CHAPTER 2: BICYCLE AND TRAIL PLANNING

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"She who succeeds in gaining the mastery of the bicycle will gain the mastery of life"
- Susan B Anthony

CHAPTER 2: BICYCLE AND TRAIL PLANNING

Introduction

Over the last 20 years, great strides have been taken in Oklahoma City to improve the bicycle and trail networks, creating momentum that will lead to even greater progress in the future. This chapter discusses the future of bicycle and trail infrastructure in Oklahoma City, and recommends projects needed to make Oklahoma City a world class place to ride a bike on streets and on trails.

The methodology for developing the bicycle and trail plan was to study current conditions and identify opportunities to build a bicycle and trail network that meets the needs and desires of the community. Planners analyzed the existing bicycle network to determine where people currently ride and determined through technical analysis, steering committee input, and public surveys what portions of the network need improvement. This plan proposes bicycling opportunities for cyclists of all skill levels.

The plan proposes expansion of the existing bicycle network and improvements to current facilities, resulting in more than 100 new or upgraded facilities totaling greater than 300 miles of on- and off-street bicycle facilities. Proposed improvements meet the following goals:

- Connect existing bicycle facilities: Tie existing facilities and close gaps between them.
- Connect people to destinations: Connect residential, shopping, and recreational areas to trails and on-street facilities.
- Create safe cycling experiences: Design facilites with safety as a main priority.
- Create barrier crossings: Cross natural and man-made barriers.

WHY RIDE A BIKE?

People choose to ride a bike when it is faster and more convenient than walking, riding the bus, or driving a car. Additionally, people choose to ride a bike for recreation or exercise. The distance people cycle is dependent on their confidence and experience. Many people will choose to cycle to nearby destinations, such as a school, local park, corner shop, or friend's house. This is especially true when they can get there safely and conveniently. If it is an easy ride, people are more comfortable riding further distances for destinations such as high schools or colleges, shopping districts, large parks, sports facilities, libraries, and for entertainment such as movies, theaters, restaurants, and bars. Additionally, commuting longer distances to work is attainable when convenient and comfortable facilities are present. One of this plan's goals is to make it possible for Oklahoma City residents to choose to cycle to these destinations.

Figure 2.1 displays the relationship between destinations and cycling distances.

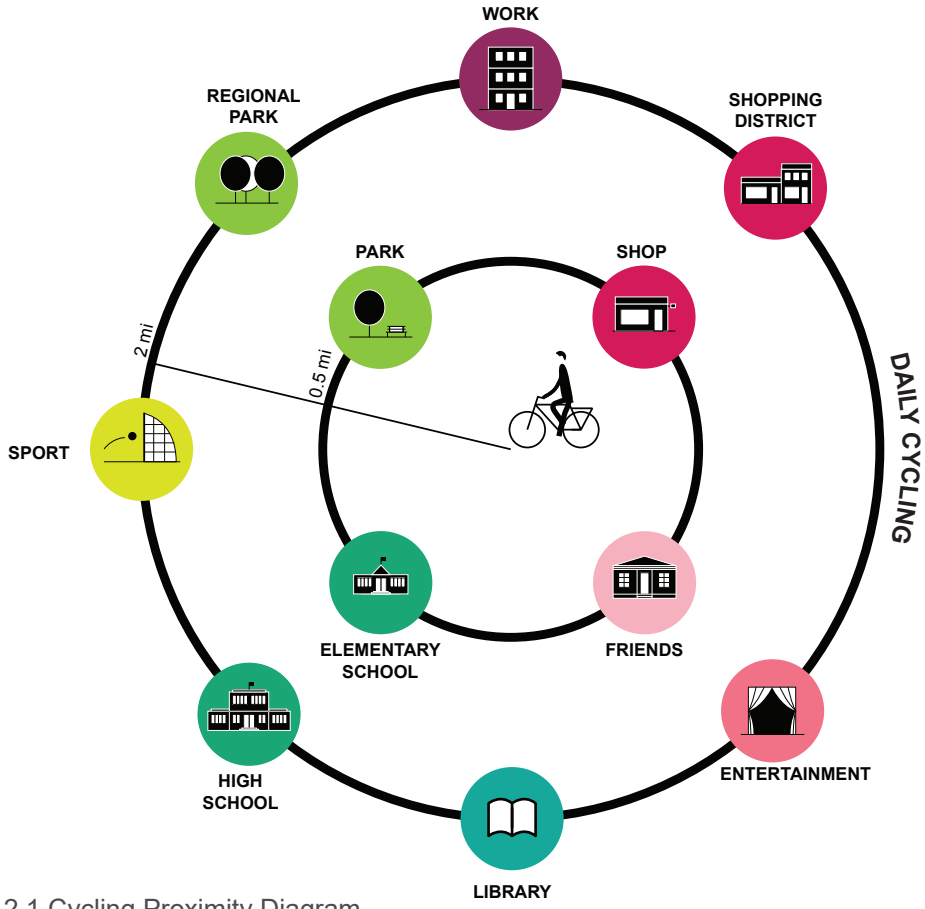


Figure 2.1 Cycling Proximity Diagram

Existing Bicycle and Trail Facilities

Existing bicycle infrastructure within Oklahoma City includes a combination of on-street and off-street facilities. Existing on-street facilities consist of designated bicycle routes and striped bicycle lanes. Bicycle routes typically include signage and sharrow symbols, indicating that cyclists share the travel lane with automobiles. Bicycle lanes provide a dedicated and delineated space for cyclists to ride alongside of automobiles. Existing off-street bicycle facilities include multi-use trails. Map 2.1 shows the locations of these facilities.

Oklahoma City's bicycle infrastructure has been constructed using a variety of funds. These include federal funds, GO Bond funds, and MAPS sales tax funding.

ASSETS AND CHALLENGES

Oklahoma City has many opportunities to improve cycling in the community, as well as several challenges. These assets and challenges are outlined below.

Assets

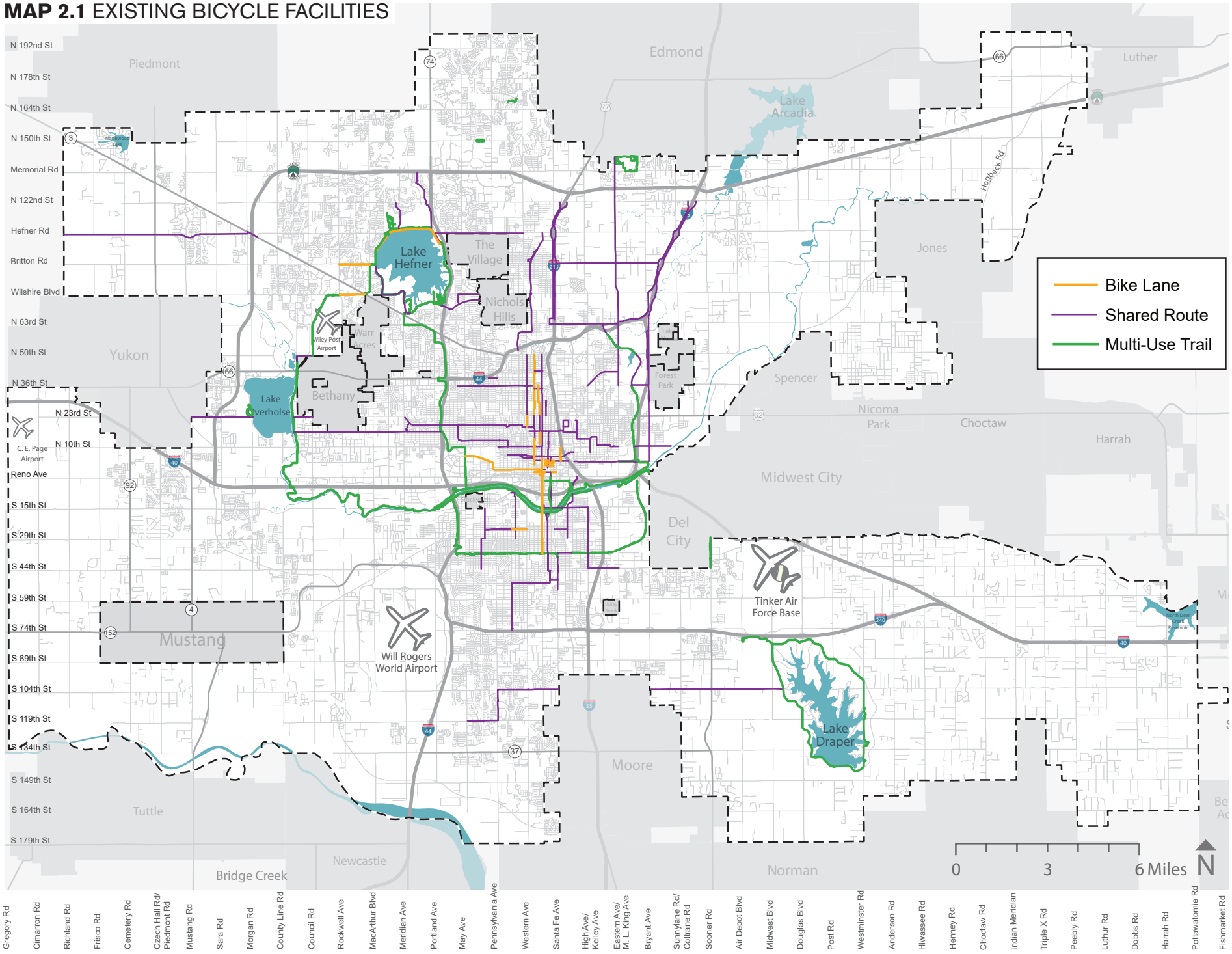
- Implementation of projects outlined in the 2018 bikewalk**okc** plan has resulted in many good bicycle routes that cyclists use extensively.
- The city's **grid network allows** many options for cycling and reaching destinations.
- **New bicycle parking** areas have been installed in downtown and midtown.
- All fixed-route public transportation **buses are equipped with bicycle racks**.
- The local bike share service, **Spokies™**, converted its fleet to e-bikes and has seen an increase in ridership.
- Cycling is growing in popularity, meaning Oklahoma City **motorists are becoming more accustomed to sharing the road**.
- The City received funding through the **Watch For Me OKC** demonstration project to construct protected bike lanes downtown, which will expand the network and provide additional safety for cyclists.
- **The trails network** currently reaches many areas of the city and allows for transportation and recreational cycling, jogging, and walking.
- Currently, over **12 miles of trails** are in the design or construction phases.
- The trail system is well-connected to **existing recreational resources**, and the Parks and Recreation Department is rolling out a new signage and wayfinding package.
- The completion of the Deep Fork Trail will finish the Grand Boulevard **loop around central Oklahoma City**.
- The City's first protected bike lanes have been constructed, including a pilot project for the first parking-protected design.

Challenges

- Outside of sign-only designated bike routes, **on-street infrastructure for bicycles is limited**.
- **Less than 1%** of the total street network consists of marked bicycle lanes.
- **Connectivity** within the transportation network drops off outside of the central city, causing cyclists to utilize arterial streets, which are less safe and uncomfortable.
- The **surface condition and debris** on some roadways make it difficult to cycle.
- **Bicycle parking facilities** are limited throughout the city.
- The trail network has **few access points**.
- Limited space on existing streets create conflict between car parking and bike facilities.
- **Only 36% of** Oklahoma City residences are **within one mile of a trail**.

Below: Cyclists using the new protected bicycle lane on S Walker Ave during an Urban Land Institute group ride.

MAP 2.1 EXISTING BICYCLE FACILITIES



Bicycle and Trail Analysis

ROADWAY SUITABILITY

In order to analyze and understand bicycling conditions on every roadway in Oklahoma City, bikewalk**okc** uses a model that examines and scores every roadway segment. The score provides the existing cycling conditions along those segments. The following sections provide an explanation of each analysis, the results, and the meaningfulness of the results. This type of analysis is a good first step for identifying potential bicycle improvements, but as with all projects, must be followed up by a more extensive analysis for feasibility of construction.

Bicycle Level of Traffic Stress (BLOTS)

The BLOTS analysis reviews components of cyclists' safety and comfort and provides a score for every roadway. The initial analysis found roadways appropriate for cycling according to model inputs. The model takes into account four variables to produce a composite score for each roadway segment:

1. **Number of Lanes** - The number of vehicular travel lanes impacts safety, comfort, and the ability to turn left onto a connecting street. Roadways with two or fewer lanes received the highest score. The score decreases as the lanes increase, with four or greater lanes receiving the lowest score.
2. **Roadway Speed** - Speed impacts cyclists' safety and comfort. Roadway segments received scores based on speeds ranging from less than 25 MPH to above 45 MPH.
3. **Present Bicycle Facility** – A score was assigned to roadway segments that have an existing bicycle facility. The score is dependent on the type of facility and the level of safety offered. Trails are the safest and thus receive the highest score while bicycle routes receive the lowest score. If no facility was present, then no points were given.
4. **Motor Vehicle Traffic Volume** – Existing traffic volume affects cycling comfort and safety. Higher traffic volume results in lower model results.

Map 2.2 shows BLOTS analysis for Oklahoma City. The map shows the streets as graduated colors from blue to red. Blue represents a road segment that has a low BLOTS score. A low BLOTS score means the segment is potentially safe and comfortable for cycling. A high score means the road segment is uncomfortable and potentially dangerous for cycling. This is a first step for identifying candidate roadways for cycling corridors. Each candidate must be further analyzed and field-verified before determining bicycle suitability.

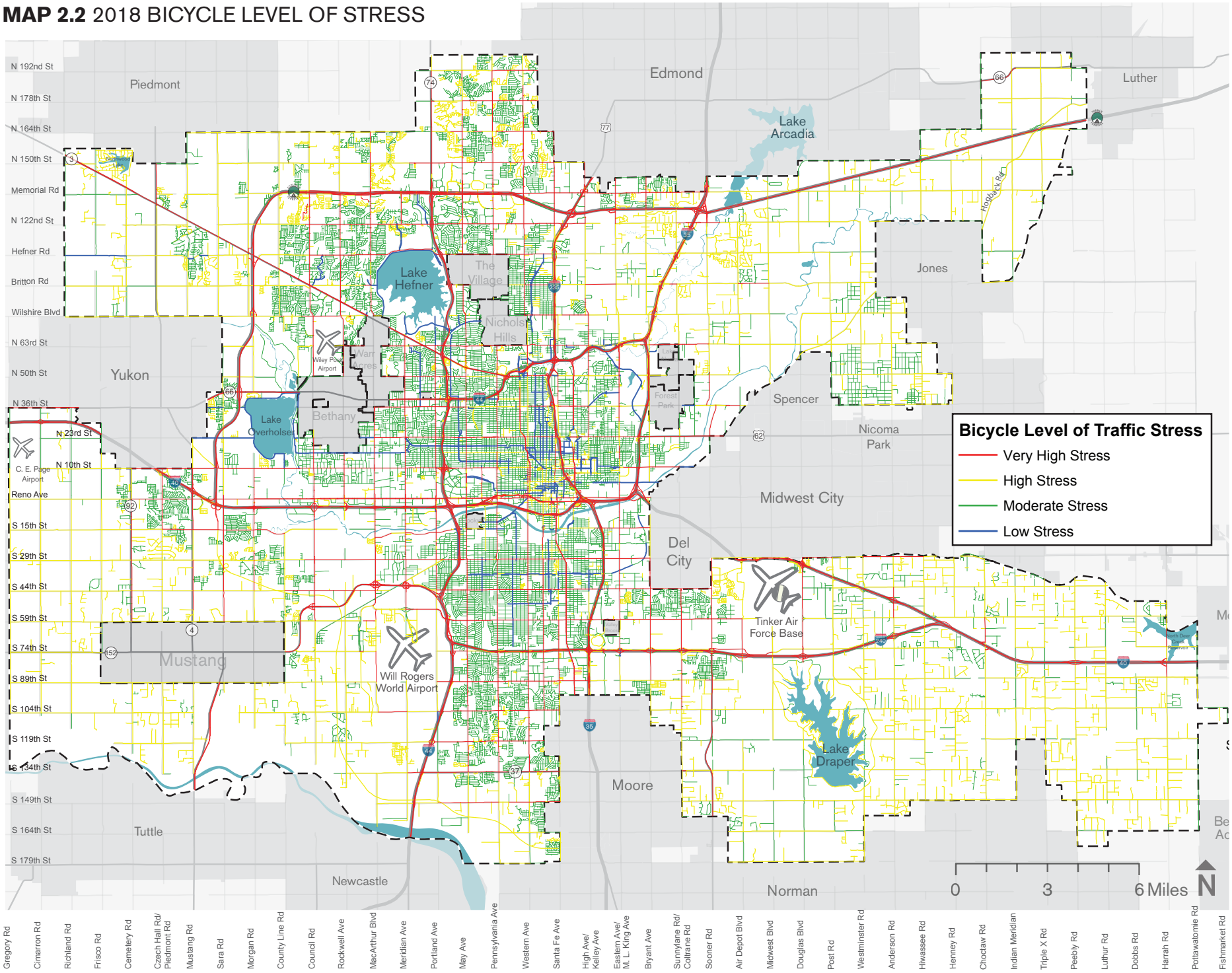
An additional outcome of this analysis is the identification of barriers for cyclists that arise as a part of street design. Nearly all major arterials in the city limits pose difficulties for cyclists, illuminating a preferred approach to identifying cycling facility locations. A focus on safe crossings of major arterials and highways has been built into the plan. Similarly, avoiding major arterials and selecting parallel streets with lower levels of traffic and speed can largely accomplish the same goals of connectivity, while also reducing costs associated with designing and building bicycle facilities that offer an appropriate level of protection.

There is a higher concentration of streets that score well in the inner city, especially where the street grid has been well preserved. Former streetcar routes, such as N. Drexel Blvd. and NW 19th St. are well-suited to accomodate bicycling because of their low speeds, low traffic volumes, and the fact that they are currently bicycle routes with signage and sharrows. There are far fewer streets in suburban areas that are presently suitable for bicycling, indicating that improvements will need to be more substantial, and this type of retrofit will cost more.

Top: Low-stress cycling environment.

Bottom: High-stress cycling environment.

MAP 2.2 2018 BICYCLE LEVEL OF STRESS



Excess Roadway Capacity Analysis

One potential limitation of the BLOTS analysis is that it defines streets with excessive number of lanes as high stress. Depending on traffic levels, that excess width can provide prime opportunity for safer designs, reallocating excess space for more comfortable walking and biking. Planners conducted a second analysis called an Excess Roadway Capacity Analysis to identify potential bicycle corridors. This analysis identifies roadways that have more lanes than needed to carry the current volume of daily traffic. These roadways are candidates for lane reconfiguration to a safer, multimodal facility that carries bicycles and pedestrians and provides a turning lane for automobiles. bikewalk**okc** reviewed roadways with 4+ vehicular lanes and an Average Annual Daily Traffic (AADT) count of less than 16,000 cars per day.

Of particular note in the results of this analysis is the density of streets in the downtown area that have extra capacity. With cycling for transportation being a primarily urban activity, this extra capacity is ripe for conversion to bicycle facilities. These interventions will impact a greater number of residents due to the higher levels of residential density in the inner city.

While AADT is often used to evaluate when a road widening should occur, it is also valuable to look at peak hour traffic data to determine which streets have been designed around a specific time of day. Streets that are below the AADT threshold and below the peak-hour threshold are prime candidates for retrofitting to accommodate bicycle infrastructure. As projects from this plan are funded and enter into engineering and design, this information will be vital in ensuring that the most effective approach to the project is followed. Where there is substantial excess capacity, traffic studies should be less of a priority. The money that would be spent on those studies can be used to improve the facility further, fund a maintenance program, or support any other aspect of the project.

Figure 2.2 Basic Lane Reconfiguration

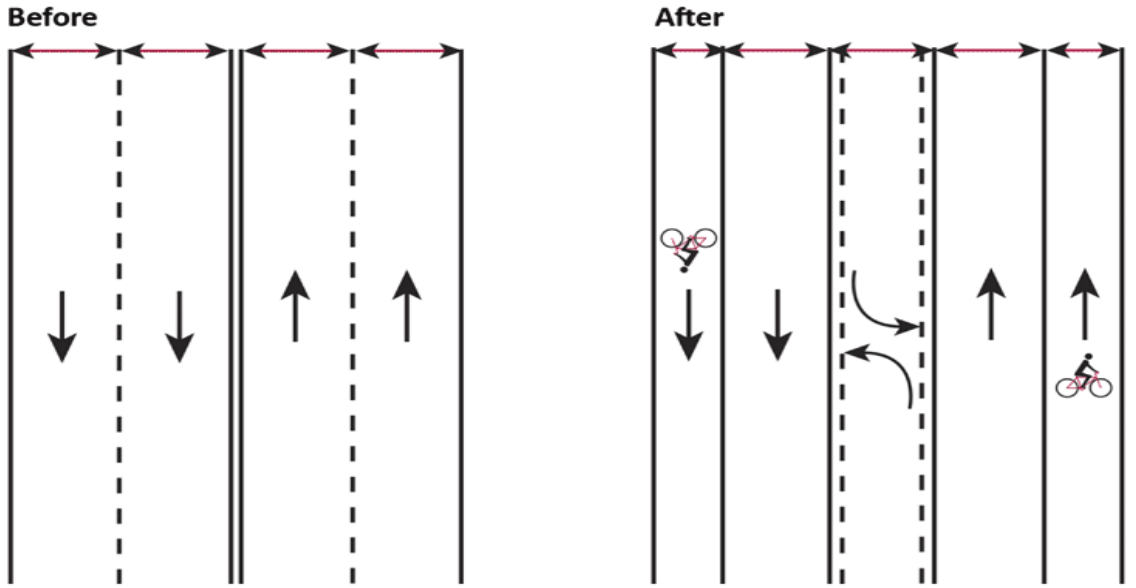
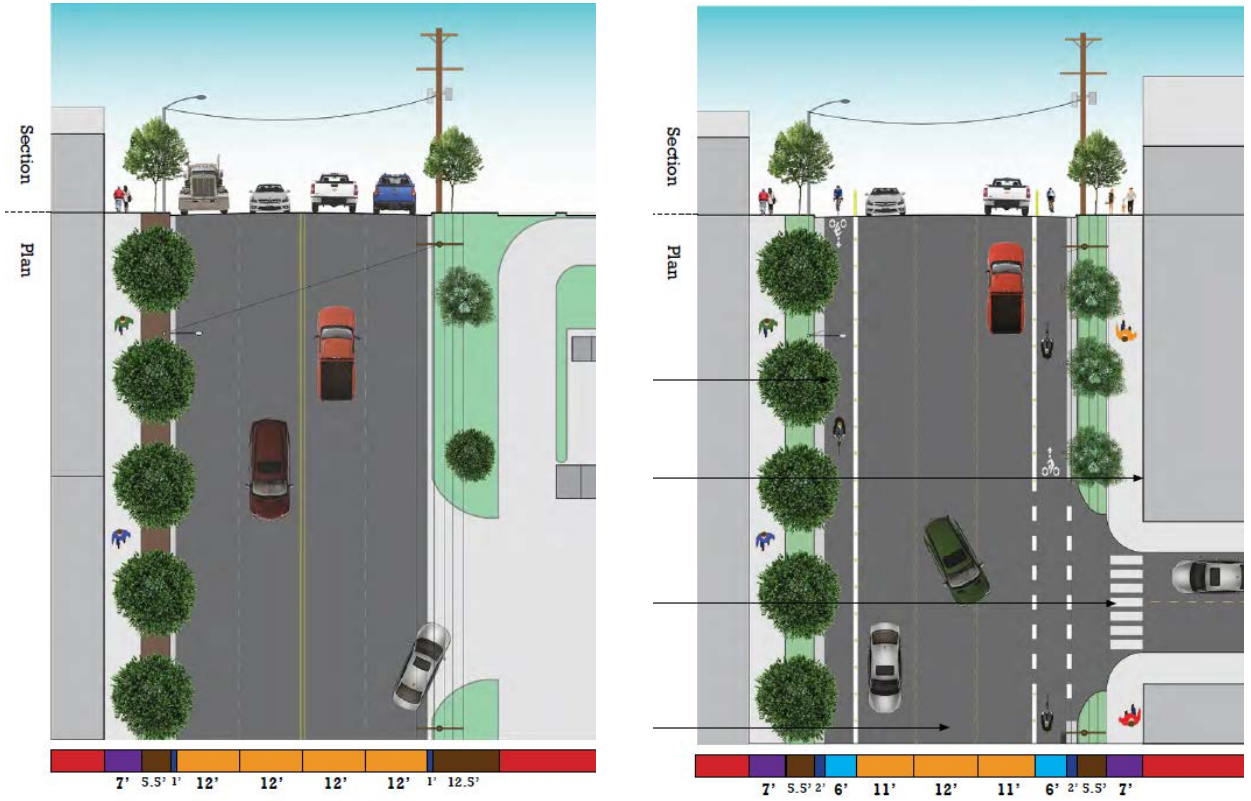


Figure 2.3 Lane Reconfiguration Cross-Section



Below: N Western Ave between NW 18th St and NW 23rd St in 2014 as a four-lane road.

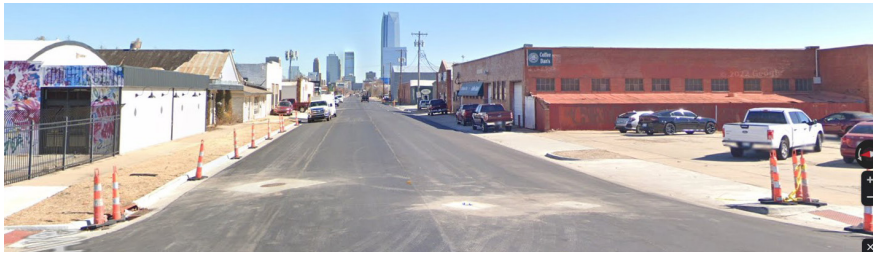
Below: N. Western Ave. between NW 23rd St. and NW 18th St. during reconstruction to reduce lanes, add bicycle facilities, add a median, and add other pedestrian safety features such as lighting, curb ramps, and refuge islands.

Below: N. Western Ave. and NW 19th St. after the reconstruction.

LESSON LEARNED: BIKE LANES VS. PARKING

The Issue: Most of the on-street bike facilities built since the adoption of bikewalkokc were implemented by reducing the amount of lanes on streets. Sometimes, the repurposing of outside automotive lanes into bike lanes has come at the cost of reducing the amount of on-street parking. This reduction is often necessary when the street's striping is updated to meet current standards, such as being set back a minimum distance from each driveway. However, the process of working with adjacent property owners to configure parking in a way that minimizes disruption has been very time-consuming for recent projects.

The Lesson: To maximize efficiency, staff should prioritize exploring the possibility of parking reconfiguration and the process of working with adjacent property owners to reconfigure parking should occur simultaneously with the design process to mitigate potential delays before construction.



COLLISIONS ANALYSIS

The dangers of sharing the road with automobiles is one of the most common reasons given as to why people do not bicycle for transportation. Table 2.1 shows when the bicycle-automobile collisions occurred in the last 18 years based on the month of the year and the time of day. January is the month with the fewest collisions on average, while September has the highest average number. Collision rates are noticeably higher in the warmer months, particularly between April and October. This is most certainly due to the fact that cycling in the cold winter months can be very unpleasant, so fewer cyclists are on the streets. There is a noticeable trend of collisions occurring between the hours of 2:00pm and 7:00pm, which could be due to children or adults bicycling for recreation after school or work, or potentially cyclists getting hit on their commute home. There is less of a trend of cyclists being hit after sunset, which is a significant issue with pedestrians. This could be due to the fact that cyclists are required by law to have lights on their bicycle to indicate to drivers that they are present.

One key takeaway shown in Map 2.3 is that the density of collision occurrences, while a significant concern, is not necessarily tied to the locations of fatal collisions. Fatal bike and pedestrian crashes are almost exclusively attributed to high-speed arterial streets throughout the city, and many have occurred where the density of documented collisions is not high. This indicates that when collisions occur on major arterial streets, the results are much more likely to be fatal than other streets. In addition to updating the maps in bikewalk**okc**, Planning staff felt it was important to illustrate this data set over the same time period. While total collisions per capita appear to be slightly growing over time, the more striking pattern is that pedestrian and bicycle fatalities per capita have been growing significantly over the almost two decades of reporting (Figure 2.4).

In addition to constructing dedicated infrastructure for cyclists, safety campaigns to educate drivers and cyclists alike about safe habits for sharing the road could be conducted during the summer months. Key locations with multiple collisions that need intervention include:

- NE 23rd St and Martin Luther King Ave
- E Reno Ave and Martin Luther King Ave
- SW 59th and Pennsylvania Ave
- SW 44th and Western Ave
- I-240 from Western Ave to Shields Blvd
- NW Expressway from Wilshire to Britton
- NW 10th St and County Line Rd
- NW 23rd St and N Pennsylvania Ave
- W Reno Ave from Meridian to MacArthur

FIGURE 2.4 FATAL BICYCLE COLLISIONS IN OKC PER 100,000 PEOPLE

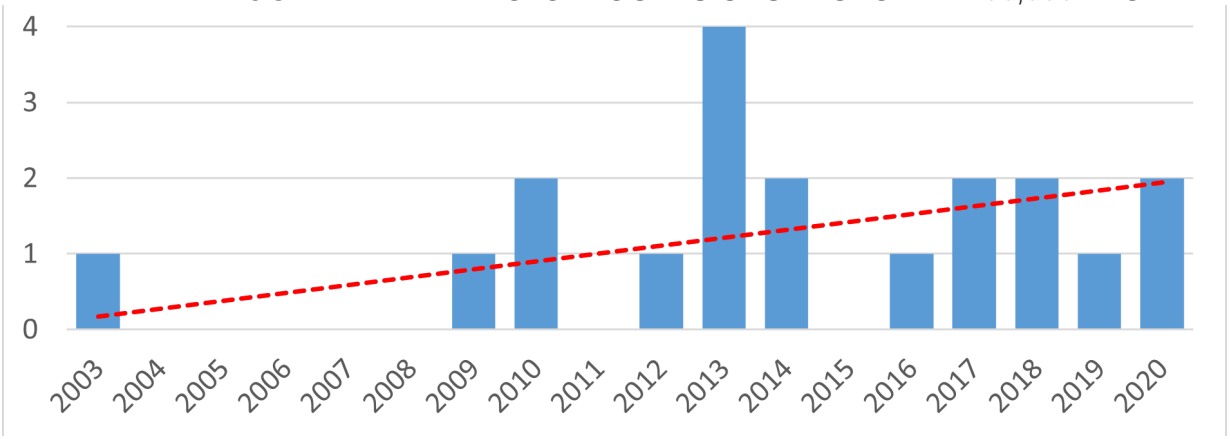
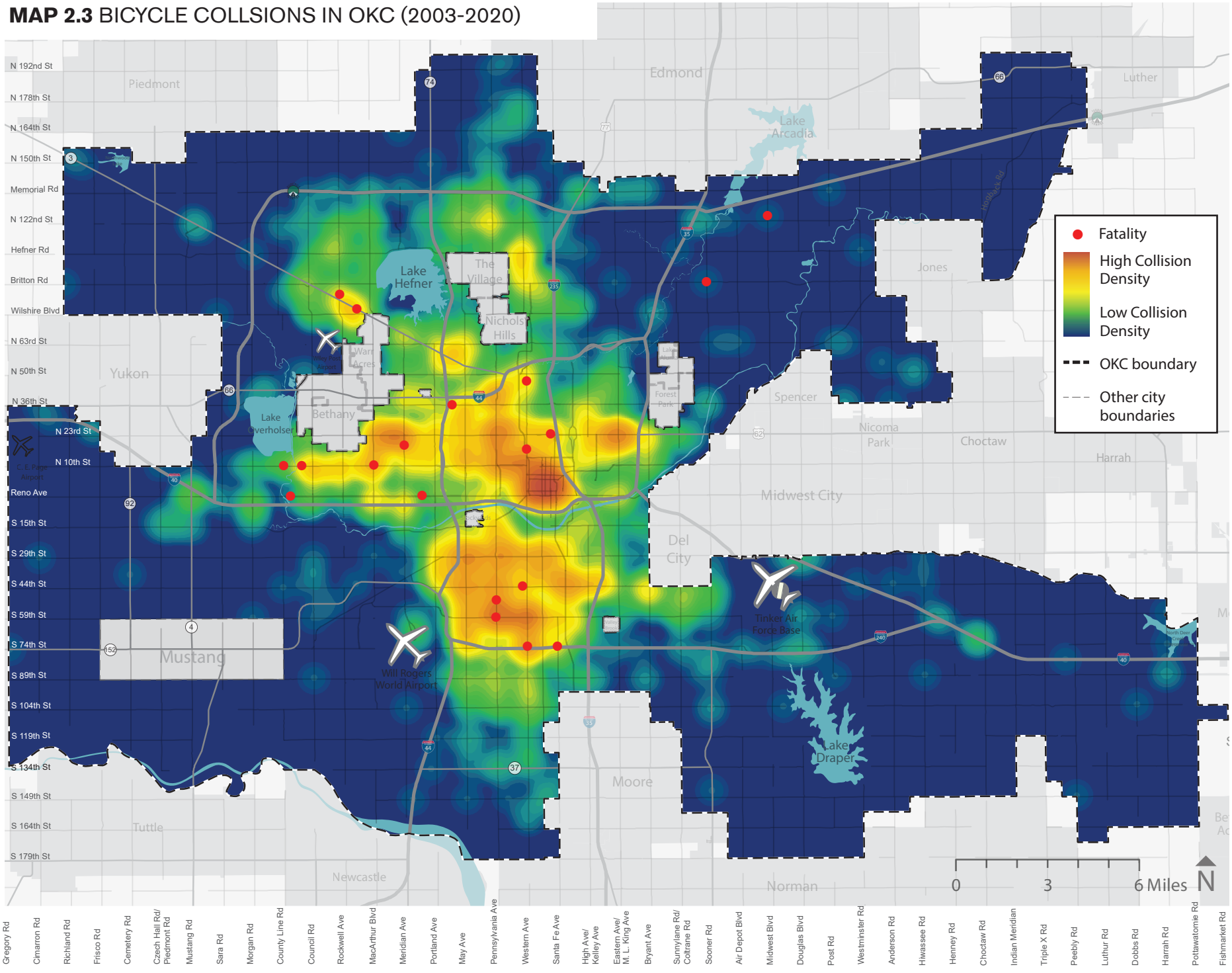


Table 2.1 - Bicycle Collisions by Month by Hour of the Day 2003-2020

	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00
January	0	0	1	0	1	0	2	2	1	1	1	1	4	2	2	3	5	5	5	5	1	3	2	0
February	2	0	1	0	0	0	1	1	1	2	1	3	2	3	3	2	6	7	6	3	2	1	2	0
March	2	0	2	1	0	1	1	1	3	1	2	2	2	1	6	6	5	10	3	6	1	6	3	1
April	4	0	0	0	0	0	1	2	2	1	2	2	3	9	5	12	4	9	14	9	10	3	9	2
May	5	1	1	1	0	0	1	1	1	1	3	1	10	9	11	6	6	10	14	5	3	6	5	3
June	0	2	1	0	0	1	0	2	1	1	6	3	5	6	14	3	8	6	12	11	7	8	7	3
July	3	0	1	1	0	1	0	3	4	2	2	4	5	5	8	2	7	6	14	9	7	14	7	4
August	3	1	3	0	0	1	3	3	3	2	2	6	4	4	10	5	7	14	14	14	7	8	5	5
September	3	1	1	0	1	3	2	4	11	7	4	2	7	5	10	7	14	9	13	7	9	4	2	0
October	2	0	2	1	1	5	3	3	6	2	4	1	3	2	5	4	15	13	6	15	10	9	6	1
November	1	1	0	0	0	1	2	1	2	0	3	4	4	2	3	7	11	15	7	3	7	2	3	1
December	0	0	0	0	0	0	0	2	1	0	2	4	4	3	3	5	5	3	6	6	1	2	3	0
Grand Total	25	6	13	4	3	13	16	25	36	20	32	33	53	51	80	62	93	107	114	93	65	66	54	20

MAP 2.3 BICYCLE COLLSIONS IN OKC (2003-2020)



Facility Type Selection

Choosing the correct facility for bicycle infrastructure depends on many different criteria. Consideration of the interaction with motor vehicles with regard to traffic volume and speed should determine the level of protection required for safe and comfortable cycling. Additionally, costs associated with the implementation of any proposed project are a major limiting factor. Therefore, cost efficiency is crucial. Taking advantage of existing roadway capacity and choosing improvements that are affordable ensures that the available money is spent efficiently, effectively, and responsibly, and improves cycling in Oklahoma City as much as possible.

The City uses four featured types of bike facilities, which are further detailed on pages 45-49:

- Tier 1 - Protected Bike Lane, Multi-use Trail
- Tier 2 - Bike lane
- Tier 3 - Shared Route, Road Shoulder

FACILITY SELECTION PROCESS

The following graphics illustrate the methodology for selecting an appropriate bicycle facility for a given road. These tables indicate the **minimum** standard for safety and comfort. Any facility that offers a higher level of security for cyclists is appropriate, but often cost prohibitive.

This approach expands upon the approach taken by the Association for Central Oklahoma Governements' (ACOG) standards for bicycle facility selection, which focuses on the stress level for cyclists. The ACOG standard determines the appropriate facility based on traffic volume and speed. This criteria is utilized to rank bicycle projects for federal funding elegibility; therefore, ensuring that Oklahoma City uses the same standard will lead to greater performance in the application for federal funds in the future.

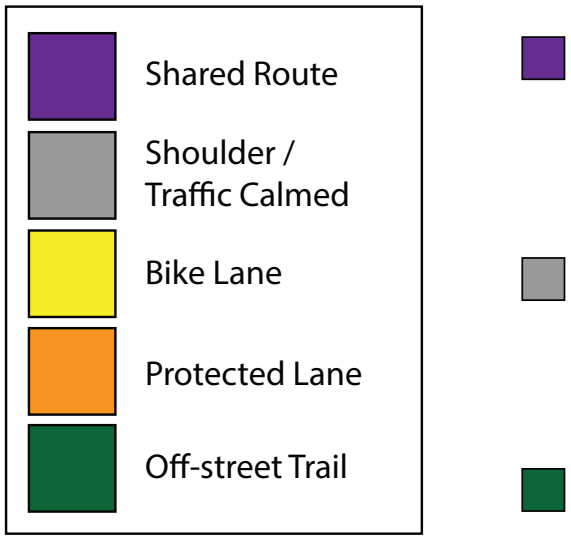
The bikewalk**okc** approach takes into account existing curb-to-curb width. Many of the streets in Oklahoma City do not have enough capacity to accomodate bike lanes without widening the street, which is cost prohibitive; therefore, the following graphics are broken into three categories based on available curb-to-curb width that could be converted to serve the needs of bicyclists.

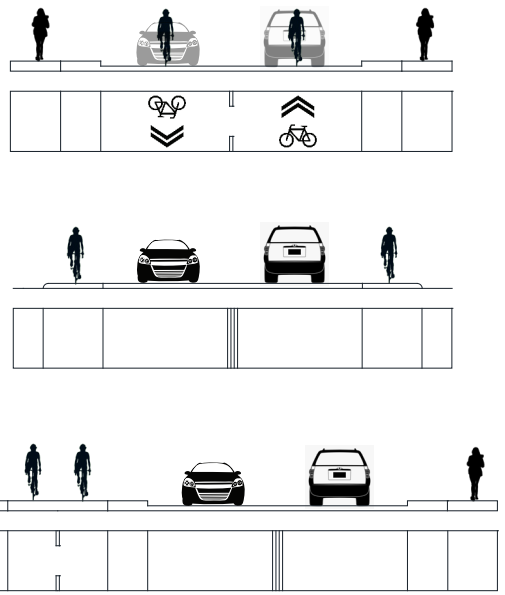
In order to choose an appropriate facility for a street, planners, engineers, project managers, and any other decision-makers involved in the process should first determine how much curb-to-curb width exists. This will point to one of the three adjacent tables. Then, based on the curb-to-curb width of the road, the traffic volume and speed will lead to a facility type for that street. At this point it can be determined if the relative cost per mile for the facility is prohibitive, potentially leading decision-makers to consider alternative routes, or to seek additional funding.

< 32' Curb to Curb

SPEED \ VOLUME	< 2000	2000 - 10000	> 10000
< 30 mph			
30-40 mph			
40-50 mph			
> 50 mph			

Cross-section Options

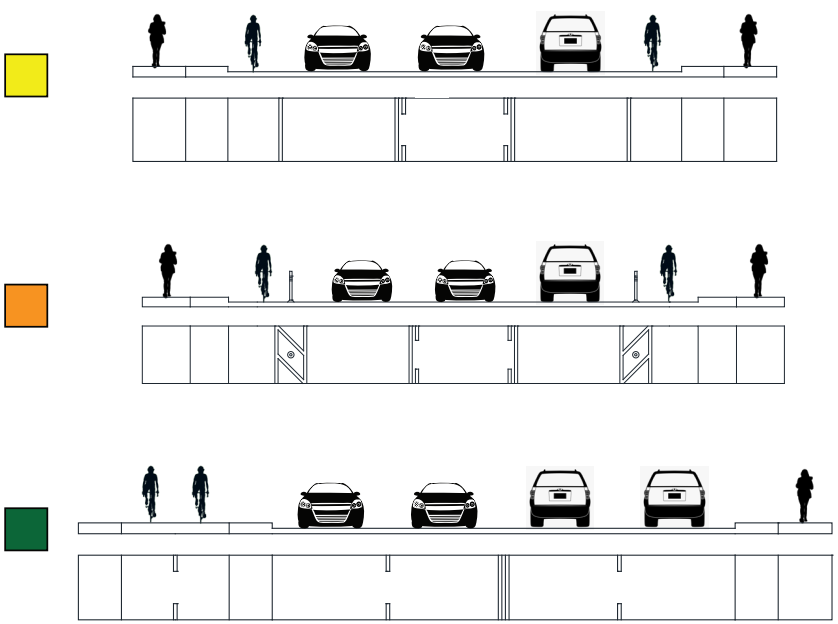




32′ < x < 45′ Curb to Curb

SPEED \ VOLUME	< 2000	2000 - 10000	> 10000
< 30 mph			
30-40 mph			
40-50 mph			
> 50 mph			

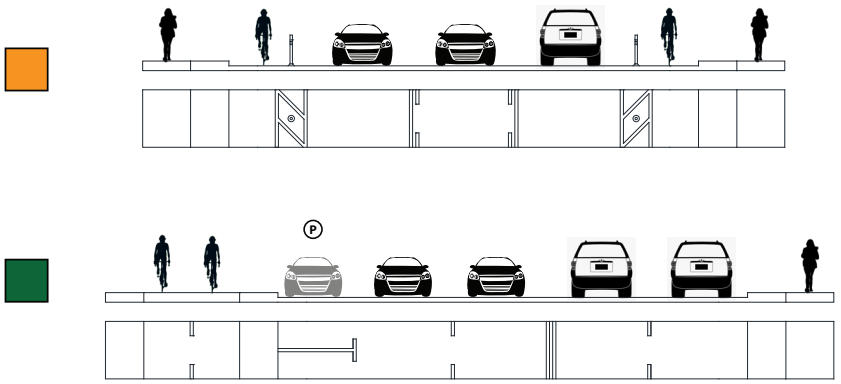
Cross-section Options



> 45′ Curb to Curb

SPEED \ VOLUME	< 2000	2000 - 10000	> 10000
< 30 mph			
30-40 mph			
40-50 mph			
> 50 mph			

Cross-section Options



Bicycle and Trail Plan

bikewalk**okc**'s bicycle plan consists of several approaches to long-range capital improvement planning that will lead to a complete, connected, and coherent network of bicycle facilities that meet the transportation and recreation needs of the residents of Oklahoma City. These approaches are individually organized into "Component Plans", each of which is described in the following sections. Map 2.4 is an overview map of these component plans.

GRAND BOULEVARD LOOP

The Grand Boulevard bicycle and pedestrian loop that wraps around the central city is nearly complete. Sections of this loop need to be completed or enhanced, so that cyclists have a seamless path that encompasses the city. A facility of this length is a rare asset for a city to have, and should be celebrated for what it provides, as well as what it could mean for future growth of the city. Completion of the loop could leverage investment already made along major portions of the alignment and spark development/redevelopment opportunities. In addition, completion of this loop could create a nationally-recognized facility comparable to the Beltline project in Atlanta, GA.

Plan Overview: Pages 36-37

CROSSTOWN CONNECTIONS

Oklahoma City has an extremely large land area, currently only traversable from edge to edge by automobile. The main focus of crosstown connections are to provide safe bicycle facilities that traverses the city north, south, east, and west. This project provides the opportunity to create recognizable bicycle "spines" in the city that people know and understand.

Plan Overview: Pages 38-39

NEIGHBORHOOD GREENWAYS

In areas of the city where there is insufficient capacity on existing roadways to convert space to bicycle infrastructure, it is necessary to find alternative alignments to accommodate safe travel by cyclists. This is especially crucial in those areas where connectivity between neighborhoods is sparse, and traffic is concentrated almost exclusively along major arterials. Where vegetative or riparian corridors exist, there are opportunities for greenway trails. The neighborhood greenways plan identifies preferred locations for these facilities, ensuring that each is connected to the citywide bicycle and trails network.

Plan Overview: Page 40

REGIONAL TRAILS

Multi-use trails have regional significance, as they are typically several miles long and often tie into surrounding cities' bicycle and trail networks. These regional trails are designed for long-distance cycling and jogging and provide benefits to multiple areas of the city. Recently built or funded regional trails include the West River Trail, Draper Trail, and Will Rogers Trail.

Plan Overview: Pages 41

BICYCLE AND PEDESTRIAN BRIDGES

One of the primary limiting factors to cycling as a transportation option in Oklahoma City is the inability to cross major barriers such as interstates, bodies of water, railroads, and major arterial streets. In some cases there is no way to re-design a street to safely accommodate all modes without degrading one or more modes in the process. The bicycle and pedestrian plan addresses this condition by identifying those locations where there is no safe alternative to the construction of a bicycle and pedestrian bridge. These bridges also present an opportunity to create iconic structures across our interstates that send a message about the importance of walking and cycling to this community.

Plan Overview: Page 44

MICROMOBILITY RIDESHARE

Micromobility is defined as the use of shared-use fleets of small, fully or partially human-powered vehicles such as bikes, e-bikes and e-scooters. These vehicles are generally rented through a mobile app or kiosk, are picked up and dropped off in the public right-of-way, and are meant for short point-to-point trips. The rapid growth in the number of shared micromobility trips and the introduction of e-scooters has required cities to focus new attention on how best to regulate these new services in order to achieve the best public outcomes. This component plan recommends ways the City can accommodate and manage micromobility systems.

Plan Overview: Page 45

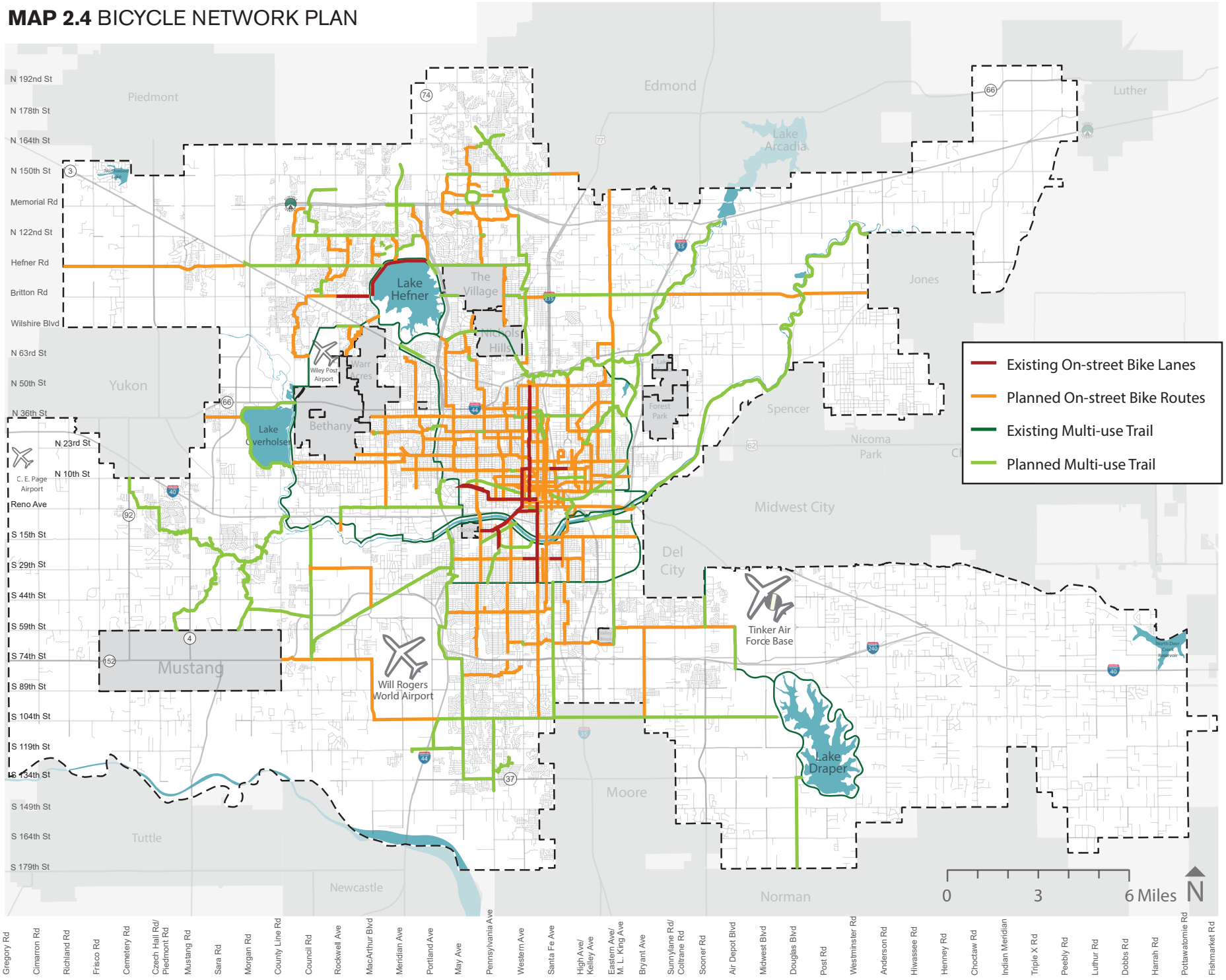
CITYWIDE BICYCLE NETWORK

While the preceding component plans will have far-reaching implications for walking and cycling in Oklahoma City, there is still a need to ensure that there is a well-connected and safe network of bicycle facilities throughout the city. A citywide bicylcle network is essential in ensuring that there is an equitable distribution of access for all residents who may want or need to use a bicycle to accomplish their personal goals, health and wellness, and economic mobility.

Plan Overview: Pages 46-51

"Every time I see an adult on a bicycle, I no longer despair for the future of the human race."
- H.G. Wells

MAP 2.4 BICYCLE NETWORK PLAN



COMPONENT PLAN: Grand Boulevard Loop

CONNECTS:

66,000 Residents

TO:

35 Parks
17 Schools
170 Transit Stops

MAJOR DESTINATIONS

The completion of the Grand Boulevard Loop connects multiple destinations. These destinations include the following:

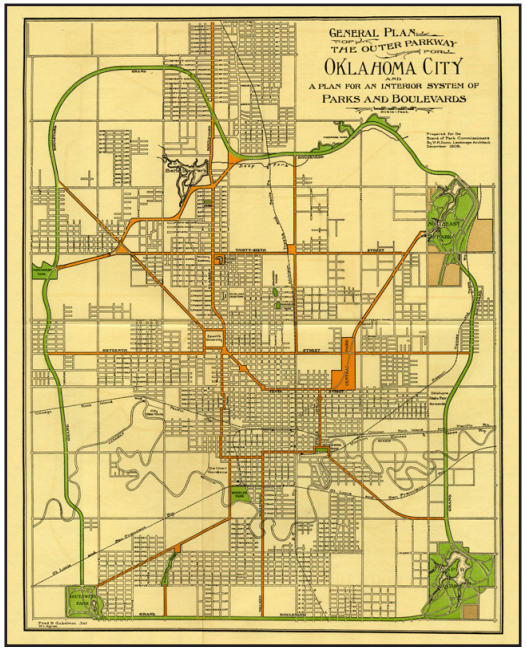
- Will Rogers Park
- Lake Hefner
- Oklahoma River
- State Fair Park
- Woodson Park
- Trosper Park
- Lincoln Park

HOW DO WE BUILD THIS?

The completion of the Grand Blvd Loop requires the constuction of several smaller but significant subprojects.

- Deep Fork Trail
- Bridge over Oklahoma River
- Bridge over I-35
- Existing S. Grand Blvd Trail Improvements
- Amenitize the trail with water fountains, restrooms, trees, and more.

Concept rendering of Grand Boulevard Loop.



Historic Map of Grand Boulevard and central OKC.

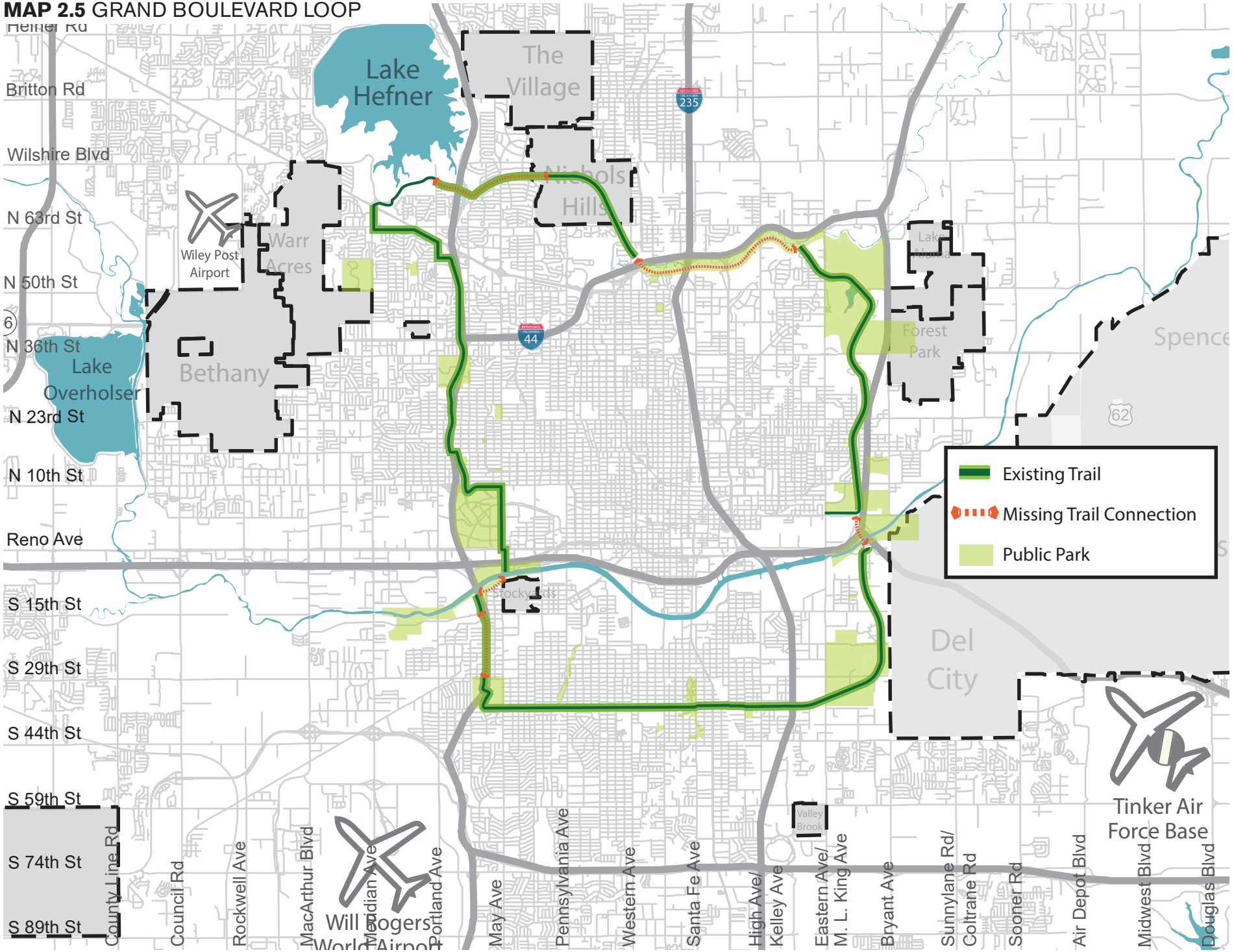
DESCRIPTION

Completing the Grand Boulevard Loop will result in a seamless beltline of trails around central Oklahoma City. This trail will enhance residents' quality of life by connecting neighborhoods to other parts of the city. Additionally, this asset will make it easy for residents to choose an active lifestyle.

The original 1910 plan for Grand Blvd was to serve as a beltline for the city and connect several regional parks. When the interstate highway system was constructed, much of the Grand Boulevard alignment was utilized. While improving automobile-based transportation, this was detrimental to other modes. The proposed completion of the Grand Blvd Loop will restore the alignment to its original intent by connecting people to recreational opportunities.

The completion of this project will give about 66,000 residents easy access to a world-class recreational and commuter facility. Additionally, the project connects 28 neighborhood parks, 7 regional parks, and 17 schools. From a broader transportation perspective, this project is impactful by connecting to 170 bus stops. The completion and enhancement of the trail could be a tourist attraction that enhances the experience visitors have when visiting the community. This project bears similarities to the ongoing intiative in Atlanta, GA - the Beltline - which set out to create an active transportation corridor around Atlanta to spur affordable housing and other development.

MAP 2.5 GRAND BOULEVARD LOOP



COMPONENT PLAN: Crosstown Connections

CONNECTS:

110,000 Residents

TO:

57 Parks
39 Schools
457 Transit Stops

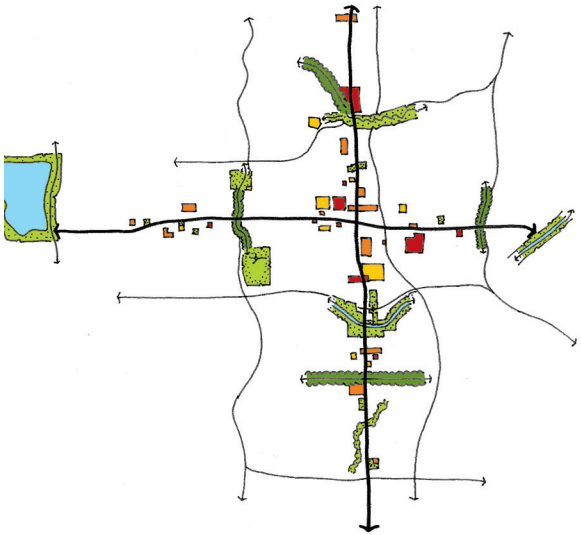
DESTINATIONS

The construction of crosstown connections provides access to multiple destinations across the city. These destinations include the following and more:

- Downtown
- Asian District
- Capitol Hill District
- Lake Overholser
- Grand Boulevard Loop
- Deep Fork Creek
- Katy Trail

HOW DO WE BUILD THIS?

This project will require the construction or improvement of safe bicycle facilities north, south, east, and west across major barriers. There are several potential alignments in each direction that may be appropriate based on other factors. This flexibility will allow for the strongest possible product that, in concert with the completion of the Grand Boulevard Loop, will form the skeleton of the greater bicycle network in Oklahoma City.



Concept rendering of Crosstown Connections.

View of cyclist on NW 19th St.

DESCRIPTION

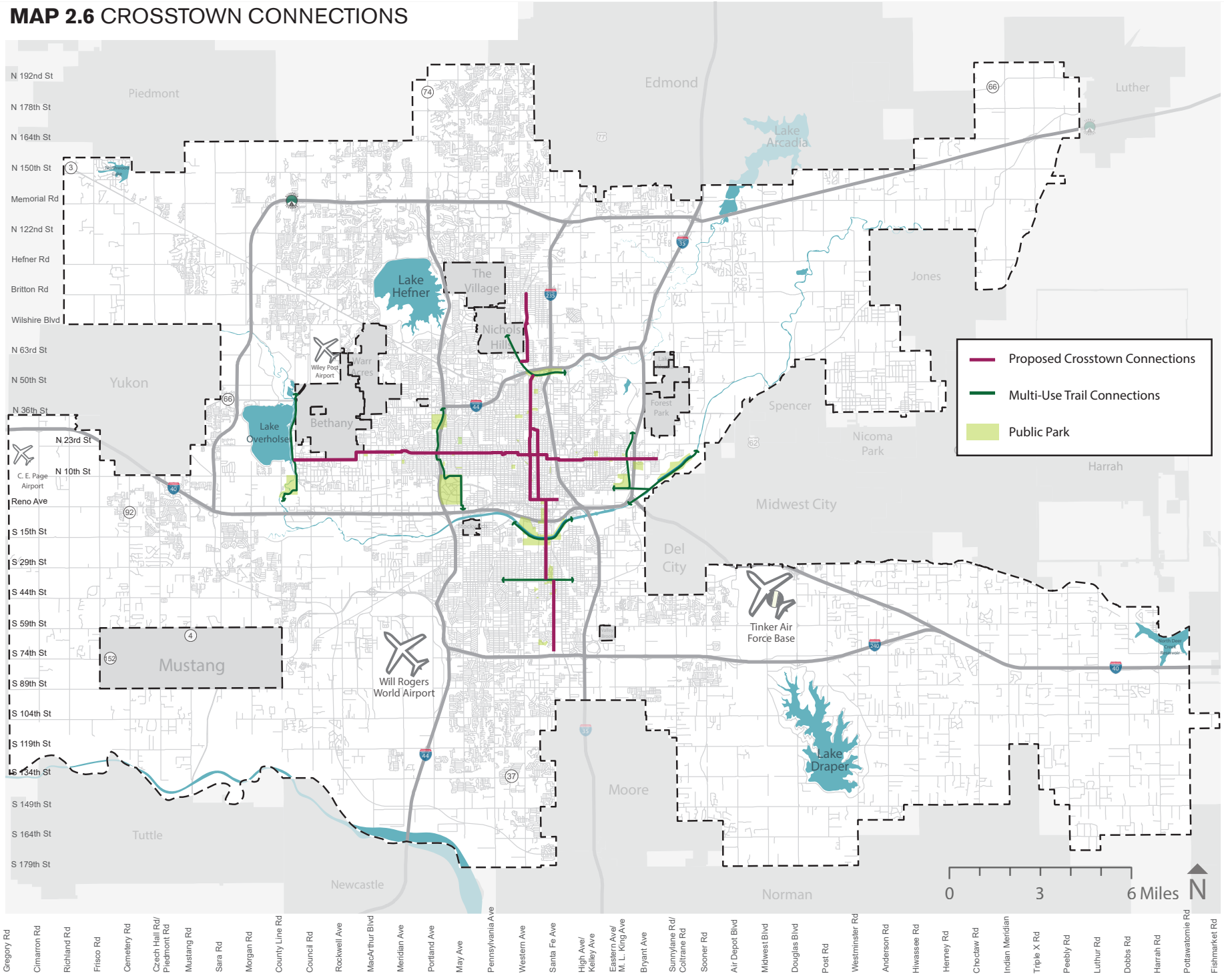
This component plan calls for specific improvements on existing roads across the city to create two perpendicular crosstown corridors for cycling. The goal of these corridors is to connect people to a variety of daily or weekly destinations. Facility design along these corridors will be to the highest feasible safety level to ensure that riders of all types are comfortable using bicycling for transportation. Being able to choose to cycle to a park, school, shop, restaurant, coffee shop, church or regional recreation area will respond to the public input received from countless residents of Oklahoma City.

One leg of this project runs from north to south, and the other runs east to west through the most dense neighborhoods in Oklahoma City. Additionally, these corridors pass through some of the most visited commercial districts.

The north-south crosstown connection runs from the historic main street of Britton Town in the north to I-240 in the south. The corridor follows stretches of far north N. Classen Blvd., N. Shartel Ave. and S. Robinson Ave., and S. Santa Fe Ave. Presently, most of these connections are cyclable and/or designated as bike routes. This project aims to improve the corridors by adding designated bicycle lanes and implementing traffic calming elements to draw more riders of all confidence levels.

The east-west crosstown connection runs from Lake Overholser Park in the west and follows NW 16th St. to NW 19th St. to NW 18th St. and back to NW 16th St. as it works its way east. This corridor provides an important alignment for recreation and transportation and is adjacent to thousands of households.

MAP 2.6 CROSSTOWN CONNECTIONS



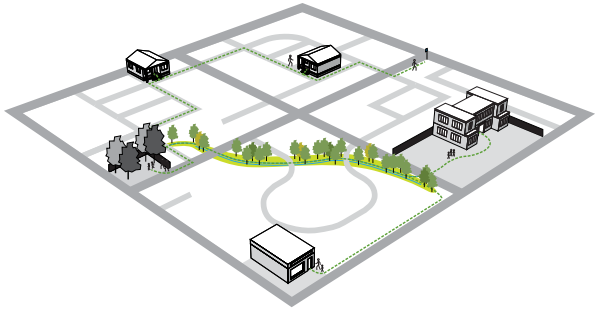
COMPONENT PLAN:
Neighborhood Greenways

DESTINATIONS

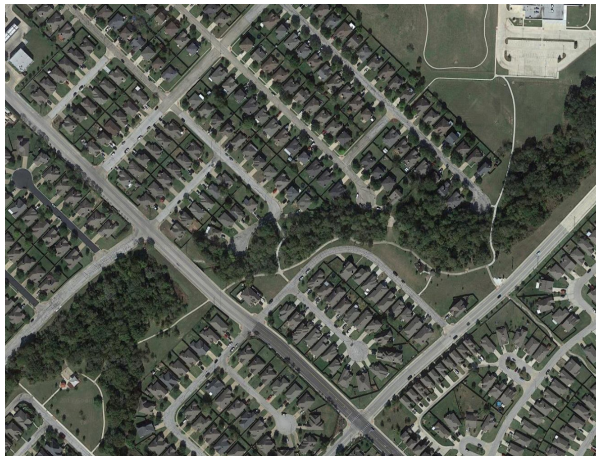
The construction of neighborhood greenway trails provides access to schools, parks, regional trails, and commerical areas. These facilities provide an active transportation option to residents in suburban locations.

HOW DO WE BUILD THIS?

The construction of Neighborhood Greenways will require trail construction during the development of new neighborhoods. Additionally, floodplains and other greenways through existing neighborhoods can be utilized by the neighborhood greenway network.



Above: Neighborhood trail connection concepts.



Above: Example neighborhood greenway connecting a neighborhood, park, and school.

DESCRIPTION

This component plan proposes several neighborhood greenways to provide off-street bicycle or pedestrian paths from residential areas to schools, parks, libraries, and commercial areas. Many of these greenways could utilize undevelopable floodplains, drainage channels, or other easements. A large portion of Oklahoma City's residential development is suburban in style with neighborhood access taken directly off of a major or minor arterial. This makes accessing the nearest school, park, or commercial area by any mode other than an automobile potentially difficult or dangerous. The Neighborhood Greenways component plan can be applied to existing neighborhoods, where retrofitting would be required, as well as within future subdivisions, where the greenways can be designed into the project in the beginning of the planning process as an acceptable form of open space.

What differentiates the neighborhood greenways from other multi-use trails is both the design standards and intended purpose. Where non-greenway multi-use trails are 10' to 12' in width with a wide clear zone that facilitates high-speed cycling, the concept for neighborhood greenways differs. The design standards call for a facility that is 8'-10' in width with a narrower clear zone; this is intended to control cycling speeds so that the facility is safe for residents of all ages to access. Additionally, the narrower clear zone will make the greenways feel more incorporated into the natural features that surround it.

COMPONENT PLAN:
Regional Trails

DESTINATIONS

Many of the smaller municipalities in the metro area, as well as many major recreational assets, create natural endpoints along Oklahoma City's recreational trail network. Some of these include:

- Mustang, Edmond, Moore, Del City, Spencer, Jones, Yukon
- Lake Stanley Draper
- Lake Overholser
- Lake Arcadia

HOW DO WE BUILD THIS?

The construction of Regional Recreation Trails builds off of the existing trail network. The trails identified to complete this project include the following:

- Adventure Trail
- Scissortail Trail
- S. May Ave. Trail
- Wildhorse Trail
- 104 Trail
- Lake Overholser Trail

Above: Recreational trails offer a chance to escape to nature.

Above: Picture of the Katy Trail at dusk.

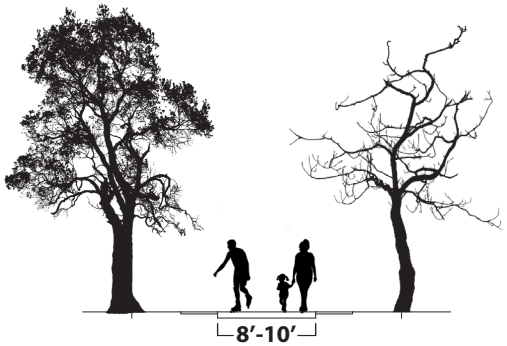
DESCRIPTION

Multi-Use trails have been a popular attraction over the last 20 years in Oklahoma City. Trails constructed since 1997 have created a strong foundation for moving forward into the next phase of recreational and transportation trails. This plan proposes the addition of 168 miles of multi-use trails to the current trail network. These trails include connection to the neighboring communities of Edmond, Moore, Mustang, Yukon, Spencer, Jones, and Del City. Multi-use trails will provide safe facilities along streets such as S. May Ave. and S. 104th St. These are locations with limited bicycling opportunities; however, they serve as important connections to the overall bicycle and trail network.

- The Adventure Trail connects the Katy Trail to Lake Arcadia, where the City of Edmond is constructing a lake trail.
- The Scissortail Trail is an extension of the Oklahoma River Trail. Cyclists can ride northeast and connect to another bicycle facility on E. Hefner Rd.
- The S. May Ave. Trail connects the Will Rogers Trail near the Oklahoma State Fairgrounds south along May Ave. to the Oklahoma City Community College and thousands of residents that live along the corridor.
- The Wild Horse Trail connects the West River Trail to Mustang.
- The 104 Trail connects Earlywine Park to Lake Stanley Draper along SW. and SE 104th St.

Trail Types

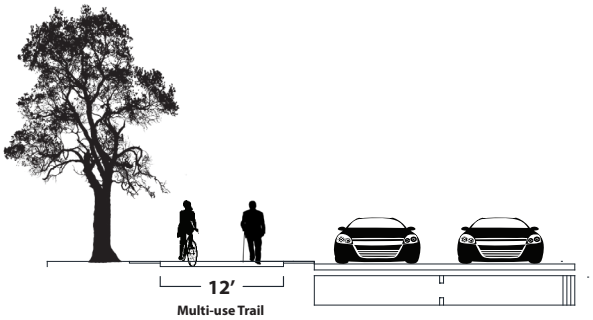
NEIGHBORHOOD GREENWAY



Neighborhood Greenways are intended to use existing greenspace, like riparian corridors or railroad easements, to connect residents to schools, parks, and other local destinations. A width of 8'-10' is sufficient, since the intended user should be traveling at slower speeds than on regional trails. Speed limitations on cyclists are appropriate to maintain a family-friendly experience. These facilities will also serve as neighborhood amenities and recreational opportunities for Oklahoma City residents.

Below: Will Rogers Trail running through open greenspace in a neighborhood

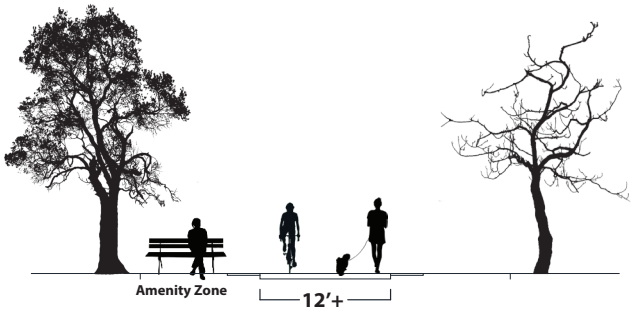
OFF-STREET MULTI-USE TRAIL



Multi-use trails are intended to provide safe facilities for micromobility users in urban and suburban areas. Unlike Neighborhood Greenways, many of these trails will serve as paths along major streets that may contain high auto traffic and high speeds, and where on-street bikeways are not feasible. Unlike Regional Trails, they are more urban and primarily, but not solely, serve a transportation function. The standard width for a multi-use trail is between 10' and 12' in order to accomodate multiple user types.

Below: Will Rogers Trail abutting a roadway

REGIONAL TRAIL



Regional trails serve multiple users, including cyclists, pedestrians, roller bladers, pedestrians with strollers, and more. While these trails can be used for transportation, many are connected along large water bodies like lakes and rivers, and become popular recreational facilities.

If a regional trail has become popular enough that there are frequent conflicts between users, widening the trail, or providing separation between the pedestrians and bicyclists is appropriate. This approach has been used to great success at the multi-use trails that surround Lake Hefner. Because of the anticipated speeds, it is important to minimize blind corners. Where potential conflicts exist between users, ettiquete signage can help to minimize any trouble.

Below: Bert Cooper Trail at Lake Hefner

Trail Amenities

Certain amenities are necessary in order to plan a trail facility that accommodates different users of all age groups. These components are necessary to create successful facilities that everyone can enjoy. Trails may include the following amenities:

- Seating and trash cans
- Water fountains
- Shade trees
- Lighting
- Public restrooms
- Signage and maps
- Fix-it stations and bicycle parking

SEATING AND TRASH CANS

A bench placed on a beautiful spot with an amazing view can change how people see their environment. Benches are places where hikers and cyclists can take a break, meet other people, and decide whether they want to continue onward or return home. A trash can or recycling bin next to the bench will keep the trail clean. Benches and trash cans should not be placed directly on the trail, but at least 10 feet away to avoid conflicts between people sitting and trail users. Benches should be oriented so that users have the best possible view when seated.

WATER FOUNTAINS

Water fountains are a necessity along trails, especially since many trails are rather remote and trail users can become dehydrated easily. Water availability will make trails more pleasant, safe, and inviting to use. Fountains should not be placed at the end of a water line, since water is not moving and can become stale.

SHADE TREES

Trees are the most appealing way to provide shade, since they also improve the appearance of the trail. A well-placed tree or a well-designed shelter can make it more comfortable to use a bench. Trees should not be placed too close to the trail (distance depends on tree species) so that roots don't damage the asphalt, but they should be close enough to provide necessary shade, especially in the late afternoon when temperatures are the highest. Trees should also be placed in open areas as screening for unattractive views. Concentrate trees along south and west edges of trails to provide maximum shade.

LIGHTING

Lighting along trails increases the number of viable hours for users, particularly in the winter when the sun sets earlier. Lighting should be consistent and functional, lining the entirety of a trail, so that there are no dark areas that will discourage riders. Lighting can be enhanced between neighborhoods and trails, so residents can safely make the journey to their closest trail.

PUBLIC RESTROOMS

Restrooms make it possible for people to stay longer in an area, but they are expensive. The level of success of restroom amenities depends highly on placement. Frequently used and highly visible restrooms are safer and less subject to vandalism. Restrooms should be located at trail heads or where trails cross through parks.

SIGNAGE AND MAPS

Signage and maps assist in wayfinding along the trails network. This trail component is necessary to provide information to visistors and new users of the facility. Signage can assist a user in planning a trip, or timing use of the facility. Signage is appropriately placed at mile markers, at junction points, or where the trail interacts with the street. Larger maps and information kiosks are necessary at trail heads and access points.

FIX-IT STATIONS AND BICYCLE PARKING

Cyclists need the ability to repair a flat tire and also to park their bicycle along the trail. Cyclists may be several miles from their origin or destination at any given time on a ride, and a flat tire can ruin the experience and leave a cyclist stranded. Fix-it stations are appropriate at each grouping of trail components.

Top: Example of a fix-it station.
Bottom: Example of grouping of amenities.

COMPONENT PLAN:
Bike & Pedestrian Bridges

BARRIERS CROSSED:

- Oklahoma River
- Deep Fork Creek
- Interstates
- Turnpikes
- Northwest Expressway

DESTINATIONS

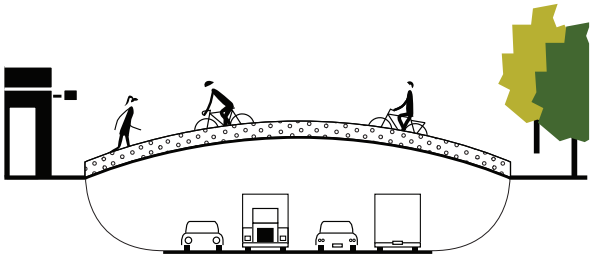
The construction of bicycle and pedestrian bridges connects multiple destinations across physical barriers. These destinations include the following:

- Grand Boulevard Loop Completion
- Wheeler Park to Downtown
- Hefner-Overholser Trail to Lake Hefner
- Southern neighborhoods to north of I-240

HOW DO WE BUILD THIS?

This project proposes six bicycle and pedestrian bridge projects. The list below conincides with Map 4.12 for approximate bridge location:

1. Two new bridges over highways and major road barriers
2. Four new bridges over rivers and water bodies
3. Upgrading existing bridges to ADA standards and adding beautification elements
4. Expanding capacity on existing road bridges to provide bike and pedestrian access

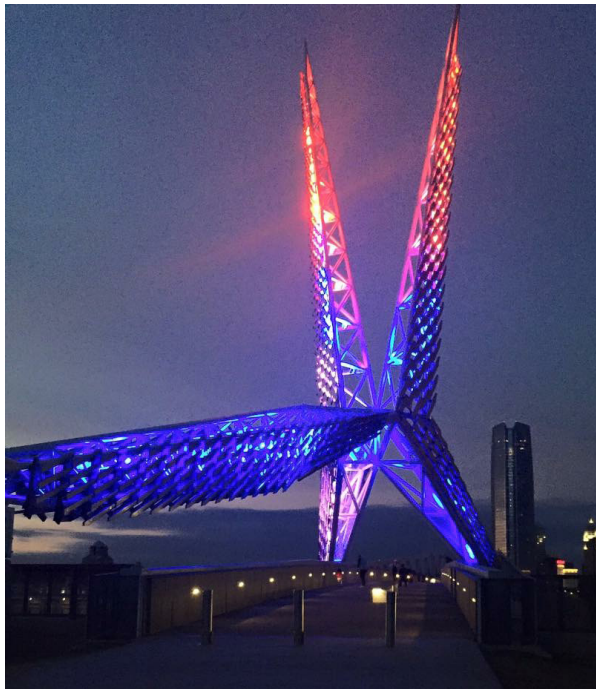


Concept Rendering of Bicycle and Pedestrian Bridge Locations

DESCRIPTION

Sometimes parks, shops, and schools are inaccessible to residents because of physical barriers such as streams, roads, or highways. A bridge can create the shortest connection between where people live and where they would like to go, as well as be a safer connection than having to use and arterial road bridge. Additionally, a bridge can be iconic and memorable for people traveling through a place by automobile. These types of impressions are what people communicate to one other and can generate further interest and tourism.

Surveys and analysis conducted for this plan identified several barriers as problematic for the active transportation network. This component plan proposes the construction of six new and the upgrade of eight existing bike and pedestrian bridges to provide safe, convenient, comfortable, and attractive crossings of these barriers. A map of these bridge locations can be found in Chapter 4 of this plan. The following list provides a description of the proposed new bridges:



Skydance Bridge across I-40

- **Railroad Bridge over Oklahoma River:** This bridge repurposes an abandoned rail bridge into a bike and pedestrian crossing to provide access across the river.
- **I-44/Deep Fork Creek Bridge:** This bridge provides a connection accross the creek to the Deep Fork Creek trail for both trail riders and transportation cyclists.
- **Oklahoma River at First Americans Museum:** This pedestrian bridge connects the First American Museum (FAM), the Oklahoma River Trails and the Downtown Oklahoma City area.
- **Wiley Post Park Bridge over Oklahoma River:** This pedestrain bridge connects the South Scissortail Park to Wiley Post Park and improves accessibility from the city center to Capital Hill District and the city's greater south side.
- **Lake Hefner Parkway at Britton Road:** The project improves bike and pedestrian access to the eastern neighborhoods and the Britton District.
- **NW 10th St. at Lake Overholser:** This bridge provides access from the existing trails along the east side to the lake road and future trails to the west.

COMPONENT PLAN: Micromobility Planning

USERS AND SERVICES:

Spokies OKC Bike Share

Private E-scooter and E-bike Companies

377,182 Average Annual Trips

729 Median Trips Per Day

ROUTES AND DESTINATIONS

The City is utilizing micromobility data to show where the most ridership and destinations are being frequented. The data show the highest activity ocurring along the following locations:

- Reno Ave and Sheridan Ave through Bricktown
- Robinson and Hudson from Scissortail Park north to Midtown
- Areas surrounding Downtown districts - Bricktown, Midtown, Scissortail Park

HOW DO WE BUILD THIS?

There are several ways the City can continue to support micromobility growth and safety. Some of the following investments include:

- Micromobility stations to reduce clutter and ADA conflicts
- Continued bike lane network buildout in and around the core
- Intersection safety improvements to accommodate e-scooters and e-bikes
- Continued coordination with Spokies and Downtown OKC Partnership

DESCRIPTION

With multiple companies deploying rental scooters and E-bikes around the city, problems have emerged with how these devices are stored within the public right of way. Without designated areas to store such devices, sidewalks can often become cluttered and accessibility issues have risen. Some of our peer cities have begun to experiment with micro-mobility stations in underutilized spaces to provide a more orderly way to store these vehicles.

Oklahoma City should construct micro-mobility stations at a few high-profile locations downtown and potentially some neighborhood commercial districts as well. These sites could then be tested and monitored to see how well they are utilized and if they meaningfully reduce the sidewalk clutter of such devices, while simultaneously providing more bike parking availability.

Because riding e-scooters and e-bikes are prohibited along sidewalks in business districts, it's important to ensure they are safely accommodated on city streets. Fortunately, on-street bicycle infrastructure is well suited for this task. At the very least, micromobility rideshare compounds the need for bike lane infrastructure to provide safe street space for all modes of transportation.

Top Left: E-scooter clutter in Bricktown, OKC
Top Right: Example of a painted sidewalk marked for dockless rideshare parking
Middle Right: Example of a street corral created for micromobility, including dockless e-scooters along with standard bike racks.
Below: E-scooter users on Walker Ave bike lanes

COMPOSITE PLAN: Citywide Bicycle Network

CONNECTS:

495,000 Residents

TO:

Schools
Parks
Libraries
Transit Stops

HOW DO WE BUILD THIS?

The completion of the City Wide Bicycle Network requires the constuction of several bicycle facilities. The full network of bicycle facilities includes the following:

1. 190 Miles of Multi-Use Trails and Neighborhood Greenways
2. 90 Miles of Protected Bicycle Lanes
3. 70 Miles of Bicycle Lanes
4. 125 Miles of Bicycle Routes

DESCRIPTION

In addition to the projects discussed in previous pages, bikewalk**okc** plans a citywide bicycle network building off of the existing bicycle and trail network. The citywide network consists of all of the projects previously discussed and additional facilities necessary for a robust, complete network of bicycle facilities. The goal of a citywide network is to create a safe, comfortable, and connected series of bicycle facilities that accommodate riders of all skill levels. A description of each facility type is provided in the following pages.

The citywide network was identified through extensive outreach and surveying conducted as part of the planning process. Additionally, a series of analyses helped identify roads that are safe and conducive to cycling. These analyses include the following:

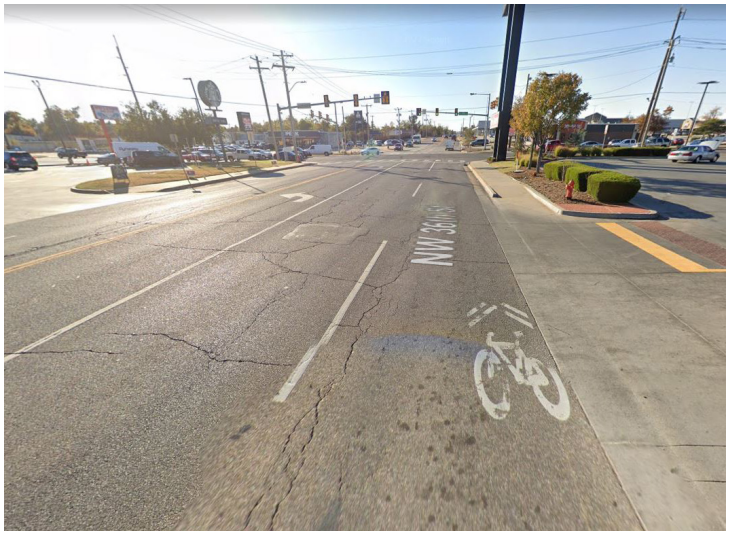
- Lane Reduction (p. 28)
- Bicycle Level of Traffic Stress (p. 26)
- Collisions Analysis (p. 30)

The proposed bicycle network is the long-range plan for implementation as funding allows. The network map should be updated regularly to reflect any new bicycle facilities constructed. As the City continues to grow and develop, additional roadways not included in the bicycle network may generate bicycle demand, and can be evaluated and added as part of the plan updates.

NEW BEST PRACTICE: UPGRADING EXISTING FACILITIES

EXISTING BIKE ROUTES BEFORE BIKEWALKOKC ADOPTION

There are still many older bike routes throughout OKC that fail to provide adequate levels of safety and comfort for cyclists of all ages and abilities. This update will determine which of those routes can be improved to provide safer facilities, and which ones may need to be diverted to an alternative route. For example, the photo to the right shows a bike route along NW 36th St that is identified as a street in need of a more protected bike facility.



IMPROVED OR NEWLY ADDED BIKE ROUTES AFTER BIKEWALKOKC ADOPTION

As part of the 2018 bikewalk**okc** plan, many streets have been converted to a safer design that allows for a more protected space for cyclists. As mentioned in Chapter 1, a road diet can have added safety benefits for all road users, including automobiles. The image on the left shows new Tier 1 bike lanes on S Walker Ave, where cyclists are now better connected from south OKC to the downtown area.

On-Street Bicycle Facility Types and Design

BICYCLE LANE/PROTECTED BICYCLE LANE

This facility type allocates a portion of the right-of-way exclusively for cycling, thereby separating cyclists and motorists into individualized spaces. The intent is to allow cyclists to safely use streets that often have higher speeds than those on designated bike routes. Because of the effectiveness of separating cycling from motorist lanes, fewer rules are required to make bike lanes an effective strategy. Ideal design guidelines for bicycle lanes and protected bicycle lanes include the following:

Bike lanes should allocate a minimum of 4' of seamless pavement.

Bicycle lanes should be wide enough to facilitate safe movements of cyclists. Bicycle lane width range should be 4 to 8 feet wide with a preferred width of at least 6 feet. Cyclists avoid riding near seams in the pavement by shifting closer to automobile traffic. Therefore, seams should be minimized or eliminated where possible to ensure well-functioning bicycle facilities. This issue is most commonly seen when a gutter pan encroaches into the bike lane, effectively narrowing bicycle lanes.

Physical separation should be utilized where greater protection from automobiles is recommended.

Where protected bicycle lanes are recommended on streets with high volume and high speeds, physical barriers, preferably raised curbs, should be installed to separate the bike lane from traffic. This helps ensure that automobiles do not drive in bike lanes, and increases cyclists' feelings of safety. Protected bicycle lanes have been shown to provide a more comfortable experience for cyclists who have the least experience and confidence sharing the road with automobiles. If raised curbs are not feasible for a given project, another form of vertical delineation should be placed in a buffer area width between 6 inches and 2 feet (see New Best Practices on page 49).

Bicycle facilities should accommodate left-hand turning motions.

Left-hand turning motions are often difficult and a source of anxiety for cyclists. There are several ways to accommodate left-hand turns, such as bicycle boxes or two-phase turn boxes. These types of approaches provide clarity to cyclists and motorists on multi-modal interactions at intersections. Additionally, bicycle-specific traffic lights at key intersections could ensure safer movements, but at a higher capital cost.

Conflict areas between automobiles and cyclists should be clearly marked.

Bicycle facilities and automobile facilities coexist, and thereby create potential conflicts where they intersect. Clearly marking these areas with green paint or other approaches to indicate the mixing of modes increases awareness for motorists and cyclists, leading to a safer bicycle facility.

Bicycle lanes should be located along the curb line and on the passenger side of on-street parking and behind bus stops where possible.

Bicycle facilities located on the driver side of on-street parking create a greater risk of "dooring" for cyclists. Additionally, conflicts may occur when vehicles that are parking on street have to cross the bicycle lane to park. Moving the bicycle lane to the curb and on-street parking beyond the bike lane keeps motorists from driving through the bicycle lane. This makes it safer to cycle next to parked cars, and reduces the risk of dooring. This same approach can be applied to bus stops, as shown in Figure 2.5.

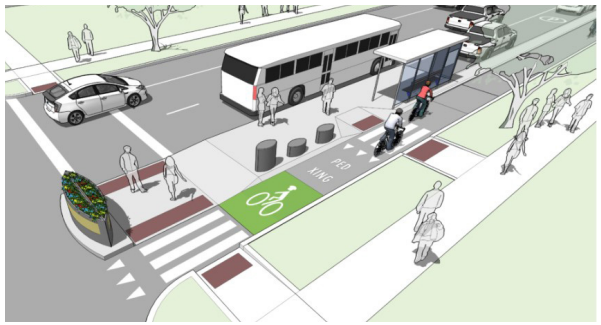


Figure 2.5 Bus Protected Bike Lane

Top: Example of a Tier 1 curb-protected bike lane.

Bottom: A new Tier 2 bike lane on W Main St.

Left: Example of a floating bus stop that protects the bike lane and prevents automobiles and cyclists from crossing paths. It also creates a pedestrian island and provides a safer crossing at the intersection.

For more information, please reference the following sections of the NACTO (National Association of City Transportation Officials) Urban Bikeway Design Guide: Bike Lanes: Conventional Bike Lanes; Buffered Bike Lanes Cycle Tracks: One-Way Protected Cycle Tracks

LESSON LEARNED: DIFFICULTIES OF MARGINAL FACILITIES

The Issue: As the city has begun to deliver some of the newer bike facilities such as dedicated and protected lanes, some of the weaknesses of earlier bike lanes and bike routes have become more obvious. Examples of this are bike routes on arterial streets without dedicated facilities such as shoulders, or early bike lanes that are too narrow or partially in a gutter pan. While there is often limited available right-of-way or budget to have built a higher tier facility, these marginally useful and more dangerous facilities may pose risks that require further reexamination.

The Lesson: Planners should review existing signed bike routes to determine whether they should be upgraded, eliminated, or rerouted. Examples such as bike routes on high-speed arterials that offer no space or protection require particular attention. The City should consider upgrading inadequate or unsafe bike lanes that provide important connections to other facilities and have the roadway space and feasibility to be upgraded.

SHARED BICYCLE ROUTE

Bicycle routes indicate that cyclists and drivers must share the same lane, rather than have a dedicated portion of the road for cyclists. These facilities offer the lowest amount of protection to cyclists in their interactions with automobiles. The following design guidelines ensure that the facility is useful and safe for both cyclists and motorists:

Bike routes are appropriate on two-lane streets with a speed limit of 25 MPH or less.

In order for cyclists to be able to integrate safely into automobile traffic, a low speed limit is required. This allows the cyclists the opportunity to keep up with traffic, and allows drivers to not be concerned about a sharp reduction in speed when driving behind cyclists. A slower speed decreases the risk of collisions, increases the awareness of drivers to the existence of cyclists, and reduces the risk of severe injuries in the event of a collision. Multi-lane streets are typically higher speed corridors for automobiles. Therefore, keeping bike routes on two-lane streets, where a center-turn lane is acceptable, will ensure that cyclists are not put at risk.

Center lines on bike routes should be legally crossable.

The intent of a bicycle route is for motorists and cyclists to use the same facility, where both modes of transportation are viewed as equal vehicles on the road. However, cyclists often travel at a speeds lower than drivers who follow them, and drivers will pass cyclists on the left. In order to make this maneuver legal, bike routes should not be located on streets with a double-yellow centerline. This makes neighborhood streets ideal for bicycle routes.

Bike routes should connect to higher intensity bicycle facilities.

Bicycle routes are appropriate when there is no sufficient right-of-way to accommodate a separated bicycle facility. Bicycle routes should not stand alone, but rather should connect neighborhoods to bicycle facilities that offer a greater level of protection from automobiles.

Example of a new bike sharrow marking in Oklahoma City.

Example of a mini roundabout used to calm traffic to make cycling more safe and comfortable.

For more information, please reference the following sections of the NACTO (National Association of City Transportation Officials) Urban Bikeway Design Guide: Bikeway Signing & Marking: Shared Lane Markings; Bike Route Wayfinding Signage and Markings System

Traffic calming should be used to reduce design speed.

Drivers tend to drive at a speed which feels appropriate and safe, which is sometimes higher than the posted speed limit. In cases where the actual traffic speed is significantly higher than the posted speed limit, traffic calming measures should be utilized to help reduce automobile speeds to a safe level for bike riders.

Sharrows should be high visibility.

The public outreach process of this plan revealed that many drivers do not notice sharrows when driving on bicycle routes. Therefore, to improve driver awareness and cyclist safety, sharrows should be designed to be high visibility through techniques such as green paint backing, reflectors, or dashed outlines.

Sharrows should be painted in the middle of the lane.

Since cyclists are allowed to use the full lane on a designated bicycle route, sharrows should be placed in the middle of the lane, rather than on the right-hand side of the lane. This will ensure that cyclists and drivers know that the full lane is available to the cyclists, and sharrows will not be obscured by on-street parking.

Sharrows should be spaced frequently.

In order to improve cyclist and driver awareness that a street is a designated bicycle route, sharrows should be spaced so they are highly visible to road users. At a minimum, three sharrows should be located per block: one at each end and one in the middle. A good rule of thumb is to space sharrows 80 to 100 feet apart.

"Bike May Use Full Lane" signage should be used.

Drivers and cyclists have expressed confusion about the "Share the Road" signage; therefore, the more direct "Bike May Use Full Lane" sign is preferred.

Bike routes on non-local roads should have shoulders.

Bike routes on non-local streets are an exception to the two-lane/25 MPH speed limit rule discussed above, because these roads will likely have higher speed limits. These routes should have paved shoulders so cyclists and motorists can safely pass each other.

NEW BEST PRACTICES: DIFFERENT WAYS TO PROTECT BIKE LANES

The Issue: bikewalk**okc** called for the city's first ever protected bike lanes and the City has followed through by creating its first ever protected bike lanes on General Pershing Blvd and S Walker Avenue. These protected bike lanes use flexible delineators posts to create a vertical separation. While these are highly visible, they are easily knocked down, which can be a continual maintenance issue. While being relatively affordable, this style of separator also does not create the same feeling of protection for cyclists as some other more intensive applications, which can be important, especially on relatively high speed streets.

The Lesson: Many other communities have diversified their type of bike lane delineation, including the use of planters and curb separation. Both of those have potential applications in Oklahoma City, as well as drawbacks and limitations that need to be studied by staff. Where it is possible, perhaps the separation style that creates the most protection for all users at the lowest cost is parking-protected bike lanes.

Parking-protected bike lanes benefit from having a wall of vehicles to separate the cyclists from the automotive traffic, increasing safety. The use of a buffer space between on-street parallel parking and cyclists can also help avoid issues with car door clearance. The limitation of this design style is that it requires additional right of way that may not be commonly available on city streets. This year Oklahoma City will be installing its first ever parking protected bike lanes on N Lottie Ave.

Bicycle Intersection Types

TYPE 1 - PASS-THROUGH

An intersection application aimed at guiding cyclists through an intersection rather than facilitating a turn onto an intersecting street is called a Pass-Through Intersection. This type of intersection treatment encourages cyclists to continue straight. This treatment is recommended when the intersecting street is high volume and typically high speed, and doesn't have a bicycle facility present. This discourages cyclists from turning onto a street that is less appropriate for on-street cycling and also communicates to automobiles that cyclists may be present. Figure 2.6 below illustrates a possible pass-through intersection. The design of an intersection and the amount of paint used will vary based on field conditions.

TYPE 2 - TURN-THROUGH

An intersection that provides less protection to cyclists than the "protected intersection" (see next page) is appropriate in areas where traffic volumes and speeds are less dangerous to cyclists. These facilities can be implemented in many ways, but the most important concepts should transcend context and be applied at all applicable intersections. Those concepts include:

- Left-hand turn motions for cyclists should be accommodated by the installation of bike boxes (see Figure 2.7), or two-phase turn boxes (also shown in Figure 2.7).
- Conflict areas should be demarcated with high-visibility applications to decrease the risk of collisions. Green paint, white paint, pictographic paint, and signage can draw the attention of drivers and cyclists to one another.

Figure 2.6 Example pass-through intersection

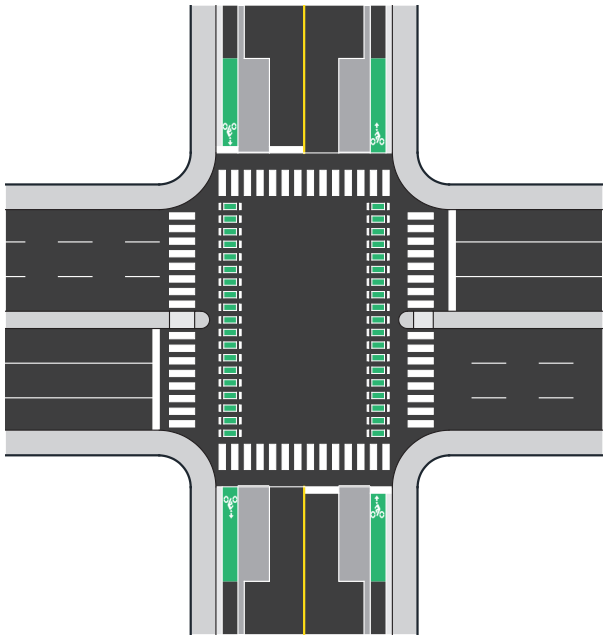
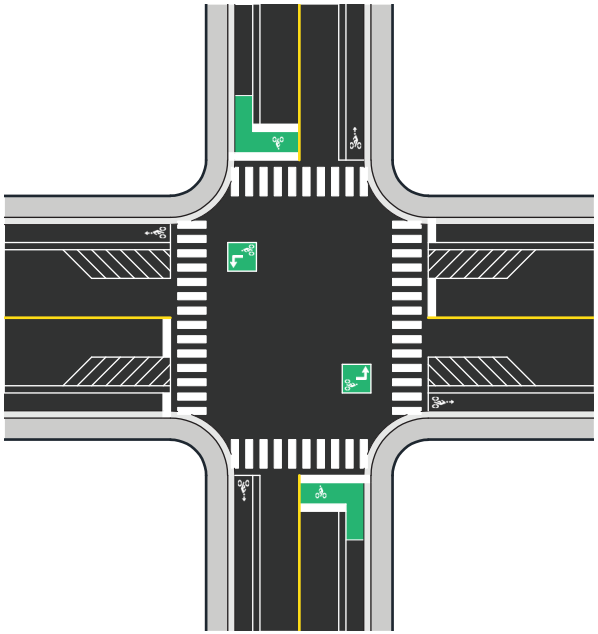
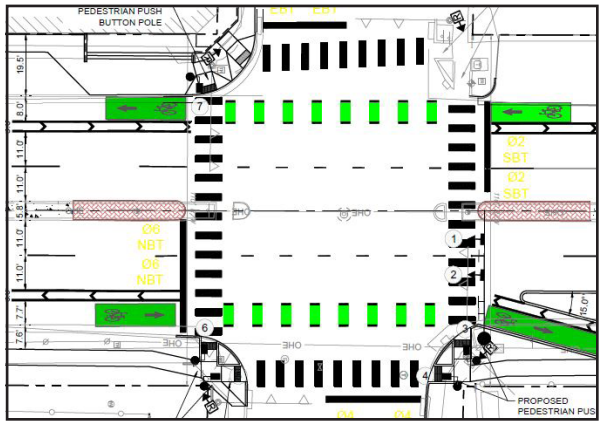


Figure 2.7 Example bike box & 2-phase turn box



Above: Example of a bike box, where drivers must stop at the first white stop bar and a designated area at the head of a traffic lane provides bicyclists with a safe and visible way to get ahead of queuing traffic.

Above: Example two-phase turn box
Below: N Classen Blvd bike lane engineering plans showing a pass-through intersection with green paint



TYPE 3 - PROTECTED

In order to safely facilitate bicycle movements through an intersection, techniques that increase awareness between drivers, cyclists, and pedestrians are required. The level of needed protection is dependent on the volume and speed of traffic on the intersecting streets. The highest level of protection at intersections is needed when two protected bicycle lane facilities intersect perpendicularly. The appropriate approach is what is commonly known as a "protected intersection." Protected intersections are being implemented across the United States after great success in Europe.

A protected intersection provides a dedicated portion of the intersection to cyclists and uses some form of vertical delineation whether bollards, planter boxes, or a curb line, to protect cyclists from turning motions. This type of intersection also allows cyclists to move further forward into the intersection, becoming more visible to drivers. This separation allows cyclists to make right-hand turns safely without needing to stop at the intersection if there are no conflicts with pedestrians (Figure 2.8). Pedestrians also benefit from a protected intersection design because it decreases the distance required to cross the street. Left-hand turns for cyclists are broken into two phases as shown on Figure 2.9.

Above: Protected intersection in Davis, CA.

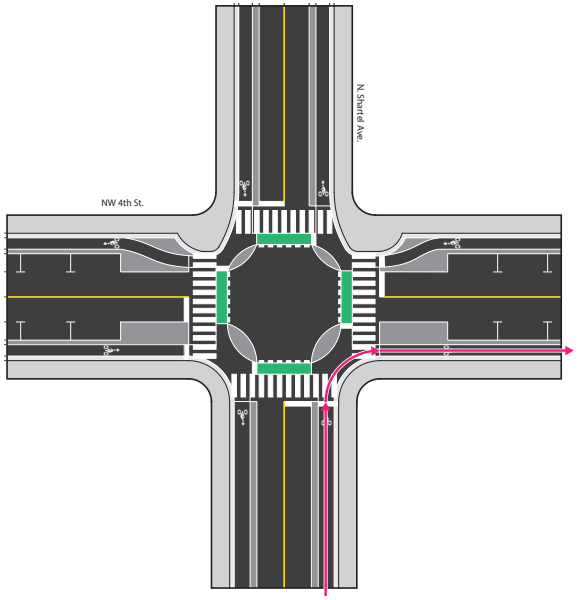


Figure 2.8 Red arrow demonstrates a right turn

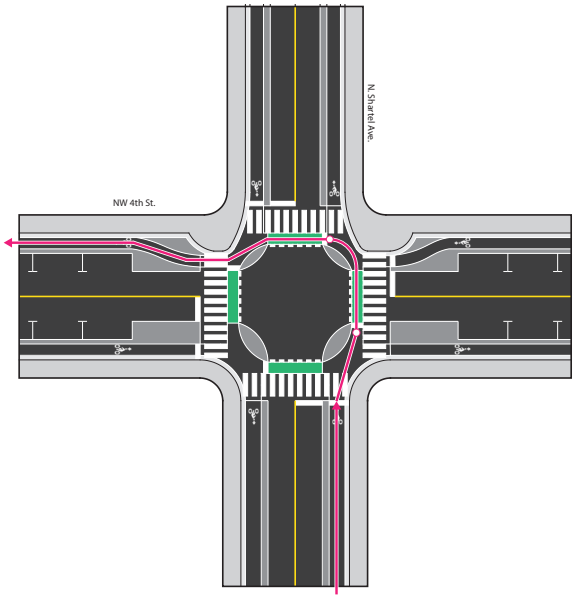


Figure 2.9 Red arrow demonstrates a two-phase left-hand turn

Above: Protected intersection design

LESSON LEARNED: PROTECTED INTERSECTIONS

The Issue: Intersections tend to be the most dangerous locations for bicyclists, and more protection is especially needed where two bike lanes intersect, since a variety of turning motions and vehicle conflicts are more likely. The City piloted its first protected intersection at W Main St and N Western Ave. Because this was a pilot project, permanent curb islands were avoided, so instead the City opted to install small lane dividers called "armadillos" to create physical separation for cyclists navagating through the intersection.

The Lesson: Throughout a timeline of 1-2 years, the armadillos were often driven over by turning vehicles, and they were not proven to be strong enough to withstand the impacts they were faced with, causing constant maintenence issues. The City has now removed the armadillos and is looking for alternative interventions.

As a permanent solution, curb islands should be used to fully integrate protected intersections, as illustrated in bikewalk**okc** and shown in multiple FHWA-recommended guidebooks.

An alternative solution could be the standard flexible delineators used to create protected bike lanes along linear routes. This form of intervention is now a common municipal practice, used to increase intersection safety for all modes by tightening up turning radii and slowing vehicle speeds where conflicts occur.