FHWA Louisiana Division Office, the Louisiana Department of Transportation and Development (DOTD), and local agencies. The project was completed in 2013, and included a road diet from four to two lanes, the addition of accessible curb ramps, shared-lane markings, and

dedicated bicycle lanes with signage as well as a lower posted speed limit. Though the total project budget was $1.9 million, the cost to resurface the street and add the bicycle lanes was $20,000.

Today, the Esplanade Avenue corridor acts as a backbone for bicycling commuters by providing connectivity to key destinations like the French Quarter and Central Business District from various neighborhoods. Traffic counts have shown an estimated 226 percent increase in bicycling and an estimated 132 percent increase in walking along the 1.6 mile corridor from Moss Street to Clairborne Avenue between 2010 and 2014.

Figure 19.The resulting road diet improved comfort for nonmotorized users, evident in the increases in bicycling and walking along the corridor following the project. Image courtesy of FHWA Louisiana Division Office.

Partners and project sponsors included the FHWA Louisiana Division Office, Louisiana DOTD, City of New Orleans, and the New Orleans Regional Planning Commission.

Chicago Complete Streets Arterial Resurfacing Program (Chicago, Illinois)

Since 2011, the Chicago Department of Transportation (CDOT) has selected key Arterial Resurfacing (AR) projects on high pedestrian crash corridors, and developed new roadway striping plans to reduce crashes and improve pedestrian and bicyclist accommodations. These improvements have included road diets, narrower travel lanes, on-street bicycle facilities (protected and separated) and high visibility crosswalks.

Figure 20. The before condition of one the City's resurfacing projects. Image courtesy of Chicago Department of Transportation.

In 2014, CDOT set aside approximately 10 percent of the AR budget to improve more locations with crash countermeasures. CDOT filtered resurfacing locations using pedestrian crash maps and the Streets for Cycling Plan 2020. It also referenced a Chicago Pedestrian Plan tool that ranks potential project locations using weighted data sets on safety, connectivity, livability, health, and equity.

Based on priority needs, CDOT added complete streets improvements to 28 resurfacing projects in the 2014 program, including lane reconfigurations described above, pedestrian refuge islands, curb bump-outs, and a raised crosswalk. For example, CDOT will install pedestrian refuge islands on Cicero, Pulaski, and 95th Street, which are four-lane State route arterials with high rates of pedestrian crashes.

Figure 21. In the after condition, the resurfaced street features bicycle lanes, fewer travel lanes, and an upgraded pedestrian refuge island. Image courtesy of Chicago Department of Transportation.

Urbana Main Street Improvements (Urbana, Illinois)

In 2013, the Main Street bike lane and pedestrian improvement project used Federal surface transportation funding to create bicycle and pedestrian linkages to the existing transportation system along Main Street, a busy arterial roadway in Urbana. Project features included a road diet, which added 1.5 miles of new bike lanes on Main Street to provide a continuous bicycle route through the center of Urbana, replacing brick sidewalks with concrete sidewalks, and adding new sidewalks and ramps to create a continuous, accessible pedestrian route along Main Street.

Figure 22. The improvements on Main Street included this pedestrian crossing, complete with a refuge island. Image courtesy of Champaign County Regional Planning Commission.

The road diet reduced motor vehicle travel lanes from four to three lanes along Main Street, and created room for the addition of bike lanes and a number of safety improvements. Redesigned left turn lanes enhanced sight distances for motorists by separating left-turn and through traffic, and protected left-turn signal phasing increased safety for all roadway users. The provision of accessible pedestrian signals at three signalized intersections in downtown improved pedestrian safety, particularly for those with disabilities. Curb extensions at two intersections in downtown improved pedestrian safety by reducing the crossing distance at intersections, and making pedestrians more visible to motorists and bicyclists.

The project enhanced connectivity along the corridor by directly connecting the bike lanes to eight other existing or proposed bike facilities. Partners and project sponsors for this example included the City of Urbana, Illinois DOT, and Champaign County Regional Planning Commission/Champaign Urbana Urbanized Area Transportation Study.

Bridges

Bridges are key components of any pedestrian and bicycle network—they are often the only way to travel across natural obstacles (rivers, ravines), railroads, freeways, and grade-separated crossings. Bridges also have longer lifespans than a typical section of road (50 to 100 years), so considerations for bicycle and pedestrian connections need to be addressed during bridge projects. The U.S. DOT Policy Statement on Bicycle and Pedestrian Accommodation Regulations and Recommendations identifies sections of the United States Code (U.S.C.) that address accommodations on bridges for nonmotorized users. Specifically, 23 U.S.C. 217(e) emphasizes the need to address bicycle accommodations during bridge replacement projects.

Bridge projects can be used to make critical connections in pedestrian and bicycle networks. In some locations, a truly cohesive network may only exist with bridge connections for nonmotorized users. In others, a new bridge may provide a more direct route than the ones currently available. For bridges that already exist, improving both safety and comfort may require that bridge to be retrofitted with more appropriate, separated facilities for nonmotorized users.

The projects highlighted in the following section demonstrate how agencies have addressed pedestrian and bicycle connections at bridge locations. Projects focus on travel across the bridge, as well as accommodations for pedestrians and bicyclists leading to and from the bridge.

Figure 23. Bicyclists and pedestrians using the Big Four Bridge connecting Kentucky to Indiana. Image courtesy of Cameron Miquelon.

Lake Lansing Road Bridge (Lansing and East Lansing, Michigan)

The Lake Lansing Road Bridge is a partial cloverleaf interchange originally built in 1970 with no pedestrian accommodations. For pedestrians and bicyclists crossing over U.S. 127 from the City of East Lansing into Lansing, the next nearest highway crossing was nearly 1.5 miles south. Over a period of 15 years, significant growth occurred on either side of the bridge, including high-density residential as well as extensive service and commercial development. The resulting development attracted high volumes of pedestrian traffic, and resulted in clear and well-defined footpaths at either end of the bridge. In 2013, the Michigan Department of Transportation (MDOT) overlaid a bridge deck on the interchange.

As a result of the changing land use context around the Lake Lansing Road Bridge, MDOT coordinated with the City of East Lansing, Lansing Township, and Ingham County Department of Roads to construct pedestrian accommodations on the bridge and through the interchanges and approaches, thus providing pedestrian and bicycle access to grocery stores and retail shopping on both sides.

The network provides direct connections to the 300,000 square foot Eastwood Town Center shopping center and entertainment complex on the west side of U.S. 127, as well as restaurants, banks, medical offices, a grocery store, and other establishments on the east side of the interchange. The combined Federal, State, and local project investments totaled $2.8 million.

Partners and project sponsors for this example included MDOT, Lansing Township, and the City of East Lansing.

Washington Bridge Bikeway (Providence and East Providence, Rhode Island)

Prone to congestion associated with intensifying development along the I-195 corridor, the Washington Bridge has remained an important link between Providence and East Providence, RI, since its original construction in 1930. Throughout its history, Rhode Island Department of Transportation (RIDOT) has played a considerable role in seeing the Washington Bridge through numerous retrofits and additions in order to maintain sufficient traffic service levels within the greater Rhode Island transportation network. State and FHWA Rhode Island Division Office leaders took a different approach, however, when they expanded pedestrian and bicycle accommodations on this vital regional connector.

The initial project cost was estimated at $35 million, but the project was not programmed for construction due to lack of available funding. Recognizing the importance of the proposed improvements, FHWA Rhode Island Division Office leaders negotiated and partnered with RIDOT in 2012 to conduct a Value Engineering workshop on the facility. Cost savings resulting from recommendations adopted during the exercise lowered cost estimates to $20 million, and resulted in the project's addition to the State's transportation improvement program.

Figure 24. Limited accommodations for pedestrians and bicyclists were available on the bridge prior to this project. Image courtesy of Rhode Island DOT.

The Washington Bridge Bikeway project parallels I-195 over the Seekonk River to connect the cities of East Providence and Providence. This linkage uses preserved sections of the historic Washington Bridge to create two separately-dedicated bicycle and pedestrian paths and a mid-channel park, providing a substantial addition to two major pedestrian and bicycle networks—the East Bay Bike Path and Downtown Providence and Seekonk River Waterfront. The improved connection affords bicyclists and pedestrians of all ages and abilities with increased access to a greater range of recreation choices, destinations, and experiences.

Figure 25. The bridge provides bicycle and pedestrian connections adjacent to the existing I-195 bridge. Image courtesy of Rhode Island DOT.

Partners and project sponsors included RIDOT, the Cities of East Providence and Providence, the Rhode Island Department of Environmental Management, the State's Historic Preservation & Heritage Commission, the Blackstone Valley Corridor Commission, the Narragansett Bay Wheelmen, the Rhode Island Bike Coalition, and the FHWA Rhode Island Division Office.

Big Four Pedestrian and Bicycle Bridge (Kentucky and Indiana)

The Big Four Railroad Bridge links the cities of Louisville, Kentucky, and Jeffersonville, Indiana. Originally constructed in 1895 and updated again in 1929, the entire bridge spans 2,525 feet across the Ohio River. The bridge was reimagined as a linkage for pedestrians and bicyclists, giving them an alternative to crossing the Interstate 65 Bridge which had no pedestrian accommodations. The project was designed to promote economic development for both cities by creating a pedestrian linkage between the two historic downtowns that honored the area's unique cultural heritage.

This new network connection plays an important part in proposals for nearby pedestrian and bicycle network expansions, including the Louisville Loops, an envisioned 100-mile loop around the metropolitan area. By demonstrating their commitment to pedestrian and bicycle facilities through the Big Four Pedestrian and Bicycle Bridge, both cities have positioned themselves to build on the project's success for future pedestrian and bicycle improvements. The project was completed in May 2014, with combined State and local project investments totaling $22 million.

Figure 26. The park at the end of the bridge provides a gathering place for residents. Image courtesy of Waterfront Development Corporation.

Partners and project sponsors included the Kentucky Transportation Cabinet, Indiana Department of Transportation, Louisville Southern Indiana MPO (KIPDA), as well as other local and private entities.

On-Road Facilities

While corridor improvements encompass large scale roadway redevelopment and work done outside of the curb lines, much can be done to reallocate road space by restriping sections of road with narrower or fewer motor vehicle travel lanes. Road diets are one example, as are projects that have narrowed lanes to allow for buffered or separated bike lanes.

The projects in the following section highlight examples of improvements that can help enhance network connections for pedestrians and bicyclists.

Figure 27. Buffered bike lanes, like the ones installed in Minneapolis, Minnesota, are excellent examples of low cost network improvements for bicyclists. Image courtesy of the FHWA Minnesota Division Office

Cahaba Road Enhancement Project (Birmingham, Alabama)

Cahaba Road connects commercial districts with residential neighborhoods on either side of the Birmingham Zoo, and serves as an alternative route for motorists entering Downtown Birmingham, Alabama, on Highway 280. This 51-foot-wide, four-lane arterial roadway has a posted speed limited of 30 mph, but lacks pedestrian and bicycle accommodations, requiring nonmotorized users to share the road with motorists passing at much higher speeds. The Cahaba Road Enhancement Project will modernize this four-lane arterial roadway near the Birmingham via a road diet and streetscape improvements.

The project plans overlay a 0.5-mile cross-section of Cahaba Road between Park Lane and the Birmingham City limit line north of the Zoo property, reducing the number of travel lanes and introducing a variety of streetscape enhancements. Project enhancements include a road diet that will reduce the existing travel lane width and provide on-street parking, sidewalks, bicycle lanes, pedestrian lighting, and a roundabout at the entrance to the Birmingham Zoo.

Once completed, the project will improve pedestrian access between the zoo and botanical gardens, providing more route alternatives between these attractions and nearby commercial retail and employment centers and increasing pedestrians and bicyclists' sense of safety as they navigate the corridor between two of the City's most popular attractions.

Partners and project sponsors included the FHWA Alabama Division Office, Alabama Department of Transportation, and the Regional Planning Commission of Greater Birmingham.

Park and Portland Avenue Buffered Bike Lanes (Minneapolis, Minnesota)

Park and Portland Avenues were originally designed for motorists as connections from south Minneapolis to Downtown. Both corridors have remained heavily trafficked since the addition of Interstate Highway 35, however, and conflicts between motorists and bicyclists have occurred more frequently since striped bike lanes were first installed on both avenues. The pair of one-way connectors provides a direct and efficient way to travel between south Minneapolis and downtown by bike, but the facilities have anecdotally suffered from low use due to the narrow bike lanes which put bicyclists uncomfortably close to traffic.

Project leaders reimagined a roadway widening along both corridors, adding approximately 4 miles of improvements on Park Avenue and approximately 1.3 miles of improvements on Portland Avenue. There was on-street parking along both sides of Park and Portland, but the project reduced each avenue's width from three to two vehicle lanes and further calmed traffic by lowering the speed limit from 35 mph to 30 mph. The project also added buffered bicycle lanes, providing room for channelized bike lanes to one side of the street with buffered areas between bicyclists and parked vehicles on the right and the vehicle lane on the left.

Figure 28. A cyclist riding in the buffered bicycle lane. Image courtesy of the FHWA Minnesota Division Office

Partners and project sponsors included the FHWA Minnesota Division Office, Hennepin County, and the City of Minneapolis.

King Street Separated Bike Lanes (Honolulu, Hawaii)

In 2011, Oahu residents accounted for two-thirds of all statewide bike crashes that resulted in a visit to the emergency room. According to the Hawaii Department of Health, up to four bicyclist fatalities occurred on Oahu every year between 2007 and 2011 as a result of motorist-related crashes. These unsettling statistics highlighted the need for improved bicyclist accommodations on Oahu, and in late 2014 project leaders proposed the State's first separated bike lane along King Street in Downtown Honolulu.

The project extends along King Street from Alapai Street to Isenberg Street, and converts the left-most lane of King into a separated facility for bicyclists. The separated bike lane is shielded from motorized traffic with an asphalt berm and reflective plastic bollards. All driveways are maintained through gaps in the asphalt curb, enabling motorists to cross the separated bike lane at regular intervals. Bike lanes have been marked with green paint to emphasize the need for both bicyclists and motorists to exercise heightened caution in these "conflict zones". The pilot project opened as a one-way facility in December 2014, and was converted to a two-way facility in May 2015.

Figure 29. The bicycle lane provides space for a car door to open in the parking area without posing a risk to cyclists. Image courtesy of Hawaii Department of Transportation (HDOT).

The King Street Cycle Track has been piloted to demonstrate the effectiveness of these facilities in advance of more separated bike lanes on parallel and perpendicular routes throughout Downtown Honolulu. The total cost of the project was $520,000.

Partners and project sponsors included City/County of Honolulu, Honolulu Area Rapid Transit, Hawaii Bicycling League, Hawaii State Department of Health, Hawaii Department of Business Economic Development & Tourism, Queen Liliuokalani Trust, Blue Planet Foundation, Hawaii Clean Energy Initiative, U.S. Environmental Protection Agency, FHWA Hawaii Division Office, Federal Transit Administration Region 9, University of Hawaii-Manoa, and more.

Figure 30. The green buffered bicycle lane with a buffer separating it from the travel lane. Image courtesy of HDOT.

Intersection and Crossing Improvements

Intersections and other crossing locations can present significant barriers to both pedestrians and bicyclists. Inadequate signal timing, long crossing distances, or high speeds and volumes can effectively serve as a gap in the pedestrian and bicycle network. Safety may be a concern at these crossings, but comfort should also be considered. Various elements of a crossing can create uncomfortable conditions for pedestrians and bicyclists. Accessibility is another important concern at intersections. Optimizing signal timing and operation for individuals with disabilities and providing accessibility features such as appropriately designed curb ramps, should be a top priority.

The projects in the following section demonstrate how agencies have addressed problem crossing locations through spot improvements that have strategically addressed network connectivity.

Shakopee Roundabout Project (Shakopee, Minnesota)

In 2014, a mini-roundabout was constructed at the intersection of County Road 79 and Vierling Drive in Shakopee, a bedroom community south of Minneapolis. The existing four-way stop control intersection created long queues of vehicles, which often resulted in frustration for pedestrians and bicyclists when motorists would speed through the intersection after a long wait. Routine traffic congestion combined with a crash rate of nearly double the metro area average added to the number of ways this intersection could be improved. Crossing distances for pedestrians ranged from 24 feet to 48 feet.

Figure 31. Prior to the installation of the roundabout, the stop-controlled intersection had a history of long delays. Image courtesy of the FHWA Minnesota Division Office

This project connected all sides of the intersection to existing sidewalks and shared use paths, shortened crossing distances, enhanced intersection lighting, added refuge islands and reduced

conflict points between vehicles and nonmotorized travelers, thus significantly increasing the safety and connectivity of the entire network.

Completed in June 2014, the improved intersection abuts Shakopee West Middle School, and the mini-roundabout closes a crucial gap in the sidewalk network between a several residential neighborhoods and the nearby downtown, as well as a park along the Minnesota River waterfront. The project was the first of its kind in the State and was completed at a total cost of $338,000. Partners and project sponsors for this example included Scott County and the City of Shakopee, Minnesota.

Figure 32. The final result of the intersection conversion to a roundabout. Image courtesy of the FHWA Minnesota Division Office.

Five Points Crossing Improvements (Huntsville, Alabama)

The historic Five Points corridor in Huntsville is a five-block commercial district that provides basic needs to surrounding historic residential neighborhoods. This aging commercial district was originally designed for pedestrians, which created several points of increasing conflict between motorists and those accessing the area on foot. Five Points' proximity to a number of residences warranted the need to maintain and improve the area for pedestrian use. Rather than treating the three-block area as a typical traffic enhancement, project leaders seized the opportunity to build on the district's existing assets by executing a series of retrofits which focused on enhancing its aging infrastructure.

This project improved circulation and access for pedestrians by reducing points of conflict with motorists and creating more clearly-defined traffic patterns. Phase One project improvements included the installation of crosswalks, pedestrian lighting and curb work along Pratt Avenue. The project also aesthetically enhanced the area by adding landscaping, benches and relocating utilities. Continuing phased work includes curb, sidewalk, and streetscape improvements along Andrew Jackson Way and Holmes Avenue, and intersection improvements along Pratt Avenue at Russell Street and Andrew Jackson Way.

Partners and project sponsors included the FHWA Alabama Division Office, Alabama Department of Transportation (Central and Division Offices), and the Huntsville Area Metropolitan Planning Organization.

Ray Sidewalks Project (Ray, North Dakota)

Completed in 1942 as a coast-to-coast paved road, the five-lane section of Highway 2 cutting through the small town of Ray limited access to businesses and school facilities on the town's south side from Main Street and the town's residential core on its north. In addition to addressing crossing difficulties, this project established or reestablished sidewalks in the area of the Ray Public School after a series of utility relocation projects caused sidewalk users difficulty in getting around town safely on foot.

As a result of the cracked, incomplete, or nonexistent sidewalk network leftover from years of neglect and utility relocation projects, many pedestrians used the roadway instead, putting them at much higher risk for conflicts with motorists. Those accessing businesses and school facilities south of the five-lane highway expressed the need for calming, citing frequent risky encounters with speeding traffic as they crossed from one side to another.

In 2012, Safe Routes to School and the North Dakota Department of Transportation (NDDOT) partnered with the Town of Ray and Ray Public School to improve access to sidewalks and intersection crossing facilities for youth walking or biking to school. Sidewalk networks were restored throughout the residential core, including several deficient cross slopes and curb ramps that were did not meet accessibility requirements. A Pedestrian Hybrid Beacon was installed across

Highway 2 to improve access to the school's baseball field, the first crossing signal of its kind in the State.

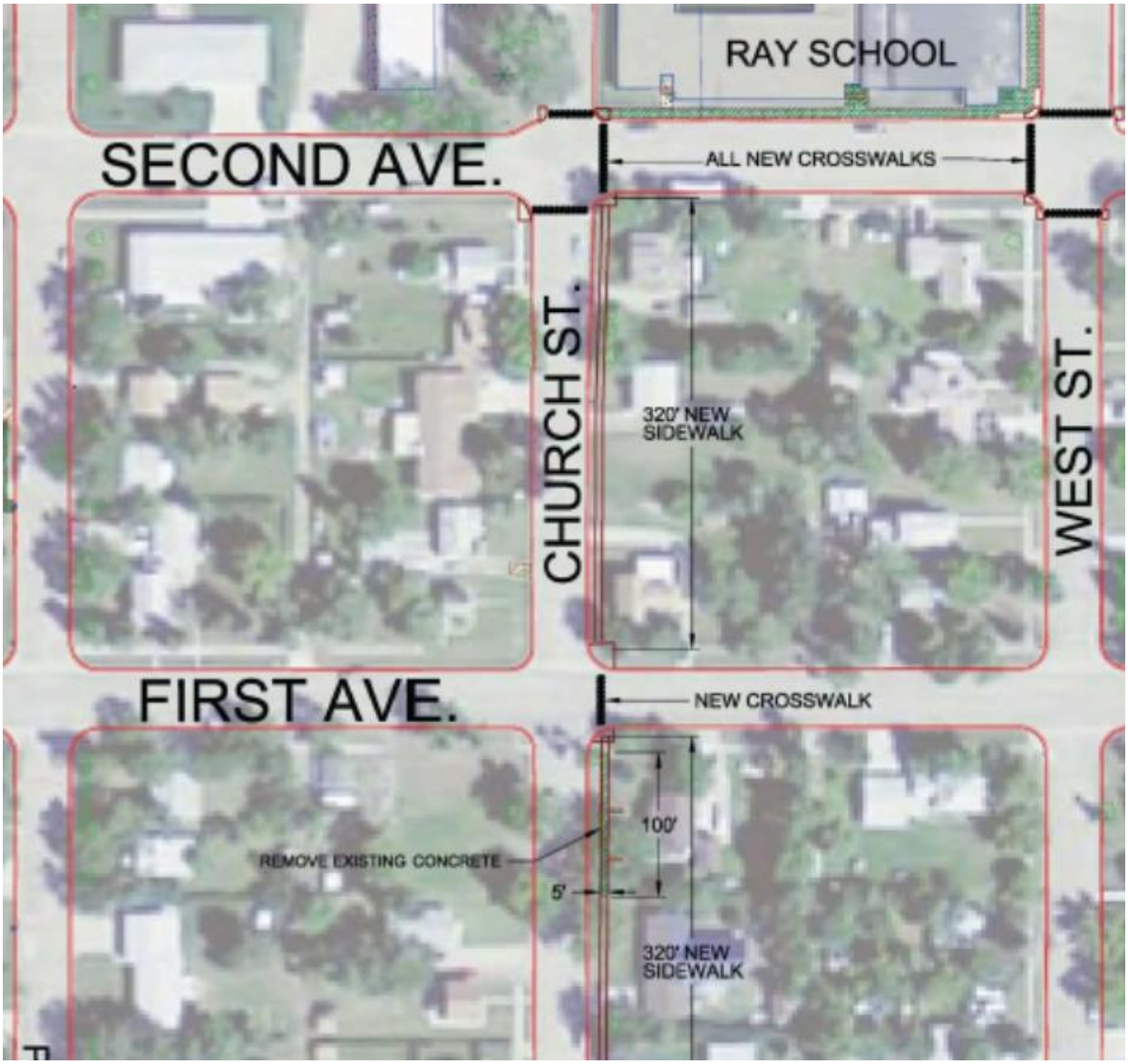

Figure 33. The map shows the sidewalk connections between residential neighborhoods and the local school. Image courtesy of Interstate Engineering, Inc.

Partners and project sponsors included the FHWA North Dakota Division Office, the City of Ray, and the NDDOT.

Discussion and Closing

Communities throughout the U.S are looking for ways to encourage and promote daily opportunities for walking and bicycling. Increasingly, private development is also playing a role in building and improving multimodal networks. Large scale development and campuses are building connections for bicyclists and pedestrians by retrofitting existing streets to provide critical network connections. Working together with private entities, planners, designers, and community leaders are ensuring that these new developments take advantage of existing infrastructure and provide links to facilitate nonmotorized transportation. With limited budgets to devote to transportation improvements, agencies are working collaboratively with new development to help implement improvements to their multimodal networks.

Filling the gaps in existing networks and shifting focus from spot and corridor improvements to a systemwide perspective is a challenge that many agencies are already addressing. Examining these projects will provide strategies to communities looking for opportunities to address the barriers in pedestrian and bicycle networks.

Measuring and evaluating network connectivity for pedestrians and bicyclists is a major challenge to many transportation agencies, though new research and guidance is beginning to fill this gap. There are tools that can be used to quantify the density of destinations, such as Walk Score,[8] and transportation agencies are able to collect detailed facility inventories to more effectively identify gaps in the network and assess quality. Crash data, even if limited, may be one of the more readily available pedestrian and bicyclist data sources in many communities. New methods of assessing safety risk will allow communities to apply systemic improvements proactively before crashes occur.[9] Many agencies also are measuring pedestrian and bicyclist comfort. A multimodal level of service analysis, documented in NCHRP Report 616,[10] can help agencies understand how various roadway characteristics impact the quality of service for pedestrians and bicyclists, distinguishing the needs of these modes from more traditional methods focusing on motor vehicle delay. Researchers at San Jose State University have begun to quantify how various roadway factors contribute to levels of traffic stress for bicyclists, as documented in the report Low-Stress Bicycling and Network Connectivity.[11] These new methods will increase our understanding of travel behavior and help contribute to the range of measures that can be used to evaluate and assess networks for pedestrians and bicyclists.

FHWA's existing policy statements, guides, and initiatives will provide the foundation for an increased focus on enhancing networks for pedestrians and bicyclists. FHWA will continue to provide tools and resources to help document and improve networks. Part of this work will involve identifying other project types that can provide valuable network connections and enhancements. These include private developments and campus projects, underpasses and tunnels, freeway removals, and the addition of cap parks on top of existing freeways. These types of projects provide a valuable option for improving pedestrian and bicycle connectivity and can connect neighborhoods that may have been previously divided by the addition of freeways through downtown areas or

neighborhoods. Documenting these and other types of network enhancing projects will add new examples to the growing toolbox of best practices and success stories.

This information, along with new ways to measure the connectivity of networks and to track change over time, will assist agencies and communities as they seek to plan, design, implement, and maintain connected pedestrian and bicycle networks that make walking and bicycling a viable transportation choice for everyone.

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Appendix – Listing of Network Examples

The following is a complete listing of all network examples that FHWA Division Offices identified. Each project includes a brief description and, where available, a link to a location that provides more information.

The table of contents below provides a quick reference for finding the project categories within the Appendix.

Planning and Prioritization

Tampa Walk-Bike Projects Plan (Hillsborough County, Florida)

Working in close coordination with the City of Tampa, the Hillsborough County Metropolitan Planning Organization developed a plan identifying low-cost options to enhance bicycle and pedestrian mobility around the three "Business Centers" identified in the city's 2009 Comprehensive Plan. Completed in June 2011, Phase I of the City of Tampa Walk-Bike Plan identified feasible project candidates along approximately 30 roadway corridors in and around the Downtown, University of South Florida, and Westshore areas. Expanding the plan beyond the three business centers, Phase II identified projects that would complete a bicycle and pedestrian network within the Interbay Peninsula and throughout west, central, and east Tampa.

Completed in October 2013, the third and final phase of the Walk-Bike Plan identified bicycle and pedestrian connectivity enhancement opportunities in the area known as New Tampa, and laid out a strategy for refining the Green ARTery Perimeter Trail concept.

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St. Lucie Bicycle-Pedestrian Network (St. Lucie, Florida)

Since 2010, more than 30 miles of on- and off-road bicycle and pedestrian facilities have been constructed in the St. Lucie Bicycle-Pedestrian Network to enhance safety and quality of life of residents in the St. Lucie Transportation Planning Organization area. Many of these facilities link schools with the surrounding community. The development of the St. Lucie Network is a cooperative effort among local, State, and Federal agencies using a variety of funding programs. In addition to schools, the St. Lucie Network connects communities with places of employment and local attractions.

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Springfield's Pedestrian and Bicycle Network (Springfield, Missouri)

The City of Springfield created a comprehensive bicycle and pedestrian network connecting greenways, bicycle routes, and sidewalks through a series of improvements. Project leaders used an interactive tool to identify priority sidewalk corridors and complete gaps in the network. A system called The Link was established as an on-street bicycle and pedestrian connection between the city's predominantly east-to-west trails, enhancing a network that connects Cox South Hospital to Doling Park, as well as the east-west greenway trails in between, for those traveling both on foot and by bicycle.

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Hawaii Statewide Pedestrian Plan and Toolbox (Hawaii)

The Hawaii Statewide Pedestrian Plan & Toolbox is a community-based Statewide Pedestrian Master Plan for the State's highway system. The Plan's comprehensive approach not only focuses on improving pedestrian safety, it evaluates ways to enhance pedestrian mobility and accessibility to help create a multimodal transportation system. The Plan prioritizes pedestrian infrastructure improvements and programs, promotes the Complete Streets vision for the State, and fulfills Federal requirements for multimodal planning.

The Hawaii Pedestrian Toolbox, a companion document to the plan, was developed to identify best practices in designing for pedestrian safety, mobility, and accessibility. Topics include layout of sidewalks, presence and timing of pedestrian crossing signals, access management along roadways, and intersection design. The Hawaii Pedestrian Toolbox serves as a resource for planners and designers as they consider pedestrians during design.

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Indianapolis Cultural Trail (Indianapolis, Indiana)

Through a public-private partnership, the City of Indianapolis constructed an eight-mile trail network that forms a loop around downtown with spurs to connect Indianapolis' five cultural districts and neighborhoods, as well as the city's greenway system. The Indianapolis Cultural Trail helps connect a trail network that is part of over 85 miles of bicycle lanes and other facilities in the city. It enhances access to many destinations within Indianapolis by walking and biking, provides walking and bicycling connections between residential and commercial areas of the city.

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Chicago Bicycle Network (Chicago, Illinois)

In 2012, the City of Chicago released the Streets for Cycling Plan 2020, outlining a 645-mile bicycle network including better bikeways that will allow all Chicagoans, from ages 8 to 80 and beyond, to feel safe and comfortable bicycling on city streets. The Chicago Department of Transportation is implementing a network of protected bike lanes in Chicago's central business district with connections to neighborhoods throughout the city. Chicago's growing bicycle network includes protected bike lanes, buffered bike lanes, neighborhood greenways, bicycle traffic signals, bike boxes, and other treatments that encourage people of all abilities to incorporate bicycling into their daily trips.

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Urbana Citywide Network (Urbana, Illinois)

In 2012, the City of Urbana used Safe Routes to School infrastructure funding to install a bicycle network within 1.5 miles of Urbana Middle School to facilitate more students bicycling to school. This project created 2.2 miles of bike lanes, 0.5 miles of shared bike and parking lanes, and 5.6 miles

of bike routes. Additional project features included upgraded bike parking at four elementary schools by working with the Urbana School District to install 112 new bike parking spaces. The city's network is adjacent to five of Urbana's six elementary schools. More than 1,200 students at the six benefiting schools live within 1.5 miles of their school, thus maximizing the impact of bicycling improvements across Urbana.

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Bike Hays Master Plan (Hays, Kansas)

The Bike Hays Master Plan lays out a strategy to utilize current street infrastructure to link the entire community and combine strategic segments of walking and bicycling paths. The plan's Phase 1 contains two sections. Section 1(a) connects a majority of schools, parks, and other destination points , while Section 1(b) features strategic bike facilities and multiuse pathways that draw additional neighborhoods into the system, provide direct access to major destinations, and link previously established segments to complete the network.

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Regional Bicycle and Pedestrian Plan Update (Portland, Maine)

Since its completion in 2009, the Portland Area Comprehensive Transportation System's Regional Bicycle and Pedestrian Plan Update has continued to be used to guide project planning and design in and around Portland, Maine. The document provides a snapshot of the existing and future networks of bicycle and pedestrian facilities in the greater Portland area. Multiple elements of the plan have been incorporated in the 5 years since its completion.

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Detroit Bicycle Network (Detroit, Michigan)

Since Detroit's first Nonmotorized Plan was completed in 2006 with funding support from MDOT, the city has made the development bicycling facilities a priority. The city's implementation effort of bicycle facilities has expanded citywide to include nearly 200 miles of bike lanes, marked routes, and off-road paths now on the ground, including the development of pathways along the riverfront and abandoned railroad corridors. With more than Federal investments, local public sector investments and private sector investment, city staff has realized dozens of projects that enhance their network, close gaps, and improve safety and mobility across the city.

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Fort Collins Bicycle Network (Fort Collins, Colorado)

Recognized as one of the best places in the country to ride a bike, the City of Fort Collins striped its first bike lane and began to plan for and build its bicycle infrastructure in the 1970s. The city developed its first comprehensive bicycle plan in 1995, which established a foundation for subsequent plans and initiatives. The 2014 Bicycle Master Plan builds on the city's previous plans

and seeks to create a safer and more inviting bicycling environment in Fort Collins. Combined with education, enforcement and encouragement, this approach to demonstrates the city's continued resolve to improve bicycling networks in the Fort Collins area for people of all ages and abilities.

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Association of Central Oklahoma Governments Bicycle Plan (Oklahoma)

Demonstrating a local desire for greater mobility within the metropolitan area, the Encompass 2035 Plan helped Oklahoma City officials recognize the health and economic benefits of nonmotorized transportation as they began to develop a strategy to create an integrated bicycle and trail network that would provide access to downtown and recreational areas for all users. A driving force behind the recommendations, local residents asked for more sidewalks and nonmotorized transportation facilities through the Encompass 2035 Plan survey, as well as through social media, email, and multiple public engagement opportunities.

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San Juan Pedestrian and Bicycle Network (San Juan, Puerto Rico)

Since 2009, the San Juan Urbanized Area 2030 Long Range Transportation Plan has served as a framework for action to achieving the vision of the San Juan Metropolitan Area, the major urban area of the Island of Puerto Rico, as a place where residents and visitors can walk or ride safely and conveniently to principal destinations. The Plan includes different projects to create a network of greenways, trails, bike routes, and lanes, in order to interconnect and provide physical and visual access to the major plazas, open spaces, natural and cultural areas, and urban waterfronts in San Juan. The proposed bicycle and pedestrian network also contains a complete street focus, in compliance with Puerto Rico Complete Streets Law of December 2010 to provide safe and affordable access for people of all ages and abilities, and as a contribution to the efforts of the Decade of Action for Road Safety (2012–2020). Some projects of this extensive network include the Piñones Trail, Isla Verde Avenue, Cyclist Connection between Isla Verde and Ocean Park, and "Paseo Puerta de Tierra."

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Aquidneck Island Bicycle Network (Aquidneck Island, Rhode Island)

In 2009, FHWA funded a two-year regional, corridor, multimodal transportation planning study on Aquidneck Island in Rhode Island called the Aquidneck Island Transportation Study (AITS). The study brought together State, municipal, Federal, bicycle and pedestrian advocacy organizations, nonprofit, and other entities to assess transportation in an economically and environmentally important region for the State of Rhode Island. The Rhode Island Department of Transportation (RIDOT) and Metropolitan Planning Organization used the AITS to initiate its RI*STARS (Strategically TArgeted Roadway Solutions) program, whose foundation is Roadway Safety Assessments. In addition to hosting training courses, over 20 Road Safety Audits (RSAs) were

completed at the corridor and intersection scale in this region to evaluate safety, mobility, and access for all road users. This process shortens project delivery by linking and streamlining system planning to on-the-ground implementation in projects and policy. Pedestrian and Bicycle networks have been the first to realize these results. RIDOT and the MPO have partnered with the Division to institutionalize this approach and repeat in other regions.

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Columbia Area Bicycle and Pedestrian Network (Columbia, South Carolina)

Since 1995, local leaders from the Columbia area have been working towards the development of a regional greenway network along the Broad, Lower Saluda, and Congaree Rivers which parallel the central business districts of the cities of Columbia, West Columbia, and Cayce. To date, almost 15 miles of protected, paved, accessible pathways have been constructed along both sides of the Congaree River from the Broad River Road Bridge to the planned 12,000 year history park near I-77. Plans are currently underway to connect the system to the River Banks Zoo via two pedestrian bridges across the Lower Saluda River and Congaree rivers. The City of Columbia is also in the process of constructing the Vista Greenway, the Green Street Enhancement project and a new bike and pedestrian master plan which recommends two high priority separated bicycle lane projects along Sumter and Laurel Streets. More information can be found at the Walk Bike Columbia website.

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East Coast Greenway Plan (South Carolina and North Carolina)

Extending from Maine to Florida, the East Coast Greenway is designed to be planned and constructed by local governments. The Grant Strand Area Transportation Study MPO in Horry and Georgetown County, South Carolina and Brunswick County, North Carolina has succeeded in planning a 90-mile route, constructing 21 miles of paths, and designating an existing 13 miles. Funding has been identified for an additional 28 miles of the greenway and several segments are currently under design or construction. An additional 28 miles of the route remains to be constructed with an estimated cost of $12 million.

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Utah Collaborative Active Transportation Study (Utah)

Phase 1 of the Utah Collaborative Active Transportation Study (UCATS) lays the groundwork for an urban network of bicycle routes and walking routes that enhance pedestrian and bicycle connectivity to major transit lines in the region. UCATS pinpoints 25 project areas on the regional network and potential improvements within those 25 areas. It emphasizes bicycle improvements within 3 miles of all train stations throughout the four-county region, and prioritizes them in the 2015 Transportation Plan update. These improvements will be programmed in future statewide

transportation improvement programs. Phase 2 of the study is underway and will further define these improvements and take 10 of them to the design phase.

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Cheyenne On-Street Bicycle and Greenway Plan (Cheyenne, Wyoming)

The Cheyenne On-Street Bicycle and Greenway Plan provides the Cheyenne area with the projects, programs and policies necessary to create a first-class on-street bicycling network, enhance and expand the existing greenway system, deliver supportive education and encouragement programs and provide a well-designed, integrated, safe, and efficient multimodal transportation network. The Plan proposes that the Cheyenne area expand the current robust bikeway and greenway network with an additional 280 miles of new designated facilities. More than half the facilities are along greenway corridors and shoulder bikeways that provide continuous connections to outlying areas of the region. The remaining mileage consists of bicycle boulevards, bike lanes, shared roadways, and buffered bike lanes that close gaps between existing bikeways and greenways within the city boundary.

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Tulsa Trails Master Plan (Tulsa, Oklahoma)

The Indian Nations Council of Governments and its partners in the Tulsa region have focused development of a comprehensive trail network around the recommendations outlined in the Tulsa Trails Master Plan. The plan establishes trail links that will provide valuable connections to existing facilities, improving pedestrian and bicycle access to destinations across the area.

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Shared Use Paths and Trails

Sitka Cross Trail Multi-Use Pathway (Sitka, Alaska)

In 2006 and 2013, Sitka was recognized as a bronze-level bike friendly community by the League of American Bicyclists. Once approved, this project provide the funding for planning, research and design for the sixth and final phase of the Sitka Multiuse Pathway system through a Federal Lands Access Program grant award. The project will extend Sitka's existing ten mile network of trails out to the Alaska Marine Highway terminal at the north end of the Sitka road system.

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Arkansas River Trail (Arkansas)

The Arkansas River Trail System is an expansive 88-mile loop through the Natural State, including the cities of Little Rock, North Little Rock, Maumelle, and Conway. This award-winning community effort winds its way across the entire metropolitan area, through Little Rock and North Little Rock, connecting 38 parks, six museums, and more than 5,000 acres of Federal, State, and local parkland.

Expansive, and om primarily flat-terrain, the trail offers recreational opportunities for people of all ages, fitness levels, interests, and health conditions.

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Farmington River Trail (Collinsville, Unionville, and Burlington, Connecticut)

The Farmington Canal was originally constructed in 1835 to provide a route from New Haven into the interior of Connecticut, Massachusetts, and beyond. In 2011, the final section of the unused rail bed was converted into a rail-trail which serves the communities of Collinsville, Unionville, and Burlington. The shared use path today serves as a regional multimodal network connecting five towns across the region. This new inter-town linkage provides safe transportation by walking or biking on a dedicated, paved shared use path, thus avoiding two-lane highway. The project links the trail to sidewalk networks in both towns, and in Unionville, connects with public transit access points that extend the accessibility and mobility potential of all users of the system.

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Razorback Regional Greenway (Springdale, Lowell, and Rogers, Arkansas)

The Northwest Arkansas Regional Planning Commission received a $15 million TIGER II grant to complete a 36-mile bicycle and pedestrian facility called the Northwest Arkansas Razorback Regional Greenway through Springdale, Lowell, and Rogers, Arkansas. Because the grant awarded was less than the amount needed for the project, the project was scaled back to a section of independent utility 16 miles long through the three cities. An additional $15 million in local and private sector funding has been committed as matching funds to complete the greenway. The majority of funds will be used to provide a 12-foot shared use path, and there are several portions of the trail using the existing right-of-way of I-540. The trail is designed to meet accessibility guidelines.

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San Francisco Bay Trail (San Francisco Bay Area, California)

When completed, the San Francisco Bay Trail will provide a 500-mile continuous regional network around the San Francisco Bay, connecting 9 counties, 47 cities, and crossing 7 toll bridges. More than 340 miles of Bay Trail are complete, with segments existing in all cities and counties and the longest continuous stretches ranging from 15 to 26 miles. Of the 7 toll bridges in the region, 4 bridges and half of another bridge have a separated bicycle and pedestrian pathway on the structure that is part of the network. The foundation of the Bay Trail Plan is to create a continuous shared use path open to the widest range of users. The Trail provides an alternative commute route for bicyclists and connects to numerous public transportation facilities.

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Columbus Fall Line Trace (Columbus, Georgia)

The Columbus Fall Line Trace was constructed on an abandoned railroad route as part of the City of Columbus Rails-to-Trails project. This project provides a 12-foot wide asphalt trail that includes two park and ride rest areas, and features improvements to several bridges and various hardscape and landscape improvements, such as benches, trash receptacles, and signage. Residents can access the trail at numerous road crossings and trail spur connectors, and the trail also provides access to transit stations.

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U.S. 36 Bikeway (Colorado)

In December 2009, the U.S. 36 Final Environmental Impact Statement issued a signed Record of Decision which includes an 18-mile long, 12-foot wide multipurpose bikeway that will run adjacent to U.S. 36. Once completed, this new bikeway will connect previously disaggregated trail segments and provide commuters a means to travel easily from Boulder to Westminster by bicycle or walking. The path will be made out of 6 inch thick concrete for a comfortable ride and will ensure minimal maintenance cost in the future.

In addition to connecting communities to one another, this bikeway will also provide access to BRT stops throughout the corridor, helping to make first and final mile connections without driving. This bikeway will seamlessly connect two major bicycling networks and communities to form a multimodal transportation corridor.

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Refuge Access Trail (Denver Area, Colorado)

Central Federal Lands Highway Division, the U.S. Fish and Wildlife Service, and numerous local and Colorado State entities are partnering to improve and build a multimodal trail that will connect three Denver area Refuges to the surrounding communities and local parks. Known as the Refuge Access Trail, the project will provide a continuous, nonmotorized, multiuse trail. It will improve some regional trails and build new linkages to create approximately 9 miles of bicycle and pedestrian connections in the Denver area.

Improvements to existing trail portions will include added signage, improved drainage and grade, and a consistent trail width. New trail sections will include new crossings, signage, and consistent width throughout. The Refuge Access Trail is the first phase in the larger America's Great Outdoor Rocky Mountain Greenway Project, which will eventually connect these three Denver area Refuges with Rocky Mountain National Park.

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Gordons Pond Trail (Delaware)

The Gordons Pond Trail is the newest trail addition to Cape Henlopen State Park connecting the northern and southern portions of the park. This 3.2-mile trail is integral in a regional network of the nearly 15 miles of trail that link Lewes, Delaware with Rehoboth Beach, Delaware. The Junction & Breakwater Trail is part of the regional trail network linking these towns.

An important facility for recreational trail users, the Gordons Pond Trail is popular for bike riders, hikers, runners and birders. Between mid-June when the trail opened and November 2014, more than 40,000 users were on the trail. Great care was taken to align the trail to avoid impacts to the Park's sensitive habitat and cultural resources.

Contact: Susan Moerschel | Moerschel@state.de.us | 302–739–9235

High Trestle Trail Extension (Ankeny and Des Moines, Iowa)

The Iowa DOT Commission approved $782,000 in Federal Recreational Trails Program funds to the Polk County Conservation Board to purchase the right-of-way for a six-mile trail extension of the High Trestle Trail. This extension will connect the High Trestle Trail with the Neal Smith Trail and the Gay Lea Wilson Trail, completing a regional network of trails in central Iowa.

Contact: Sean Litteral | sean.litteral@dot.gov | 515–233–7321

Selmon Greenway Trail (Tampa, Florida)

The Tampa-Hillsborough Expressway Authority is implementing an urban trail project beneath the elevated lanes of the expressway in Downtown Tampa. Referred to as the Selmon Greenway, the proposed multiuse trail will run parallel to the expressway to provide pedestrian and bicycle access throughout the downtown area. The Greenway will provide opportunities to increase park space in downtown and incorporate art and educational elements, historical monuments, and stormwater improvements while retaining much of the parking now available under the highway deck. The Selmon Greenway will create connections between the Channel District, Ybor City, and the central business district and neighborhoods beyond. The project is currently under construction and is expected to be completed early this year. Project was funded with a TIGER grant

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Courtney Campbell Causeway Scenic Trail (Hillsborough County, Florida)

The Courtney Campbell Causeway Scenic Trail is a symbol of the collaboration of local, regional, and State governmental agencies, public- and private-sector partners. Hundreds daily enjoy the beaches, boat launch, vistas, and fishing opportunities along this 9.5-mile causeway across Old Tampa Bay. The trail is an 8 to 12-foot-wide paved path that will allow pedestrian and bicycle access along the entire southern side of the Courtney Campbell Causeway, from the Veterans Expressway in Tampa to Bayshore Boulevard in Clearwater, as well as connecting to recreational trails on both

sides of the Bay. The 5.5-mile portion in Tampa / Hillsborough County, including a 45-foot-high bridge, was completed in fall 2013. The remaining section was completed in early 2015.

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Pinellas Trail (Pinellas County, Florida)

The Pinellas Trail is the primary artery of St. Petersburg's pedestrian and bicycle network. The trail consists of a 15-foot wide asphalt surface that is striped and marked to designate 10 feet for use as a bike and skate lane and 5 feet for a walking lane. Where space allows, the walking lane is separated from the bike lane by a grass median, allowing pedestrians and bicyclists to comfortably use the trail. The Pinellas Trail runs 47 miles in Pinellas County and passes through passes through the historic downtowns of Dunedin, Tarpon Springs, and Palm Harbor. Connecting trails lead to a variety of local parks as well as to Honeymoon State Park. The Fred Marquis Pinellas Trail opened in 1990 with an initial 5-mile stretch. Plans are underway for an additional 20-mile extension along the abandoned railroad corridor.

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Dubuque Street Multiuse Trail (Iowa City and North Liberty, Iowa)

The Dubuque Street Multiuse Trail connects the towns of Iowa City and North Liberty along a major thoroughfare in Iowa City. The project closed a network gap by installing a bicycle and pedestrian bridge over I-80. All but the most seasoned bicyclists are intimidated by the heavy traffic along the Dubuque Street corridor. Repairing this network gap will create bicycle and pedestrian access to recreational opportunities north of I-80 in a more direct, efficient manner.

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Prairie Trail (Cour D'Alene, Idaho)

The Prairie Trail project was built on a railroad right-of-way in Cour D'Alene, Idaho, once project leaders realized the abandoned track's potential for a multiuse path. In order to construct the 4-mile trail, a land swap was brokered with the Bureau of Land Management and Lake City Development Corporation to purchase the $2 million railroad property. LCDC provided funding to purchase the property, and the city received the 4-mile trail and property along the river where another park and trail system will be built. The Prairie Trail was constructed by a local philanthropy in exchange for using the corridor as a haul road during the construction of their facility.

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Pumpkinvine Trail (Indiana)

The Pumpkinvine Trail is a regional trail connecting Goshen, Middlebury, and Shipshewana mostly along an abandoned railroad corridor in rural Elkhart and LaGrange Counties in Northeast Indiana. It is approximately 17 miles long and is part of a regional trail system that connects to two other trails systems in the Cities of Goshen and Elkhart. The trail traverses the scenic rural countryside

and travels through the centers of Goshen, Middlebury and Shipshewana, which is home the third largest Amish community in the nation. The trail has generated a nonmotorized route for the residents of the area to travel, as well as tourism and recreational opportunities in these towns. Additional sections of the State's visionary trail were built using Federal funding through the Indiana's Department of Transportation and Department of Natural Resources.

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Bitterroot Branch Trail Connection (Montana)

The 38-mile Bitterroot Path connects a series of rural communities between Hamilton and Lolo, Montana, and the 5-mile Bitterroot Branch Trail runs from the edge of Missoula to the city's downtown. However, the 7-mile gap between these two trails effectively severs bicycling, walking, and other forms of active transportation choices between these rural communities and the City of Missoula. This project fills a critical gap between the two previously disconnected trail networks. Missoula County was awarded a TIGER grant in the amount of $4.6 million to construct the missing trail segment between Missoula and Lolo.

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Assabet River Rail Trail (Massachusetts)

The Acton-Maynard segment of the Assabet River Rail Trail is a new infrastructure project to continue an off-road corridor for bicycle and other nonmotorized transportation via a 12-foot wide paved trail system in the MetroWest region of Massachusetts. This segment of the project begins at the Stow–Maynard Town line, extends through the Maynard downtown, and ends at the South Acton commuter rail station, where there have already been investments in bicycle parking. This segment will eventually connect to the existing segment of the trail in Hudson to continue the trail through the five adjacent communities.

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Long Leaf Trace Trail (Hattiesburg and Prentiss, Mississippi)

The Long Leaf Trace Trail extends approximately 41 miles from the City of Hattiesburg to the Town of Prentiss. The trail 15-foot wide paved trail utilized the former railroad bed of the old Mississippi Central Railroad. The Pearl & Leaf River Rails to Trails Recreational District was created to carry out the creation of the trail, and in the late 1990s the first phase of the trail was opened. Subsequent phases have brought the trail up to the current 41 miles. The City of Hattiesburg secured additional funding to extend the Trail an additional 2 miles into Downtown Hattiesburg. Future plans call for additional mileage to connect the historic Hattiesburg Railroad Depot and eventually to the newly constructed Chain Park.

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University City Boulevard Multiuse Path (Charlotte, North Carolina)

The University City Boulevard Multiuse Path runs parallel to University City Boulevard to the main entrance of the University of North Carolina at Charlotte, connecting commercial areas with the campus and surrounding neighborhoods. There are many off-campus apartments near the university, new apartments under construction across from the university's main entrance and a large commercial shopping center to the west on Hwy 49. The path connects the surrounding land uses to campus for bicyclists and pedestrians along a State highway that would otherwise be a formidable travel corridor.

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Beale-Wendover Connector (Charlotte, North Carolina)

The Beale-Wendover Connector is a 10-foot wide multiuse path that provides an off-street connection for bicyclists traveling on Bike Route 9 in Charlotte, North Carolina, allowing a direct crossing of a five-lane thoroughfare. Prior to this upgrade, bicyclists traveling this route were forced to make an "L" type maneuver which required riding alongside vehicular traffic for a short distance. The path also connects a neighborhood recreation center and playground to a nearby apartment complex, terminating at a signalized crosswalk for a shopping center and grocery store. Additionally, a bicycle detection signal was installed on Marvin Road at the intersection of North Wendover Road to allow for easier crossing and access to the bicycle path. Sharrows have also been painted on both Marvin Road and Beal Street.

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Cross Triangle Greenway Trail (Triangle Area, North Carolina)

The Cross Triangle Greenway Trail is a portion of the East Coast Greenway that traverses the Research Triangle Region connecting five municipalities from Durham to Clayton, North Carolina. The focus of this connectivity initiative is two trail sections that were completed in 2014: the completion of the American Tobacco Trail in Durham with a bridge over Interstate 40 and about 4 miles of connecting trail, and the opening of the Walnut Creek Trail in Raleigh between Worthdale Park and the Neuse River Greenway, which connected over 15 miles of greenway between Lake Johnson and the Neuse River Greenway. Many of the various trail segments have been funded through Federal funds.

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Santa Fe Rail Trail (Santa Fe, New Mexico)

Running parallel to the rail line that passes into Santa Fe, New Mexico, the Rail Trail is a paved, multiuse commuter trail from the Santa Fe Railyard to the outskirts of town at Rabbit Road. The trail continues unpaved along the tracks out of town, up to highway 285 near Lamy, where the rail spur meets up with the main Atcheson, Topeka & Santa Fe Rail Line. The project had been an informal trail for years, but in 2010 the portion of the trail within the city limits was paved and

widened in order to bring it up to AASHTO guidelines, as well as make it comply with accessibility guidelines. The Rail Trail plays a critical role in the Santa Fe Metropolitan Transportation Plan, which aims to complete a citywide network of high quality trails for bicyclists and pedestrians.

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Seacoast Greenway (New Hampshire)

New Hampshire's Seacoast Greenway is the New Hampshire section of the larger East Coast Greenway. The ECG vision is for a long-distance, urban, shared-use trail system network linking 25 major cities along the eastern seaboard between Calais, Maine and Key West, Florida. The New Hampshire 16-mile section of the ECG is an on-road route along Route 1A in New Hampshire with the Memorial Bridge functioning as the New Hampshire gateway from the north. From there, the route hugs the coast, offering continuous views of the Atlantic Ocean including the historic Isles of Shoals. The southernmost portion of the trail was acquired by the State of New Hampshire Department of Transportation when it was abandoned as a rail corridor, including the section passing through the Seabrook Nuclear Power Plant. The northern section is owned by Guilford Industries is presently negotiating sale of the land to the State.

Contact: Leigh Levine | Leigh.Levine@dot.gov | 603–4104844

Holmes County Trail (Holmes County, Ohio)

The Holmes County Trail is an important transit route alternative for the safety of the Amish community in Ohio. Allowing convenient off road travel for Amish Buggies as well as bicycles pedestrians and horses, this multiuse trail connects Amish housing with their major shopping area. Labeled the first trail in the nation to accommodate Amish buggies, the unique and scenic Holmes County Trail has two lanes, one lane of the trail is paved with asphalt for biking, in-line skating, walking, running, and wheelchairs, while the adjoining buggy and equestrian trail is paved with "chip and seal" for horse-drawn vehicles and horseback riding.

Contact: Andy Johns | Andy.Johns@dot.gov | 614–280–6850

Ohio to Erie Trail (Ohio)

The Ohio to Erie Trail spans the State of Ohio from Cincinnati to Cleveland, following lands formerly owned by railroads and canals. When complete, this trail will connect Cleveland, Akron, Columbus, and Cincinnati metropolitan areas, a dozen large towns and numerous small villages on paved trails which are separated from highways. The trail network also appeals to tourists by connecting with commercial districts and views of many of Ohio's historic sites along the way.

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South East 17th Avenue Regional Trail Connector (Portland, Oregon)

The SE 17th Avenue Regional Trail Connector exemplifies how the Portland region is integrating its off-street trails system with its on-street system to create a seamless, connected walking and

bicycling experience. This multiuse trail will be built in the existing right of way on 17th Street between McLoughlin Boulevard and S.E. Ochoco Street, providing a connection to two major regional multiuse trails, the Trolley Trail to the south and the Springwater Corridor to the north.

Contact: Lake Strongheart McTighe | Lake.McTighe@oregonmetro.gov | 503–797–1660

The Circuit (Philadelphia, Pennsylvania)

The Circuit is a 750-mile network of bicycle and pedestrian trails connecting people to jobs, communities, and parks in the Greater Philadelphia Region. This multiuse trail network consists of 250 miles of built trails throughout the Greater Philadelphia area in Pennsylvania and New Jersey, and an additional 500 miles of planned trails. More than 30 miles of trail have been built since January 2012, and each year over 800,000 people use the Circuit's Schuylkill River Trail section, contributing $7.3 million to local economies.

Contact: Karyn Vandervoort | Karyn.Vandervoort@dot.gov | 717–221–2276

Tennessee Riverwalk (Chattanooga, Tennessee)

The Tennessee Riverwalk is a 13-mile multiuse path running along the banks of the Tennessee River in Chattanooga. The concept for the Riverwalk originated in the early 1980s, with a task force that envisioned a corridor of linear parks along a 22-mile stretch of the Tennessee River. The task force concluded that the river park could reconnect the city with the river through active use, which could in turn strengthen community pride and reignite business investment in Chattanooga. Thanks to public-private collaboration on both planning and funding, the first 13 miles of the Riverwalk were completed in 1993. Today, the path is jointly maintained by Hamilton County and the City of Chattanooga. An additional 4.7 miles of trail extensions are programmed by 2017.

Contact: Scott Allen | Scott.Allen@dot.gov | 615–781–5792

Bloomington B-Line Trail (Bloomington, Indiana)

An abandoned railroad corridor in the heart of Downtown Bloomington, IN, was transformed into a 3.1-mile shared use path and urban greenspace. Opened in September 2011 and serving as a "backbone" for the city's bicycle and pedestrian network, the B-Line Trail enables users of all ages and abilities to more readily access downtown by bicycling and walking. The trail begins on the north west side of downtown, turns south through the Switchyard Property, and connects to the trailhead of the Bloomington Rail Trail. The downtown sections of the B-Line Trail incorporate streetscape design features such as street name paver treatments at each crossing, drinking fountains, benches, and landscaping. Existing and new development adjacent to the trail such as hotels, grocery stores, coffee shops, single family homes, and retail stores have popularized the use of the trail as another piece of the city transportation network.

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Wasatch Loop (Utah)

This 250-mile loop trail traverses six counties in north central Utah, including the Wasatch Front and Wasatch Back mountain ranges. As of 2015 the trail is 80 percent complete and the rest is programmed. Approximately 80 percent of the State's population lives within the loop, and residents use the trail daily for recreational and commuting purposes. The trail network has also been used for mass bicycling events. The Murdoch Trail section of the loop was completed in 2013, and was the subject of the State's first Federal Bicycle and Pedestrian Safety assessment. The loop connects several existing and new trail segments.

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Burlington Bike Path (Burlington, Vermont)

The Burlington Bike Path serves as the backbone of the bicycle transportation network in Burlington, Vermont, and several surrounding towns. The Bike Path is a 7.5 mile route running from Burlington's southern end at Oakledge Park to the northern end at the Winooski River, where it connects to the Colchester Bike Path via a bike path bridge. It follows the Lake Champlain shoreline, linking six major waterfront parks along with a high school and the Waterfront district.

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Eastside Trail (King County, Washington)

The Eastside Rail Corridor Council, a body of locally elected leaders from the Puget Sound, has given its unanimous approval for cooperation on future uses of this important multimodal corridor that may accommodate passenger rail in the future and several new sections of the trail have been constructed or received funding and are being developed currently. When complete, the Eastside Trail will extend along a 42-mile rail corridor that stretches north-south from Renton to Snohomish, passing through Renton, Bellevue, Kirkland, Woodinville, Redmond, and portions of unincorporated King County. This trail provides a community and economic development opportunity of regional and State significance linking jobs and housing, serving growing communities, offering amenities to business and residents, and supporting the protection of King County's natural resources—the protected forest land and open space to the east. WSDOT has funded a $1.5 million dollar project through the State Pedestrian and Bicycle Safety Program to support sections of the Eastside Trail through Redmond, and is providing additional support for the completion of the Wilburton Gap.

Contact: Megan P. Hall | Megan.Hall@dot.gov | 360–753–8079

Paul Ambrose Trail for Health (Huntington, West Virginia)

The Paul Ambrose Trail for Health (PATH) is a growing bicycle and pedestrian system currently being constructed in the Greater Huntington, West Virginia area. Huntington has consistently been named one of the most obese cities in the United States since 2008.The trail was named after local health advocate and Huntington native Dr. Paul Ambrose, whose plane was crashed into the

Pentagon on September 11, 2001. As of 2015, approximately 15 miles of trails and bike paths have been developed, and once complete the project will provide recreational and alternative transportation opportunities to all user groups. The constructed sections of PATH are in neighborhoods and city parks, and future projects will provide alternative transportation opportunities between residential neighborhoods and the Central Business District.

Contact: Henry (Ed) Compton | Henry.Compton@dot.gov 304–347–5268

Emerald Isle Multiuse Path (Emerald Isle, North Carolina)

A multiuse path was constructed alongside NC Highway 58 in Emerald Isle, North Carolina, to provide bicycle and pedestrian access to key destinations across the town. First established in 2004, the path was prioritized in local planning documents and has been developed over time with funding from a variety of sources. The path serves as a primary arterial for nonmotorized transportation across the island.

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Fennel Creek Trail (Bonney Lake, Washington)

In 1997, a citywide survey by the City of Bonney Lake showed that trail networks were a community priority. Building on this input, a trail plan was created in 2007 that proposed a network of shared use paths to provide access to a nonmotorized transportation corridor for the surrounding area. Opened in April 2013, the Fennel Creek Trail project is part of a $2.5 million Safe Routes to School pedestrian safety grant. The Trail connects Allan Yorke Park, Lake Tapps, Downtown Bonney Lake, the Midtown Commercial District, the regional Park-and-Ride for Sound Transit, and the Bonney Lake School District to the thousands of homes in the surrounding neighborhoods.

Contact: Megan P. Hall | Megan.Hall@dot.gov | 360–753–8079

Grand Teton Multiuse Pathway (Wyoming)

Grand Teton National Park has partnered with the Western Federal Lands Highway Division of FHWA for the design and construction of 14.5 miles of shared use pathway connecting the Town of Jackson, Wyoming, to Grand Teton's boundary. The shared use pathway network connects to another 6-mile shared use pathway segment initiated and installed by the Jackson Hole Community Pathways that connects the Town of Jackson. The Park's AASHTO-compliant paved shared use pathways are separated from the adjacent roadway. As of August 2012, Grand Teton has completed construction of 14.5 miles of its system in two phases and intends to complete another 1.25 miles of pathway to be opened in the spring of 2016.

Contact: Jessica Brown | Jessica_H_Brown@nps.gov | 307–739–3578

Statewide Multiuse Trails Program (Connecticut)

The Connecticut Department of Transportation and Department of Energy and Environmental Protection developed a statewide strategy to close gaps in existing trails and develop a statewide trail

network. The comprehensive strategy outlines a series of steps to first identify trails of significance and their gaps, establish priorities for improvements, and develop a five year program for closing the gaps. The plan focuses mainly on completing critical gaps in the East Coast Greenway, which is recognized by these agencies as the most important statewide trail. The plan will continue to drive investment in trail projects to establish a comprehensive, statewide network.

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Corridor Improvements

Edgewood Street Improvements (Washington, DC)

The District of Columbia Department of Transportation has received several traffic safety complaints along the 601 block of Edgewood Street, NE. These issues are a major concern as there are four school campuses at this location. The Road Safety Audit (RSA) team identified several issues related to traffic safety for pedestrians, bicyclists, motor vehicles, and transit. Based on the RSA team's recommendations, DDOT staff developed plans to address several recommendations, including the implementation of Park and Walk and Walking School Bus programs, the relocation of existing bus stops along Edgewood Street, an increase in Metropolitan Police Department support during school drop-off and pick-up hours, and the installation of accesssibie pedestrian facilities, new pedestrian crosswalks, and new signage near schools for pedestrians and motorists.

Recommendations also include a plan to convert traffic flow to one way on Edgewood Street in the eastbound direction between 7th Street NE and Franklin Street Overpass, but only during school drop-off and pick-up sessions.

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Chicago Complete Streets Arterial Resurfacing Program (Chicago, Illinois)

Since 2011, the Chicago Department of Transportation (CDOT) has selected key Arterial Resurfacing projects on high pedestrian crash corridors, and developed new roadway striping plans to reduce crashes and improve pedestrian and bicyclist accommodations. These improvements have included road diets, narrower travel lanes, on-street bicycle facilities (protected and buffered), and high visibility crosswalks. In 2014, CDOT set aside approximately 10 percent of the AR budget to improve more locations with crash countermeasures. CDOT filtered resurfacing locations using pedestrian crash maps and the Streets for Cycling Plan 2020. It also referenced a Chicago Pedestrian Plan tool that ranks potential project locations using weighted data sets on safety, connectivity, livability, health, and equity. Based on priority needs, CDOT added complete streets improvements to 28 resurfacing projects in the 2014 program, including lane reconfigurations described above, pedestrian refuge islands, curb bump-outs, and a raised crosswalk. For example, CDOT will install pedestrian refuge islands on Cicero, Pulaski, and 95th Street, which are four-lane State route arterials with high rates of pedestrian crashes.

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Sutro Complete Streets Project (Reno, Nevada)

In 2012, the Sutro Complete Streets Project provided mobility and safety benefits to transit dependent and zero auto households in Reno, Nevada, by linking high-density residential communities to employment, social services, and educational centers. Bus stop improvements increased quality of service for transit riders on three transit routes that serve this area.

Additionally, road conversion improvements allowed space for bicycle lanes and created a critical link in the regional bicycle network. Other project components included street lighting at key crossing points, two high-visibility mid-block crosswalks at schools, an audible traffic signal at the 9th and Sutro Streets, and a 2,850-foot pedestrian access path with sidewalk bulbouts at four intersections, and 50 new pedestrian ramps that comply with accessibility requirements.

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Fletcher Avenue Complete Streets (Hillsborough County, Florida)

Strip retail located along a 3.1-mile section of Fletcher Avenue between Nebraska Avenue and N 50th Street in Hillsborough County had attracted high volumes of pedestrian traffic from the South Florida University campus and Florida Hospital Tampa and had resulted in one of the highest crash rates in the Tampa Bay region. In 2014, Florida DOT awarded Hillsborough County $3 million in Safety Enhancement Grant funding for a complete streets project on Fletcher Avenue. The $5 million project added crosswalks, bus shelters, and bike lanes to provide system users with multimodal access throughout the corridor.

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Southwest Moody Avenue Project (Portland, Oregon)

Located in the rapidly redeveloping South Waterfront District, Southwest Moody Avenue serves as the main access point between downtown Portland and the central city's largest remaining supply of vacant land. This project created three traffic lanes, dual streetcar tracks, pedestrian walkways and a separated bike lane by elevating the roadway 14 feet above the original grade.

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Russell Street Reconstruction (Sioux Falls, South Dakota)

The reconstruction of Russell Street in Sioux Falls included the addition of bike lanes and a side path along the south side of the road. Prior to reconstruction, no bicycle or pedestrian accommodations were provided on the corridor. The new improvements provide a vital pedestrian and bicycle connection from the city's bicycle trail system to the city's Arena and Convention Center complex and on-street bicycle route system. Completed in November 2014, the route also connects to the Interstate 29 bicycle and pedestrian overpass, providing a vital east-west neighborhood link for pedestrians and bicyclists in Sioux Falls.

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Esplanade Avenue Corridor Improvements (New Orleans, Louisiana)

Roughly 10,000 vehicles per day use Esplanade Avenue, a 19th-century boulevard running from the Mississippi River to City Park in New Orleans. The corridor is an important connection within the central city and it is also a heavily trafficked route for people walking and bicycling. Project leaders responded to a request for a bike lane as part of the contract to resurface Esplanade Avenue with the Paths to Progress Program, a coordinated transportation improvement program between FHWA, the Louisiana Department of Transportation and Development, and local agencies. The project was completed in 2013, and included a road diet from four to two lanes, the addition of ramps that comply with accessibility requirements, shared-lane markings, and dedicated bicycle lanes with signage as well as a lower posted speed limit. Today the Esplanade Avenue corridor acts as a backbone for bicycling commuters by providing connectivity to key destinations like the French Quarter and Central Business District from various neighborhoods.

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Urbana Main Street Improvements (Urbana, Illinois)

In 2013, the Main Street bike lane and pedestrian improvement project used Federal surface transportation funding to create bicycle and pedestrian linkages to the existing transportation system along Main Street, a busy arterial roadway in Urbana. Project features included a road diet, which added 1.5 miles of new bike lanes on Main Street to provide a continuous bicycle route through the center of Urbana, replacing brick sidewalks with concrete sidewalks, and adding new sidewalks and ramps to create a continuous, accessible pedestrian route along Main Street. The road diet resulted in a reduction from four to three lanes along Main Street, creating room for bike lanes and a number of safety improvements. Redesigned left turn lanes enhanced sight distances for motorists by separating left-turn and through traffic, and protected left-turn signal phasing increased safety for all roadway users. The provision of accessible pedestrian signals at three signalized intersections in downtown improved pedestrian safety, particularly for those with disabilities. Curb extensions at two intersections in downtown improved pedestrian safety by reducing the crossing distance at intersections, and making pedestrians more visible to motorists and bicyclists. The project enhanced connectivity along the corridor by directly connecting the bike lanes to eight other existing or proposed bike facilities.

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University Avenue Corridor Improvements (Madison, Wisconsin)

The need for bicycle and pedestrian accommodations between the Cities of Madison and Middleton along University Avenue from Allen Boulevard to Grand Avenue was identified in the Bicycle Transportation Plan for the Madison Urban Area and Dane County in September 2000. Through the MPO prioritization and programming process, a project to reconstruct University Avenue between Allen Boulevard and Segoe Road with bike lanes was initially scheduled to begin in 2011, but construction activity was authorized by the Division Office in January 2012. The project coordinated with water and sewer reconstruction activity along the corridor, which helped minimize

construction delays. Bicycle accommodations along this corridor include on-road bicycle lanes and a new multiuse pathway parallel to University Avenue. Additional enhancements included green-colored path crossings at intersecting streets and the use of Safe Routes to School funding to rebuild the Spring Harbor underpass of University Avenue to comply with accessibility guidelines and to connect schools and neighborhoods.

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First and Fifth Street Improvements (Lewiston, Idaho)

Experiencing the negative impacts of disinvestment following suburban growth, downtown Lewiston recognized an opportunity to revitalize its core through streetscape and transportation improvements. Following priorities laid out in its pedestrian and bicycle plan, the city enhanced First and Fifth Streets with a complete streets design that provided multimodal connections throughout downtown. The project provided transit access at a new library location and enhanced connections with regional trail networks, and also featured landscaping and other aesthetic improvements along these redesigned corridors.

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Bridges

Gibbs Street Pedestrian and Bicycle Bridge (Portland, Oregon)

The Gibbs Street Pedestrian and Bicycle Bridge project created a new linkage for pedestrians and bicyclists over I-5 in Portland, Oregon. It provides a direct route for Lair Hill neighborhood residents to reach the south Waterfront, where there had been no direct connection since the freeway's construction in the 1960s. This 700-foot bridge is estimated to support up to 730 crossings per day when school is in session. The project was completed in 2012, at a cost of $8 million.

Contact: Lake Strongheart McTighe | Lake.McTighe@oregonmetro.gov | 503–797–1660

Lake Lansing Road Bridge (Lansing and East Lansing, Michigan)

The Lake Lansing Road Bridge is a partial cloverleaf interchange originally built in 1970 with no pedestrian accommodations. For pedestrians and bicyclists crossing over U.S. 127 from the City of East Lansing into Lansing, the next nearest highway crossing was nearly 1.5 miles south. Over a period of 15 years, significant growth occurred on either side of the bridge, including high density residential as well as extensive service and commercial development. As a result of the changing land use context around the Lake Lansing Road Bridge, the Michigan Department of Transportation coordinated with the City of East Lansing, Lansing Township, and Ingham County Department of Roads to construct pedestrian accommodations on the bridge and through the interchanges and approaches, thus providing pedestrian and bicycle access to grocery stores and retail shopping on both sides.

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Route 52 Bridge and Causeway (Somers Point and Ocean City, New Jersey)

A pedestrian and bicycle path was included in the $500 million Route 52 bridge and causeway project completed in 2012. The 10-foot wide path connects the communities of Somers Point and Ocean City, and provides a link to another 16-mile path that connects to Mays Landing. The path serves as a vital connection for pedestrians and bicyclists, and features a wrap-around porch and areas for launching kayaks, boats, and facilitates places for bird-watching and fishing.

Contact: Calvin Edghill | calvin.edghill@dot.gov | 609–637–4230

Washington Bridge Bikeway (Providence and East Providence, Rhode Island)

Prone to congestion since the advent of the automobile and challenges associated with intensifying development along the I-195 corridor, the Washington Bridge has remained an important link between Providence and East Providence since its original construction in 1930. The Washington Bridge Bikeway project parallels I-195 over the Seekonk River to connect the cities of East Providence and Providence. This linkage uses preserved sections of the historic Washington Bridge to create two separately-dedicated bicycle and pedestrian paths and a mid-channel park, providing a substantial addition to two major pedestrian and bicycle networks—the East Bay Bike Path and Downtown Providence and Seekonk River Waterfront. The improved connection affords bicyclists and pedestrians of all ages and abilities with increased access to a greater range of recreation choices, destinations, and experiences.

Contact: Barbara Breslin | barbara.breslin@dot.gov | 401–528–4031

Big Four Pedestrian and Bicycle Bridge (Louisville, Kentucky, and Jeffersonville, Indiana)

The Big Four Railroad Bridge links the cities of Louisville, Kentucky, and Jeffersonville. Originally constructed in 1895 and updated again in 1929, the entire bridge spans 2,525 feet across the Ohio River. The bridge was reimagined as a linkage for pedestrians and bicyclists, providing an alternative to crossing the Interstate 65 Bridge which had no pedestrian accommodations. The project was designed to promote economic development for both cities by creating a pedestrian linkage between the two historic downtowns that honored the area's unique cultural heritage.

Contact: Greg Rawlings | Gregory.Rawlings@dot.gov | 502–223–7628

Waud Bluff Trail Bridge (Portland, Oregon)

Completed in April 2013, the Waud Bluff Trail and Bridge (provides a transit connection from the North Portland peninsula to a major employment district on Swan Island, and links Willamette Blvd to a future North Portland Greenway Trail along the Willamette River. An integral part of the 1,700 foot trail, the bridge allows users safe access over the Union Pacific railroad tracks. Project costs totaled $3.2 million.

Contact: Lake Strongheart McTighe | Lake.McTighe@oregonmetro.gov | 503–797–1660

On-Road Facilities

North Main Street Road Diet (Ashland, Oregon)

In 2012, the City of Ashland Public Works Department coordinated with Oregon Department of Transportation to develop a road diet pilot project as part of an evaluation to reduce traffic crashes and improve bicycle travel along North Main Street, a key arterial roadway. Project improvements included a lane reduction from four lanes to two lanes with a two-way center turn lane, bicycle lanes, sharrows and signal improvements. The project created continuous bicycle lanes along the main corridor into Downtown Ashland, also increasing network connectivity throughout the neighborhoods surrounding the Downtown area.

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Park and Portland Avenue Buffered Bike Lanes (Minneapolis, Minnesota)

Park Avenue and Portland Avenue were originally designed for motorists as connections from south Minneapolis to Downtown. The pair of one-way community connectors provides a direct and efficient way to travel between south Minneapolis and downtown by bike, but the facilities have anecdotally suffered from low use due to the narrow bike lanes which put bicyclists uncomfortably close to traffic. Project leaders implemented a roadway widening along both corridors for this project, adding buffered bicycle lanes to provide space between bicyclists and parked vehicles on the right and the vehicle lane on the left.

Contact: Will Stein | William.Stein@dot.gov | 651–291–6122

College Hill Bikeway (Macon, Georgia)

The College Hill Bikeway in Macon is a 1.5,mile system of on-street facilities consisting of both bicycle lanes and shared lanes. The connection was installed as a cooperative effort between the City of Macon and the College Hill Alliance—a department of Mercer University funded by a Knight Foundation grant. The route provides functional connections from Mercer University and the Macon area to several residential neighborhoods, recreational facilities, parks, and local businesses.

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Cahaba Road Enhancement Project (Birmingham, Alabama)

Cahaba Road connects commercial districts with residential neighborhoods on either side of the Birmingham Zoo, and serves as an alternative route for motorists entering Downtown Birmingham on Highway 280. This 51-foot-wide, four-lane arterial roadway has a posted speed of 30 mph, but with no pedestrian or bicycle accommodations, nonmotorized users have been forced to share the road with motorists passing at much higher speeds. The Cahaba Road Enhancement Project will modernize this four-lane arterial roadway near the Birmingham via a road diet and streetscape improvements. Project enhancements include a road diet that will reduce the existing travel lane width and provide on-street parking, sidewalks, bicycle lanes, pedestrian lighting, and a roundabout.

Once completed, the project will improve pedestrian access between the zoo and botanical gardens, providing more route alternatives between these attractions and nearby commercial retail and employment centers and increasing pedestrians and bicyclists' sense of safety as they navigate the corridor between two of the city's most popular attractions.

Contact: Nicole Spivey | Nicole.Spivey@dot.gov | 334–274–6345

Arlington Protected Bike Lanes Projects (Arlington County, Virginia)

Arlington County has been building a bicycle and pedestrian network for four decades. Sometimes the network is expanded with dramatic new projects, and sometimes by more modest new facilities, operational adjustments, or new maintenance priorities. These examples involve two protected bike lanes that replaced striped bike lanes along streets in the Pentagon City and Crystal City neighborhoods of Arlington County in fall 2014.

South Hayes Street in Pentagon City acquired protected bike lanes after county staff decided that the scheduled repaving of Hayes Street presented an opportunity to try protected lanes instead. The first of their kind in the County, the lanes were installed between on-street parking and the curb from 15th Street South to South Fern Street, giving cyclists a buffer from vehicular traffic along the four-lane road. Arlington also implemented a pilot project to convert South Eads Street into a complete street. This project is located between 15th Street South and 23rd Street South and utilizes the existing curb-to-curb space and accommodates all modes of travel. The four-lane roadway was converted into three lanes: two through lanes and a center two-way left turn lane, with a new protected bike facility. Pedestrian crossings were upgraded and parking lanes reconfigured.

Contact: David Patton | Dpatton@arlingtonva.us | 703–228–3633

King Street Separated Bike Lanes (Honolulu, Hawaii)

In 2011, Oahu residents accounted for two-thirds of all statewide bike crashes that resulted in a visit to the Emergency Room. According to the Hawaii Department of Health, up to four bicyclist fatalities occurred on Oahu every year between 2007–2011. These unsettling statistics highlighted the need for improved bicyclist accommodations on Oahu, and in late 2014 project leaders proposed the State's first separated bike facility along King Street in Downtown Honolulu.

The project extends along King Street from Alapai Street to Isenberg Street, and converts the left-most lane of King into a protected facility for bicyclists. The separated bike lane is shielded from motorized traffic with an asphalt berm and reflective plastic bollards. All driveways are maintained through gaps in the asphalt curb, enabling motorists to cross the separated bike lane at regular intervals. Bike lanes have been marked with green paint to emphasize the need for both bicyclists and motorists to exercise heightened caution in these "conflict zones". The pilot project opened as a one-way facility in December 2014, and was converted to a two-way facility in May 2015.

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Intersection and Crossing Improvements

Shakopee Roundabout Project (Shakopee, Minnesota)

In 2014, a mini-roundabout was constructed at the intersection of County Road 79 and Vierling Drive in Shakopee, a bedroom community south of Minneapolis. The existing four-way stop control intersection created long queues of vehicles, which often resulted in frustration for pedestrians and bicyclists when motorists would speed through the intersection after a long wait. Routine traffic congestion combined with a crash rate of nearly double the metro area average added to the number of ways this intersection could be improved.

This project connected all sides of the intersection to existing sidewalks and shared use paths, shortened crossing distances, enhanced intersection lighting, added refuge islands and reduced conflict points between vehicles and nonmotorized travelers, thus significantly increasing the safety and connectivity of the entire network.

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Five Points Crossing Improvements (Huntsville, Alabama)

The historic Five Points corridor in Huntsville is a five-block commercial district that provides basic needs to surrounding historic residential neighborhoods. This aging commercial district was originally designed for pedestrians, which created several points of increasing conflict between motorists and those accessing the area on foot. Five Points' proximity to a number of residences warranted the need to maintain and improve the area for pedestrian use.

Rather than treating the three-block area as a typical traffic enhancement, project leaders seized the opportunity to build on the district's existing assets by executing a series of retrofits which focused on enhancing its aging infrastructure. This project improved circulation and access for pedestrians by reducing points of conflict with motorists and creating more clearly-defined traffic patterns. The project improvements included the installation of crosswalks, pedestrian lighting, and curb work along Pratt Avenue, as well as aesthetic enhancements such as landscaping, benches, and relocating utilities.

Contact: Nicole Spivey | Nicole.Spivey@dot.gov | 334–274–6345

Ray Sidewalks Project (Ray, North Dakota)

Completed in 1942 as a coast-to-coast paved road, the five-lane section of Highway 2 cutting through the small town of Ray limited access to businesses and school facilities on the town's south side from Main Street and the town's residential core on its north. In addition to addressing crossing difficulties, this project established or reestablished sidewalks in the area of the Ray Public School after a series of utility relocation projects caused sidewalk users difficulty in getting around town safely on foot. In 2012, Safe Routes to School and the North Dakota Department of Transportation partnered with the Town of Ray and Ray Public School to improve access to sidewalks and

intersection crossing facilities for youth walking or biking to school. Sidewalk networks were restored throughout the residential core, including several deficient cross slopes and curb ramps which did not meet accessibility requirements. A Pedestrian Hybrid Beacon was installed across Highway 2 to improve access to the school's baseball field, the first crossing signal of its kind in the State.

Contact: David Ferrell | David.Ferrell@dot.gov | 701–221–9463

Other Projects and Programs

Phoenix Bike Share Program (Phoenix, Arizona)

The City of Phoenix launched its first bike share program in November of 2014. The program, Grid Bikes, provides 250 bikes across 29 station locations in the Phoenix area. Using Federal Congestion Mitigation and Air Quality Improvement Program (CMAQ) funds to establish the program, Phoenix has future plans to double the number of bikes and increase the number of stations to 50 in 2015. The Phoenix program is setting an example for other Arizona cities like Tempe and Mesa, which plan to join the program in its expansion in future years. The Grid Bikes system links area residents to Valley Metro light rail stations by using existing networks of bicycle facilities.

Contact: Ed Stillings | Ed.Stillings@dot.gov | 602–382–8966

Montgomery County Bike Share Program (Montgomery County, Maryland)

The Montgomery County Bike Share Program was launched in 2013, and has grown to a total of 51 stations. Set up by Federal funding under the CMAQ program, the bike share system is one of seven grant recipients in 2011 and the only one in Maryland to focus funding on developing a bike share program. The program is designed to provide regional countywide access to transit locations to help bridge the gap between residences and transit hubs. A satellite system of stations was set up to provide expanded access points to transit facilities. The first year of the program saw a total of 35,000 trips, which accounted for approximately 14 percent of total Capital Bikeshare ridership.

Contact: Lindsay Donnellon | Lindsay.Donnellon@dot.gov | 410–779–7157

Pronto Bike Share (Seattle Area, Washington)

The Pronto Bike Share Program is the regional bike share system serving the Puget Sound area. The program was funded through Washington State DOT and several public and private organizations, and currently features 500 bikes for public use at 50 different stations across the Seattle area. The system logged 11,000 rides totaling over 22,000 miles in its first month of use. This system provides flexible bicycling options to the residents of the Puget Sound area, connecting destinations across the city through the existing network of bicycle facilities. The City of Seattle is also providing funds to ensure that the system is expanded to serve traditionally underserved areas.

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Mount Joy Station Improvements (Mount Joy, Pennsylvania)

The Amtrak station in Mount Joy is served by the Keystone Line that links Pittsburgh to Philadelphia, where other lines provide regional access to other large cities across the east coast. The station is well-used but had somewhat basic amenities. There was an expressed need and desire for station enhancements to be completed as part of a larger revitalization effort in Mount Joy. The resulting project was a collaborative effort between Main Street Mount Joy, PennDOT, and Amtrak that benefited from several years of visioning and development. The redeveloped station features improved access from downtown, including accessibility features and covered rail platforms. Subsequent phases of the project, which are still in development, will continue to enhance the station and improve access to this important regional transit service.

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