TRAILS & BIKEWAYS
INTRODUCTION

BACKGROUND

Access to safe, quality trails and bikeways is a key component of the Parks, Recreation, Open Space, Trails and Streetscape Visioning Master Plan. One of the main visions set forth in the report is the “String of Pearls and Gems” concept which has, at its core, the need for alternative modes of transportation serving bicyclists and pedestrians. This chapter provides recommendations on how to achieve this goal.

McKinney has a long history of proactively planning, designing, and implementing trails and bikeways throughout the community, as evidenced by the numerous high-quality pathways connecting parks, neighborhoods, and civic destinations. As the City continues to grow in the near and long-term future, it is important that the trail and bikeway system continue to serve the needs of the community, while balancing City resources.

EXISTING BIKEWAY AND TRAIL SYSTEM

Known for its quality and integration with neighborhoods, McKinney’s existing bikeway and trail system has expanded as the City has grown and connects neighborhoods with schools, parks, and other civic destinations. As such, the system—which currently includes 58.4 miles of bikeways and trails—is more fully developed in the southwest quadrant of the City. The system primarily consists of 8-foot, 10-foot, and 12-foot wide paved concrete paths along roadways. Paved paths along roadways are referred to as “sidewalks” throughout this plan (this term is used to distinguish this type of path from trails in greenways and natural areas).

One of the highlights of McKinney’s existing system is the Wilson Creek corridor, which includes approximately 5.9 miles of trails that span from Lake Forest Drive, across US-75, to Tennessee Street. These trails connect McKinney Boyd High School, Cockrill Middle School, Bonnie Wenk Park, Al Ruschhaupt Soccer Complex, Towne Lake Park, and McKinney High School. In doing so, numerous neighborhoods are provided access to these destinations and hundreds of acres of wooded open space along Wilson Creek. Once completely developed, the Wilson Creek greenbelt trail system will total 17 miles in length and will continue to serve as the backbone of McKinney’s bikeway system, providing access to neighborhoods, commercial centers, downtown, parks, schools, and surrounding communities.
MEETING NEEDS IN THE FUTURE

According to the Open Houses and surveys performed during the development of this Master Plan, expanding the City’s trail system is a top priority. People strongly desire that trails be developed in or near scenic areas and along greenbelts, with a preference for trails that create large loops within the community. There is also a strong desire to enhance McKinney’s bikeway and trail system to serve as a viable active transportation system. Specifically, people voiced preferences for bikeways and trails that connect neighborhoods, schools, Downtown McKinney, libraries, recreation centers, neighboring cities, and retail centers.

Community preferences specify that priority should be placed on linear trails in scenic locations, such as the Wilson Creek greenbelt and other greenway corridors. These will continue to serve as the “spine” of the bikeway and trail system going forward. Outside of the greenbelts, bikeways that minimize interaction with motor vehicle traffic—such as sidepaths—should be provided to connect neighborhoods and destinations to these areas. It will also be important to seek opportunities for on-street bikeways on low-traffic streets in order to create connections where trails and sidepaths are not feasible. This is a need recognized by 65 percent of the survey respondents, who agree that the City should have on-street bike routes on some roadways.

Continuing to grow McKinney’s bikeway and trail system to meet the community’s needs and preferences today and in the future will require continuing to focus on comfort and safety for a wide array of people. In short, this means emphasizing separation between people biking and motor vehicle traffic to the extent possible. Where traffic must intermingle, special attention must be paid to increasing the safety of road crossings.
WHO ARE WE SERVING?

People vary considerably in terms of physical ability, comfort in sharing the road with cars, endurance, reason for walking or biking, cultural perspective, and age, among other factors. McKinney’s bikeway and trail system needs to serve not just the people that are already out there biking and walking, but also the large portion of our population that would like to bike and walk more, but need more and better bikeways and trails in order to do so comfortably.

THE TYPICAL BICYCLIST DEFINED

Research indicates that people (whether or not they regularly ride a bicycle) fall into one of the four categories shown in Figure 5.0. These categories are based on traffic stress tolerance—or comfort, confidence, and willingness to interact with motor vehicle traffic. The findings are that the majority of people (classified as “interested but concerned”) have little tolerance for interacting with motor vehicle traffic and most are very worried about being struck by a motor vehicle while biking.

Figure 5.0: Categories of People Based on Traffic Stress Tolerance

<table>
<thead>
<tr>
<th>No Way, No How</th>
<th>Interested but Concerned</th>
</tr>
</thead>
<tbody>
<tr>
<td>Don’t ride a bike/ have no plans to start</td>
<td>Only feel safe on sepa-rated trails/paths with few traffic crossings</td>
</tr>
<tr>
<td>31%</td>
<td>56%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Enthused and Confident</th>
<th>Strong and Fear-less</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prefer separated paths, but will ride on roads where space is available and traffic is manageable</td>
<td>Confident and comfortable riding with traffic in most situations</td>
</tr>
<tr>
<td>9%</td>
<td>4%</td>
</tr>
</tbody>
</table>
Separation is achieved by providing different types of bikeway facilities depending on the traffic context (speed and volume of motor vehicle traffic). Many people can feel comfortable bicycling on low speed streets with very little motor vehicle traffic, even without a dedicated bicycle facility. On the other hand, higher speeds and higher volumes of motor vehicle traffic necessitate the provision of bikeway facilities that provide additional separation in order to be comfortable for the majority of the bicycling public. Figure 5.1 illustrates the relationship between bicycle facility types and traffic context. Each of the example images presents a low level of traffic stress for casual bicyclists.

Dedicated, separated infrastructure is key to encouraging more people to bike. But it must connect people to where they want to go. The recommendations of this plan, therefore, focus on providing treatments that reduce interactions between people biking and walking and motor vehicle traffic while also increasing awareness of where these interactions occur. These treatments range from signs and pavement markings that direct people along very low-traffic streets to separated trails in greenways or sidepaths along busier streets.
EXISTING & PROPOSED TRAILS SOUTH
The existing and proposed bikeways and trails from the previous Trails Master Plan and the 2012 On-Street Bicycle Transportation Master Plan were overlaid into a single network and analyzed to assess the connectivity of the system today and in the future. The analysis focused on pinpointing gaps in the existing and planned bikeway and trail system, as well as the identification of neighborhoods and other areas in the City that are not currently connected to the system. The overall result of the analysis is that McKinney’s bikeway and trail system generally provides a high level of connectivity across the city. However, there are several key areas where gaps in the system or physical barriers limit connectivity, as described below.

**MINOR GAPS AND BARRIERS**

**Southwest Quadrant Neighborhood Access**

Numerous pockets of smaller neighborhoods in McKinney’s southwest quadrant are not well-connected to the trail and bikeway system. Due to the built-out nature of these areas and right-of-way limitations, there are very few opportunities to expand trails or sidepaths into these areas. Addressing these gaps will require the use of on-street bikeways.

**Neighborhoods North of US Highway 380**

The area north of US Highway 380 is currently under development with numerous residential subdivisions and commercial developments either under construction, plating, or subdivision. Today, the development pattern in this area is understandably fragmented as a result. Bikeways and trails will be constructed to connect these areas as development continues to occur. However, adjustments to the alignments of some bikeways and trails proposed in previous plans will help ensure desired outcomes.

**Far North Trails and Bikeways**

The One McKinney 2040 Comprehensive Plan update that is underway highlights opportunities and needs for increasing the connectivity of major bikeway corridors in the far north portions of McKinney. While development in this part of the City is several years in the future, it is important to identify any missing corridors today so that steps can be taken to ensure the system adequately connects to destinations and neighborhoods in the future. Such corridors include Hardin Blvd, Laud Howell Parkway, and the Collin County Outer Loop.

**Other Gaps in the System**

Several smaller gaps in the system exist today. Trails and sidepaths are already planned for many of these gaps and will continue to be prioritized for implementation in the future.
MAJOR GAPS AND BARRIERS

US Highway 75
Freeways, tollways, and other major highways often pose barriers to bikeways and trails. While the more recently-constructed highways in McKinney (such as the Sam Rayburn Tollway) were designed and constructed with adequate clearance for trail crossings in mind, US Highway 75 was not. While the crossing at Wilson Creek has recently been reconstructed and enhanced, crossing this highway is otherwise challenging. Improvements at Eldorado Drive, Comegys Creek, White Avenue, and Laud Howell Parkway would all improve mobility and access for bicycling and walking within this corridor.

Downtown McKinney
Access to Downtown from other parts of McKinney is challenging, in part due to the barrier posed by US Highway 75. Currently, there are not any dedicated bikeways or trails providing access into Downtown, although there are numerous low-traffic city streets that more confident bicyclists can utilize. Considering the reinvestment in Downtown, it is important to link this area with the Greenbelt Spine Trail network and other elements of the bikeway and trail system.

North of Downtown
The area north of Downtown (bordered by US Highway 75, US Highway 380, State Highway 5, and Wilmeth Road) contains major retail centers, several commercial/industrial businesses, and the North Texas Job Corps. This area is largely disconnected from the trail and bikeway system even though it is a significant destination and a major employment center.

THE FUTURE BIKEWAY AND TRAIL SYSTEM
Moving forward, McKinney’s bikeway and trail system will continue to provide comfortable, easy-to-use facilities that serve a wide range of people. This system will minimize conflicts with motor vehicle traffic while providing access to the places people want to go. As the system continues to grow, it will provide increased access to civic destinations, parks, schools, Downtown McKinney, and places where people work and shop.

Building upon past planning efforts, public input, and new opportunities, McKinney’s bikeway and trail system has been expanded for the future, as illustrated on the maps on pages 152-155. Today, the majority of households in McKinney are within a half mile of the trail and bikeway system. Expansions to the system will increase connections to neighborhoods to ensure more people are able to access these opportunities for walking and biking.
ELEMENTS OF THE BIKEWAY AND TRAIL SYSTEM

The future bikeway and trail system described on the previous pages is composed of interconnected networks of trails, sidepaths, and low-stress on-street bikeways. These networks exist in a hierarchy, with some focusing on higher levels of use and longer-distance travel and others focusing on local access and connectivity. These networks rely upon each other in order to constitute a complete system. The hierarchy outlined below describes the concept and vision for each.

1 GREENBELT SPINE TRAILS

Typical Width: 12’

Greenbelt Spine Trails are the heart of McKinney’s bikeway and trail system and reinforce the “String of Pearls” concept by connecting parks together found along the creek corridors. This network follows McKinney’s scenic creeks, the Trinity River, and other greenbelts in the City, providing longer-distance linear connections within a serene setting. Greenbelt Spine Trails are the widest trails in McKinney with the highest level of amenities—in a sense, they serve as the “expressways” of the bikeway and trail system as well as linear parks. When biking or walking along a Greenbelt Spine Trail, people experience little to no interaction with motor vehicle traffic. Where trails cross streets, crossings are either fully grade-separated or have signalized traffic control to increase safety and visibility.

2 OTHER SPINE TRAILS

Typical Width: 12’; Enhanced Bike Boulevards Vary

To extend the high level of service provided by Greenbelt Spine Trails in areas without greenbelts, other Spine Trails along streets extend into the surrounding community, creating linear connections and large loop networks. The majority of these trails provide physical separation from the roadway and minimize interactions with motor vehicle traffic at major intersections either by providing grade-separated crossings or signalized traffic control. Driveway crossings are limited and high-visibility crosswalks are provided at minor intersections.

In Downtown McKinney, the Spine Trails are provided as “enhanced bicycle boulevards” along low-traffic streets. These streets include traffic calming, pavement markings, and warning/regulatory signs that increase the awareness of people biking in the roadway. Enhanced bicycle boulevards are distinct from “bicycle boulevards” in this way. Bicycle boulevards have recently been implemented throughout the city and consist of signage along neighborhood streets to promote cycling as shown below.
3 ARTERIAL TRAILS

Typical Width: 10’-12’

Arterial Trails are similar to Spine Trails in that they follow streets and are separated from motor vehicle traffic. The primary difference is that Arterial Trails are typically not as wide and have a slightly lower level of amenities. Arterial Trails are also less likely to have fully grade-separated crossings of streets; however, grade-separated crossings are desirable when crossing principal arterials and state highways.

4 NEIGHBORHOOD CONNECTOR BIKEWAYS

Typical Width: Variable

Right-of-way, physical, and fiscal constraints mean it is not possible to directly connect every household and destination to a trail or sidepath. Neighborhood Connector Bikeways fill the gap by connecting neighborhoods to the Greenbelt Spine Trail, Spine Bikeway, and Arterial Bikeway networks in locations where trails and sidepaths are not feasible. Neighborhood Connector Bikeways primarily follow lower-traffic collector streets and neighborhood streets and include bike lanes, shared-lane markings, wayfinding signs, and selective traffic calming.

SUPPLEMENTARY ON-STREET BIKEWAYS

The bikeway and trail system described in the previous section is designed for the entire population, including seniors, families, and casual bicyclists. However, there is a significant portion of the community that has a higher level of confidence interacting with motor vehicle traffic. People in this group may need or desire to bike on the roadway on some of McKinney’s busier streets, even if a sidepath is present. This may be because they need to access destinations not accessible from the sidepath or because they are biking at a speed much higher than that of other sidepath users.

For this group, supplementary on-street bikeways are provided. Treatments within this category primarily include the placement of Bikes May Use Full Lane signs and other regulatory, warning, and wayfinding signage to increase awareness of the presence of people biking and their rights and responsibilities. Streets constructed or reconstructed in the future may also include bike lanes, shoulders, or wide outside lanes suitable for use by more confident bicyclists.
BIKEWAY & TRAIL FACILITY RECOMMENDATIONS

FACILITY TYPES

A variety of bikeway types are available to meet the needs of a wide variety of bicyclists. These range from simple bike route signs on low-traffic streets to fully-separated sidepaths and trails. The determination of appropriate bikeway types is based on traffic context and the complexity of the roadway environment. For example, simple on-street bikeway treatments are appropriate on some lower-traffic neighborhood streets while fully-separated sidepaths are more appropriate along busier streets. Over the following pages, the basic bikeway types recommended by this Master Plan are described and classified either as “separated” or “on-street.” Variations of bikeway facilities are common (such as adding a buffer to a bike lane) but are not specified by this Master Plan.

SEPARATED BIKEWAYS

Trails

A paved trail (also known as a shared use path) is typically located in an independent right-of-way such as a creek or river corridor, wooded greenway, along a utility corridor, or an abandoned railroad corridor. Trail width is determined by context and amount of use expected. The existing standard minimum width for paved trails is 10 feet. Trails that are part of the Spine system, however, should be 12 feet wide or more (10 feet is acceptable in constrained locations). Short loop trails in parks or those that make minor connections to other bikeways may be as narrow as 8 feet.

Sidepaths

A sidepath is a shared-use paved path or trail located along a roadway. Sidepaths may be desirable along high volume or high speed roadways, where dedicated on-street bikeways are impractical due to physical constraints, traffic volumes and speeds, and context. However, sidepaths may present increased conflicts between path users and motor vehicles at intersections and driveway crossings. Conflicts can be reduced by minimizing the number of driveway and street crossings present along a path and otherwise providing grade-separated or high-visibility crossing treatments. Common engineering standards state that sidepaths should not be used to preclude on-street bicycle facilities, but rather to supplement a network of on-street bikeways. In other words, in some situations it may be appropriate to provide an on-street bikeway in addition to a sidepath along the same roadway. The standard minimum width for sidepaths is 8 feet. Sidepaths that are part of the Spine system should be 12 feet wide or more (10 feet is acceptable in constrained locations). Short sidepaths that make minor connections to other bikeways may be as narrow as 8 feet.
ON-STREET BIKEWAYS

Enhanced Bicycle Boulevards

An enhanced bicycle boulevard is a street with low motorized traffic volumes and speeds designated to provide priority to bicyclists and local motor vehicle traffic. Enhanced bicycle boulevards typically have signs, shared lane markings (also known as “sharrows”), and traffic calming elements. The specific traffic calming treatments to be included along a bicycle boulevard varies based on context. Common traffic calming treatments include speed humps, traffic circles, chicanes, or curb extensions. In addition, it is often desirable to divert motor vehicle traffic by placing medians in intersections to allow bicycle traffic to process while requiring motor vehicle traffic to turn.

Enhanced bicycle boulevards are an important component of this Master Plan and serve as the primary facility type to connect McKinney’s trails and sidepaths to Downtown McKinney. In addition to lowering traffic stress for bicyclists, traffic calming can also improve conditions for pedestrians (such as by adding curb extensions to shorten crosswalks). Enhanced bicycle boulevards benefit neighborhoods by reducing cut-through traffic and speeding without limiting access by residents.

Bike Lanes (and Buffered Bike Lanes)

A bike lane designates space for the preferential or exclusive use of bicyclists. Standard bike lanes are typically 5 feet wide but wider variations can be advantageous, especially where traffic volumes are higher than 8,000 Average Daily Traffic (ADT) or speeds are greater than 30 miles per hour. A common variation is the buffered bike lane, which places an 18-inch to 3-foot wide painted buffer between the bike lane and adjacent travel lane. This is especially helpful on higher-traffic or higher-speed roadways in order to increase horizontal separation between bicycle and motor vehicle traffic. When high-turnover on-street parking is present, it is common to place a painted buffer between the bike lane and the parking lane to minimize the threat of “dooring.” The bike lanes recommended as part of the Collector Bikeways network are of standard width and without buffers.

Shared Roadways

Shared roadways are routes along low-traffic neighborhood streets and are designated by signs and shared lane markings (sharrows) to increase awareness and aid in wayfinding. Their purpose is to provide circulation within neighborhoods and connect people to sidepaths and trails outside of their neighborhoods. Shared roadways may resemble enhanced bicycle boulevards in some ways, although shared roadways typically do not have the same level of traffic calming and traffic diversion as an enhanced bicycle boulevard.
Other On-Street Bikeway Treatments

Two supplementary treatments are commonly applied to on-street bikeways to increase awareness of the presence of bicyclists, aid in wayfinding, and reinforce existing state laws. These treatments are typically applied on bicycle boulevards and shared roadways. They can also be applied on streets without dedicated bikeways; however, when applied on higher traffic (over 8,000 ADT and/or 30 miles per hour) streets, these treatments are not a sufficient substitution for a dedicated bikeway or sidepath.

- **Shared Lane Markings (SLM)** – Also known as “sharrows,” SLMs are not a standalone facility type. Rather, they are a treatment to be applied on bicycle boulevards and signed roadways to increase awareness of bicyclist presence. The use of SLMs on busier roadways should be avoided unless used as a supplementary (e.g., in addition to a sidepath) or interim treatment (until a dedicated bikeway can be established).

- **Bikes May Use Full Lane Signs** – Bicyclists are allowed to use the full lane when the lane is less than 14 feet in width or when conditions in the roadway make it unsafe to ride next to the edge of the roadway. This is regardless of whether Bikes May Use Full Lane signs are present. The placement of these signs along roadways is advisable because the signs reinforce and increase awareness of the law. Where implemented in the city these routes are referred to as “Signed Roadways.”

Shared Lane Markings and Bikes May Use Full Lane signs are typically installed concurrently, as shown in the central page image.

EXISTING FACILITY INVENTORY

The foundation of McKinney’s bikeway and trail system is its extensive network of trails and sidepaths that extend across the developed portions of the City while making connections into neighboring communities and the broader region. The centerpiece of the existing system is the existing Greenbelt Spine Trail that extends 5.9 miles along Wilson Creek. However, the majority of miles of existing bikeways in McKinney are in the form of sidepaths along streets, as illustrated in Table 5.0.

Table 5.0: Existing Network Inventory

<table>
<thead>
<tr>
<th>Hierarchy</th>
<th>Separated</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Trails</td>
<td>Sidepaths</td>
</tr>
<tr>
<td>Greenbelt Spine Trails</td>
<td>5.9 miles</td>
<td>-</td>
</tr>
<tr>
<td>Other Spine Trails</td>
<td>3.3 miles</td>
<td>15.6 miles</td>
</tr>
<tr>
<td>Arterial Trails</td>
<td>5.5 miles</td>
<td>21.1 miles</td>
</tr>
<tr>
<td>Neighborhood Connector Bikeways</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Supplementary On-Street Bikeways</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Other**</td>
<td>6.5 miles</td>
<td>0.5 miles</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td>21.2 miles</td>
<td>37.2 miles</td>
</tr>
</tbody>
</table>

*Streets with Bikes May Use Full Lane signs.

**Not including approximately 0.8 miles of bikeways for which further study is needed in order to determine a suitable facility type.
FACILITY RECOMMENDATIONS

The goal of the trails and bikeways plan for McKinney is to provide facilities for all comfort levels, but with a specific focus on serving the majority of the population that needs an added level of safety and separation from vehicles before they are willing to bike to certain destinations. Due to this focus, some recommendations include lower-stress facilities on streets that already have bicycle infrastructure because the existing facilities (typically Bikes May Use Full Lane signs) do not ensure an appropriate level of traffic stress. The types of bikeways and trails recommended vary based on factors such as a roadway’s traffic context, planned upcoming roadway projects, existing conditions, and facilities needed to improve a street’s stress level. Recommendations were developed using the following methodology:

- **Greenbelt Spine Trails** – All facilities developed as part of this network will be trails with widths of 12 feet or more.

- **Other Spine Trails** – Most facilities developed as part of this network will be trails or with widths of 12 feet (or 10 feet in constrained locations). The segments of this network that connect to Downtown will be developed as enhanced bicycle boulevards.

- **Arterial Trails** – Most facilities developed as part of this network will be trails with widths of 10 to 12 feet (or 8 feet in constrained locations). The segments of this network that connect to Downtown will be developed as enhanced bicycle boulevards.

- **Neighborhood Connector Bikeways** – Bikeways developed as part of this network will either be shared roadways or bike lanes. Bike lanes are primarily recommended along streets with adequate existing pavement width and with low demand for on-street parking.

### Table 5.1: Proposed Facility Summary

<table>
<thead>
<tr>
<th>Hierarchy</th>
<th>Separated</th>
<th>On-Street</th>
<th>Totals</th>
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<tr>
<td></td>
<td>Trails</td>
<td>Side-paths</td>
<td>Enhanced Bicycle Boulevards</td>
</tr>
<tr>
<td>Greenbelt Spine Trails</td>
<td>42.8 miles</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Other Spine Trails</td>
<td>20.0 miles</td>
<td>41.8 miles</td>
<td>3.7 miles</td>
</tr>
<tr>
<td>Arterial Trails</td>
<td>25.6 miles</td>
<td>35.9 miles</td>
<td>1.8 miles</td>
</tr>
<tr>
<td>Neighborhood Connector Bikeways</td>
<td>-</td>
<td>-</td>
<td>12.6 miles</td>
</tr>
</tbody>
</table>

*Streets with Bikes May Use Full Lane signs.

**Not including approximately 0.8 miles of bikeways for which further study is needed in order to determine a suitable facility type.
IMPLEMENTATION

PLANNING AND DESIGN POLICIES

The locations of future bikeways and trails were identified in the previous sections. In order to supplement the planned alignments and selected facility types, several planning and design policies should be considered during the implementation of individual projects.

INTEGRATION OF FORM AND FUNCTION

It is desirable to design sidepaths and streetscapes to be aesthetically pleasing as well as functional. To ensure the functionality of sidepaths, several factors should be considered:

- **Design Speed** – The AASHTO Guide specifies a minimum design speed of 18 mph, which may be lower “in rare circumstances.” Design speed determines sight distances and horizontal alignments. Specifically, curve radii should be at least 60 feet in diameter if the design speed is 18 mph. In locations where physical constraints limit the ability to meet the minimum design speed, warning signage must be used, just like is required for roadway design.

- **Width** – Sidepaths should be a minimum of 12 feet wide, which is the minimum width needed for two bicyclists to safely pass each other. In addition, other path users require wide operating spaces (up to 5 feet for inline skaters), so the 12-foot minimum is justifiable for other users as well. The AASHTO Guide states that 8 to 10-foot wide paths “may be used for a short distance due to a physical constraint such as an environmental feature, bridge abutment, utility structure, fence, and such.”

- **Signage** – Signs are crucial elements for bicyclists in terms of minimizing safety hazards and indicating who has the right-of-way at intersections. Signage for paths along roadways should follow the same regulatory controls as the parallel roadway. For example, a stop sign should not be placed along the path at an intersection or driveway unless the parallel roadway also has a stop sign at the same location. Instead, the perpendicular street should include a stop bar behind the path crossing and warning signage for both the motorists and the path users. At such a location, the motorist should always yield to the path user. Warning signs for motorists turning across sidepaths may be appropriate at high traffic areas (see Figure 5.2).

AT-GRADE CROSSING MINIMIZATION

- Sidepath crossings of driveways and streets present many challenges, including:
  - Path crossings are often blocked by motor vehicles waiting to turn (motorists typically ignore stop bars).
  - The need for additional traffic control signage, especially at driveways and intersections.

Figure 5.2: Visibility limitations of paths along roadways.
At-grade crossings:

- There is a lack of clarity regarding who has the right-of-way where paths cross minor streets.
- There is an increased risk of crashes due to the limited visibility of drivers (see Figure 5.2).

In light of these challenges, sidepaths are most appropriate where driveways and intersections are limited. There are three primary strategies used to achieve the outcome of minimizing at-grade crossings:

- Place sidepaths along developed roadways with few driveways and street crossings.
- Apply Access Management principles such as driveway consolidation along sidepath corridors to the greatest extent possible.
- Prioritize the construction of grade-separated crossings for sidepaths and trails.

**AT-GRADE CROSSING DESIGN**

Where at-grade crossings are necessary, they should be designed to increase visibility, clarity, compliance, and safety. There are two primary strategies to achieve this outcome:

**High Visibility Crossings**

Pavement markings, signage, and traffic signals can all be used to increase the visibility of sidepath crossings of driveways and intersections, thereby reducing conflicts between people bicycling and people driving. In addition to standard warning signs, a variety of pavement markings, including green pavement, shared lane markings, bike boxes, dashed lines, and solid lines, can be used to enhance visibility, guide bicyclists, and warn of potential conflicts. The treatment will vary depending on the context of each intersection and should be chosen based on engineering judgment.

**Adjust Intersection Approaches**

Another way to mitigate conflicts is to adjust the location of the sidepath as it approaches the intersection. Best practices support taking one of two approaches:

1. Move crossings closer to the curb line of the parallel road (and reduce corner radii significantly). The theory behind this approach is to allow people driving and people bicycling to be able to recognize each other as intersecting traffic. However, this approach may result in motor vehicles blocking the crosswalk and places bicyclists in a location that is not highly visible for turning motorists. Mitigating high-visibility signage and pavement markings should be combined with this approach. The only national guidance that is relevant in this case is the NACTO Guide’s section on two-way separated bike lanes (cycle tracks), which recommends very small corner radii (e.g., 5-10-foot actual radius) and high-visibility pavement markings (such as solid green paint bordered by white dashed stripes).

2. Moving crossings farther away from the curb line so that the crossing functions as a second intersection. Moving the path crossing farther from the curb line of the parallel road has the advantages of increasing the visibility of bicyclists pedestrians in the crossing (since the crossing is now directly in front of the motorist once he has turned, instead of in his peripheral view) and providing additional queueing space without blocking the crossing or the parallel street. The primary disadvantage is that offset crossings require more right-of-way and additional traffic control (warning signs for motorists). The most applicable design guidance for suburban sidepaths is the Dutch CROW Manual. Its guidelines recommend 16-23-feet of setback from the curb line of the parallel road, with the path offset bend beginning at least 115-feet from the intersection with curve radii at least 39-feet (which serves to slow bicyclists). These recommendations are for intersections between arterial roads and collector/local roads. For intersections between two arterial roads, the crossings should be closer to the intersection and bicycle-specific signal heads should be used.

**Design Standards and Guidelines**

The NCTCOG minimum standards or AASHTO Guide for the Development of Bicycle Facilities, 4th Edition, 2012 (AASHTO Guide) should be used in the design of all on-street bikeways until the new AASHTO Guide is released in 2017 or 2018. While it is recommended that the AASHTO Guide serve as a set of minimum standards, the NACTO Urban Bikeway Design Guide (NACTO Guide) should also be consulted, especially in challenging locations and when designing sidepath crossings. The NACTO Guide is used by many communities to design innovative bicycle infrastructure that surpasses the AASHTO minimum standards.

Since McKinney's trail and bikeway system heavily relies on sidepaths, it is important that the City design these facilities according to the best design guidance available, such as the NACTO Guide section on two-way cycle tracks and the CROW Design Manual for Bicycle Traffic (CROW Manual). The CROW Manual is the primary bicycle infrastructure design guide for the Netherlands (a country well-known for its extensive system of sidepaths) and while it is not directly applicable to American cities, it contains many relevant concepts for path design. The CROW Manual is especially informative for designing path crossings at intersections and driveways.
IMPLEMENTATION STRATEGIES

The following section outlines recommended implementation strategies. These reflect the most common and practical strategies used by agencies across the country that are most appropriate in McKinney. However, the implementation strategies described herein are not exhaustive. Conditions may change, new opportunities may arise, and unique approaches may be developed that fall outside of these strategies. New strategies should be considered over time to implement the countywide bikeway network.

COORDINATION WITH OTHER CAPITAL PROJECTS

The most cost-effective and coordinated way to provide bicycle and pedestrian infrastructure (bike lanes, sidepaths, sidewalks, curb extensions, etc.) is to do so as part of a larger roadway reconstruction, rehabilitation, or repaving project. When constructed in this manner, the bikeway project is considered “incidental” because it is incorporated into the overall phasing of a larger road project. Incidental projects are often driven by opportunity, such as when a roadway is resurfaced or reconstructed. When such opportunities arise, bikeways are typically funded using the same source of funding as the roadway project and can often be incorporated at a relatively modest cost. For example, providing bicycle accommodations as part of a larger roadway project often means simply adding a few additional feet of pavement. Depending on right-of-way constraints and the selected bikeway type, the impact on the project cost can be cost-effective.

The City of McKinney can further enhance this strategy by adopting a Complete Streets policy and coordinating with new construction, reconstruction, resurfacing, restoration, and rehabilitation projects on all streets in the City.

ACQUIRE RIGHT-OF-WAY EARLY ON

In some cases, a bikeway might not be included as part of a roadway project due to lack of near-term feasibility, funding, or demand. In these situations, the road project should not preclude future bikeway additions. This applies to new construction, reconstruction, right-of-way acquisition, bridge replacement, and other significant undertakings along future bikeway corridors. Examples are listed below:

• If a new roadway is being constructed, the City should acquire adequate right-of-way to provide a sidepath alongside the roadway in the future.

• When a bridge is replaced, it should be adequately designed to accommodate a bikeway now or in the future.

• When above- and below-ground utilities are installed or replaced along a roadway, place them so that they do not obstruct the future bikeway.

• Where a grade-separated crossing may be needed in the future, acquire adequate right-of-way for ramps, approaches, structures, and related appurtenances.
EMPLOY INTERIM SOLUTIONS AS A BRIDGE TO FULL-BUILD IMPLEMENTATION

Along many segments of the future citywide bikeway network, it may be advantageous to identify and develop interim solutions until the full bikeway can be developed as envisioned. Interim solutions offer a near-term mobility option that did not previously exist and are not seen as an alternative to a more comprehensive solution. One example of how an interim solution can be implemented is to provide an on-street bikeway accommodation (e.g., a bike lane) that may adequately serve more confident bicyclists until a lower-stress bikeway can be funded and constructed (e.g., a sidepath). Another example is to provide a low-stress on-street bikeway along a parallel route that might not be very direct or might not be highly-accessible until a bikeway can be established along the preferred alignment.

CONTINUED INTERJURISDICTIONAL COORDINATION

The development of this Plan has been one of several interjurisdictional trail planning efforts initiated in Collin County over the past several years. One of the many benefits of interjurisdictional and interagency coordination is that it broadens funding opportunities and increases communication for individual projects where shared objectives may be achieved. The City of McKinney should continue to coordinate with neighboring communities, Collin County, and other agencies to update this Plan in the future and continue active discussions regarding other bikeway issues.

CONTINUED DEVELOPER PARTICIPATION

New land development results in additional population placing increased demand on the City’s infrastructure, including streets, utilities, parks, and the bikeway and trail system. As such, the City of McKinney assesses impact fees or requires developers to construct public improvements to be dedicated to the City upon construction. Specifically, Sec. 142-105. – Improvements of the City of McKinney’s Subdivision Regulations requires that concrete trails that fall within or border the subdivision, as referenced in the City’s trails plan, shall be constructed by developers and accepted by the city engineer prior to plat filing.

This approach has been highly effective in ensuring that the City’s bikeway and trail system grows with the community. As such, it is core to the City’s implementation strategy and will be continued into the future. Consideration should be given to expanding this requirement to include the provision of on-street bikeways as part of the Neighborhood Connector Bikeways network, especially where the provision of sidepaths is not feasible.
FUNDING

PLANNING LEVEL COST ESTIMATES

While every bikeway and trail project is unique, it is possible to estimate an approximate cost per mile based on past projects in the City adjusted to inflation. In recent years, many miles of trails and sidepaths have been constructed in McKinney and numerous roadway projects have been performed, all of which inform the cost estimates for this Plan. These cost estimates include the elements that are typically part of every bikeway and trail project (e.g., pavement markings, moderate grading, and signs), but are not all-encompassing for every project. For example, these estimates do not include costs for elements such as trailheads, fence removal and replacement, wetland mitigation, etc.

The cost estimates are presented as a range and a prevailing (most common) typical cost is also provided (see Table 5.2). Considering a range of costs is important because context dictates the complexity of a bikeway and therefore the cost of bikeway improvements in many cases. For example, paths built on abandoned railroad grades are less expensive per mile than those built on virgin land, in densely developed areas, or in locations requiring significant grading.

Table 5.2: Planning-Level Cost Estimates

<table>
<thead>
<tr>
<th>Facility/Treatment Type</th>
<th>Typical Cost Range</th>
<th>Prevailing Typical Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Trails</td>
<td>$800,000 per mile</td>
<td>$1.5 million per mile</td>
</tr>
<tr>
<td>A concrete trail in an independent alignment like a greenbelt or former railroad.</td>
<td>Example: An 8-foot wide connector trail linking a neighborhood to a Greenbelt Spine Trail.</td>
<td>Example: A 12-foot wide trail along a wooded greenbelt with undulating topography and numerous drainage crossings. May include boardwalk sections and small bridges.</td>
</tr>
<tr>
<td>Sidepaths</td>
<td>$450,000 per mile</td>
<td>$1.25 million per mile</td>
</tr>
<tr>
<td>A concrete path along a roadway.</td>
<td>Example: An 8-foot wide connector sidepath along a roadway as part of a larger reconstruction project with existing cleared and graded right-of-way.</td>
<td>Example: A 12-foot wide sidepath with multiple grade-separated roadway crossings and built in uncleared right-of-way requiring grading.</td>
</tr>
<tr>
<td>Enhanced Bicycle Boulevards</td>
<td>$100,000 per mile</td>
<td>$500,000 per mile</td>
</tr>
<tr>
<td>Streets with various combinations of traffic calming, traffic diversion, high-visibility pavement markings and enhanced signage (depending on signage).</td>
<td>Example: Add bicycle boulevard signs, shared lane markings, and minor traffic calming such as rubberized speed cushions.</td>
<td>Example: Reconfigure or add traffic signals at major intersections and add significant traffic calming features, such as curb extensions, mini traffic circles, traffic diverters, and raised crosswalks.</td>
</tr>
<tr>
<td>Bike Lanes</td>
<td>$40,000 per mile</td>
<td>$650,000 per mile</td>
</tr>
<tr>
<td>Includes variations of bike lanes, wide bike lanes, and buffered bike lanes. Significant savings can be realized by constructing as part of a larger roadway project.</td>
<td>Example: Add bike lanes as part of a resurfacing project requiring no additional pavement, but including additional pavement markings and signs.</td>
<td>Example: Widen a roadway by 14 feet independent of a larger roadway project expressly to add buffered bike lanes.</td>
</tr>
<tr>
<td>Shared Roadways</td>
<td>$10,000 per mile</td>
<td>$50,000 per mile</td>
</tr>
<tr>
<td>Low-cost, strategically-placed pavement markings (e.g., shared lane markings) and signage along bike routes.</td>
<td>Example: Add Bikes May Use Full Lane signs or simple wayfinding signs to an existing street.</td>
<td>Example: Restripe a roadway to provide a wide outside shared lane with shared lane markings as a stand-alone project.</td>
</tr>
</tbody>
</table>
FUNDING SOURCES

Determining how to fund various bikeway and trail improvements is a key strategic issue that communities face when implementing plans. While there are many funding options available, the most consistent and reliable source of funding for bikeways and trails in McKinney is the City’s own funding, as well as continuing to require new development to fund and construct bikeways and trails.

Furthermore, each federal and state funding source may have limitations making it more or less appropriate for certain types of projects. Some funding sources are targeted to infrastructure while others target education and encouragement efforts. Some sources are not directly bicycle or pedestrian related but can be applied to bikeway and pedestrian projects that may have a nexus with another public priority such as historic preservation or public health. Some sources may support grants of hundreds of thousands or millions of dollars; others may be targeted to smaller amounts and require citizen volunteers or community involvement, as a part of the required local match.

Federal Funding Administered by State Agencies

On December 4, 2015, President Obama signed the Fixing America’s Surface Transportation (FAST) Act into law. The primary Federal Transportation funding program for bicycling projects, known as the Transportation Alternatives Program (TAP) under the previous transportation act, MAP-21, was replaced with a set-aside of Surface Transportation Block Grant (STBG) Program funding for transportation alternatives (TA). These set-aside funds include all projects and activities that were previously eligible under TAP, encompassing a variety of smaller-scale transportation projects such as pedestrian and bicycle facilities, recreational trails, safe routes to school projects, community improvement—such as historic preservation and vegetation management—and environmental mitigation related to stormwater and habitat connectivity. Annual funding levels under the new ‘Transportation Alternatives Set-Aside’, or ‘TA Set-Aside’, are estimated to increase modestly over the life of the Act, from FY 2016 to FY 2020, but are subject to the annual obligation limitations imposed on the Federal-aid Highway Program. Funds are apportioned to States based on each State’s proportional share of FY 2009 Transportation Enhancement funding. For most projects under the TA Set-Aside the Federal share is generally 80 percent Federal and 20 percent State or local match; with some exceptions, predominantly safety improvements or projects on tribal or national park lands where 100 percent federal funding can be available.
Other programs under the new FAST Act have remained largely unchanged, although names of programs have seen some changes. The long-standing Surface Transportation Program (STP) has been converted into the Surface Transportation Block Grant Program (STBG), recognizing that this program has the most flexible eligibilities among all Federal-aid highway programs and aligning the program’s name with how the FHWA has historically administered it, and with the funding’s intention to best address State and local transportation needs. The TA Set-Aside and other federal funding sources that are pertinent to the City of McKinney are summarized below.

- The STBG-Transportation Alternatives Set-Aside (STBG-TA) program will provide McKinney’s best opportunity for federal funding of bicycle and pedestrian projects. Projects that exceed $300,000 are the best fit for this program since a significant amount of administrative work is involved. As indicated above, this is a slightly revamped version of the Transportation Alternatives Program (TAP) under the prior federal transportation act, MAP-21. Prior to MAP-21, under SAFETEA-LU legislation, there were three programs that were subsequently combined under MAP-21 and carried through to the FAST Act as one program. The earlier programs were Transportation Enhancements (TE), Safe Routes to School (SRTS), and Recreational Trails Program (RTP). Projects that were previously eligible under any of these programs, and carried forward as TAP, are now eligible under STBG TA Set-Aside. TxDOT or designated Metropolitan Planning Organizations (MPO) administers this program, including project selection through a competitive process, with the exception of the Recreational Trails Program (RTP) portion, which is administered by TPWD and is discussed below.

- The FAST Act continues the Highway Safety Improvement Program (HSIP) to achieve a significant reduction in traffic fatalities and serious injuries on all public roads, including non-State-owned public roads and roads on tribal lands. The HSIP requires a data-driven, strategic approach to improving highway safety on all public roads that focuses on performance. Seven percent of each State’s annual STBG Program funds is set aside for the Highway Safety Improvement Program and Railway-Highway Crossing Program, which are intended to address bicycle and pedestrian safety at hazardous locations, among other issues.

- Funds from the Congestion Mitigation and Air Quality Improvement Program (CMAQ) may be used to construct bicycle facilities, pedestrian walkways, or nonconstruction projects such as maps, brochures, and public service announcements related to safe bicycle use.

- Funds from the Recreational Trails Program (RTP) may be used for all kinds of trail projects. This is the only federal transportation funding source that can be used for maintenance activities. These funds are administered by the Texas Parks and Wildlife Department (TPWD).

- The Highway Safety Grant Program (Section 402) is administered by TxDOT. Federal 402 funds are used for pedestrian and bicycle public information and education programs. Funds are distributed to states annually from the National Highway Traffic Safety Administration (NHTSA) according to a formula based on population and road mileage. Government agencies or government-sponsored entities are eligible to apply for 402 funds.
• Major bicycle and pedestrian projects could potentially be funded under the highly competitive Transportation Investment Generating Economic Recovery Program (TIGER-Discretionary Grants). The program originated as a part of the American Recovery and Reinvestment Act (ARRA) of 2009 and, with minor modifications, has continued to award grants on a competitive basis for projects that will have a significant impact on the Nation, a metropolitan area, or a region. Funded projects have been multimodal and multijurisdictional projects, which are typically difficult to fund through traditional programs. Awarded projects are those that leverage resources, encourage partnership, catalyze investment and growth, and fill a critical void in the transportation system or provide a substantial mobility benefit to the area. In the most recent cycle TIGER Discretionary Program funding (FY2015), just 39 projects were selected for funding from 627 eligible applications from across the nation. The selection focused on projects that better connect communities to centers of employment, education, and services, especially in economically distressed areas. One recent project was awarded a $10 million grant to develop complete streets and a linear park trail to catalyze redevelopment in the heart of a community by relocating rail serving an industrial park and removing rail from the downtown area. Other projects included the construction of sidewalks as a small component of a much larger project to provide accessible transportation throughout a community. Applications have been accepted for the FY 2016 TIGER Discretionary Grant cycle, however, recipients have not yet been selected. Awards could range from a minimum of $5 million in urbanized areas (>50,000 population in the 2010 Census), or $1 million in rural areas, to a statutory maximum of $100 million. Local share must cover at least 20 percent of funded projects.

Information regarding the eligibility of various activities for these and other federal funding sources can be found at: http://www.fhwa.dot.gov/environment/bicycle_pedestrian/funding/funding_opportunities.cfm

Additionally, Advocacy Advance provides an online Bicycle and Pedestrian Federal Funding Resources List with frequently updated links to each program: http://www.advocacyadvance.org/resources#federal

State Funding Sources

Currently, there are no state programs that fund bicycle projects, however, state agencies (TxDOT and TPWD) administer the federal funding programs discussed above.

Local Funding Sources

As previously discussed, local funds will be the primary source for the implementation of McKinney’s bikeway and trail system. Generally, the majority of the bikeway recommendations that are implemented as stand-alone projects will need to be funded through McKinney’s 4B sales tax or other local sources. This is particularly true of any on-street markings. Projects that have a longer life than street markings (i.e. paths) may be able to be financed through general obligation debt or revenue debt in the same manner that many street or other infrastructure projects are financed.
“BIG thinking precedes GREAT achievement.”

— Wilferd Peterson