Appendix 5: Network Planning Approach Memorandum

Fort Worth Active Transportation Plan

April 2019

FORT WORTH®

North Central Texas Council of Governments

Introduction

The Fort Worth Active Transportation Plan establishes infrastructure and policy priorities to improve bicycling and walking conditions in Fort Worth for people of all ages, abilities, and backgrounds. The planning process included an investigation and evaluation of several bicycle network structures and pedestrian priority areas, which led to an overall framework to guide the development of the Active Transportation Plan's infrastructure recommendations. This document:

- describes the principles behind planning, designing, and implementing bicycle and pedestrian networks;
- documents the recommended bicycle network structures and pedestrian priority areas for Fort Worth; and
- lists considerations for connecting active transportation networks to transit networks.

Network Principles

National planning guidance and research informed the development of the bicycle network principles and pedestrian network principles. The bicycle network principles are based on national guidance, including Federal Highway Administration's report entitled "Case Studies in Delivering Safe, Comfortable, and Connected Pedestrian and Bicycle Networks," as well as international guidance such as the CROW Design Manual for Bicycle Traffic, which serves as the primary guide for Dutch bikeway design. Decades of urban design theory have yielded the five pedestrian network principles, which are described further in publishings such as "Measuring the Unmeasurable: Urban Design Qualities Related to Walkability," by Reid Ewing and Susan Handy and "Pedestrian & Transit-Oriented Design," by Reid Ewing and Keith Bartholomew.

Bicycle Network Structures and Pedestrian Priority Areas

Based on the network principles and examples in cities across the country, the bicycle network structures and pedestrian priority areas describe the geography, operations, and implementation of active transportation infrastructure. Of the seven bicycle network structures documented, the project team selected two that best meet the needs and opportunities in Fort Worth. The Active Transportation Plan's existing conditions analysis and project team's desire for an optimum pedestrian network yielded the three pedestrian priority areas. While other types of pedestrian priority areas exist, the project team determined the three shown in this document are the most appropriate ones for the City of Fort Worth.

Network Planning Recommendations

The findings and recommendations of this Network Planning Approach document informed the development and prioritization of the recommended bicycle and pedestrian projects in the Active Transportation Plan. The recommended bicycle network structures guide the planning and design of trails and on-street bicycle facilities, while the pedestrian priority areas highlight areas in Fort Worth that should be prioritized for sidewalk and crossing improvements. Improvements to public infrastructure—including streets, sidewalks, and trails—must comply with the accessibility requirements of the Americans with Disabilities Act. A safe, comfortable, and well-connected active transportation network can accommodate bicycling, walking, and wheelchair trips for people of all ages and abilities. Connections between active transportation and transit networks can yield benefits for both active transportation and transit.

Pedestrian Network Principles

Pedestrian networks are interconnected pedestrian facilities that allow people to safely and conveniently get where they want to go. Complete pedestrian networks should follow these principles:

Accessibility

All sidewalks, trails, crosswalks, and transit services accommodate people with disabilities.

Transparency

Sidewalk users can see or perceive human activity in adjacent buildings via doors and windows.

Enclosure

Outdoor spaces are bounded by buildings, trees, and other architecture to create "outdoor rooms."

Human Scale

Buildings and streets are designed to match the size, perspective, and travel speed of people walking.

Complexity

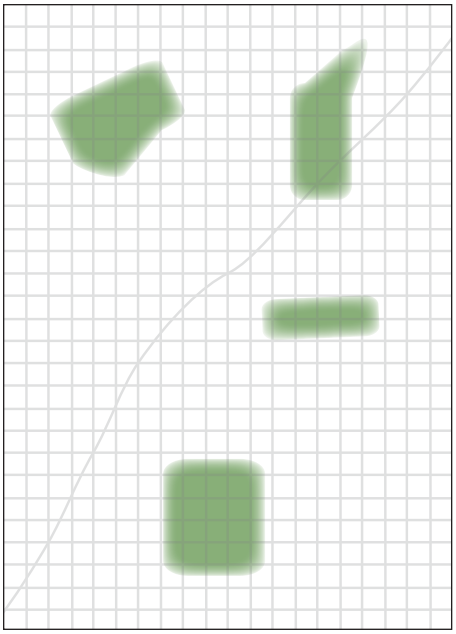
The built environment and social activity are diverse, interesting, and visually engaging.

Imageability

Streets are welcoming, comfortable, and memorable for people traveling by foot.

Pedestrian Priority Areas

The following categories showcase areas where improvements to the pedestrian infrastructure network should be prioritized. Pedestrian priority areas emphasize supporting short-distance travel, connecting people to transit, and encouraging trail use for connections between neighborhoods.

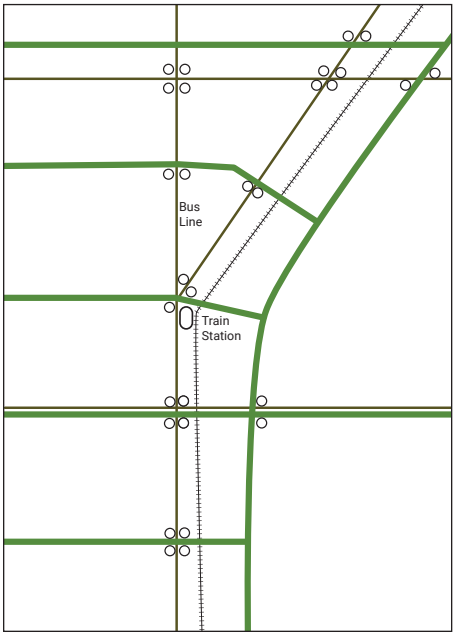


High Demand Areas

What it is: High demand areas are areas with existing or latent demand for pedestrian infrastructure. Latent demand is potential demand that would exist if conditions were different/better. When pedestrian infrastructure is made safer and more comfortable, it can attract walking and wheelchair trips that would have otherwise been made by motor vehicle. Latent demand is positively related to population and employment densities, transit users, existing trail heads, schools, households without access to motor vehicles, and people with disabilities.

Trips accommodated: Short trips around major activity centers.

Considerations: Good approach for spread-out areas with multiple activity centers and can be complemented by strong bicycle and transit networks.

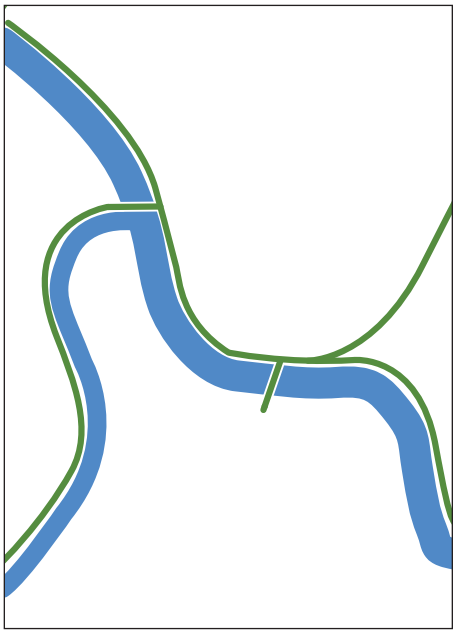


Transit Corridors

What it is: The vast majority of transit trips include travel by walking or wheelchair use. The provision of safe, comfortable, and connected sidewalks and crossings can improve access to bus stops and rail stations.

Trips accommodated: Trips between transit stations, bus stops, and high pedestrian demand areas.

Considerations: Pedestrian facilities can expand the catchment area for transit agencies. Connecting sidewalks and crosswalks to transit stops and stations will result in improved network coverage in many communities with active transit systems, mutually benefiting active transportation and transit, especially for people with disabilities.



Trail Corridors

What it is: Trails follow linear corridors along largely uninterrupted routes across large sections of a community. Trail networks frequently rely on rail, utility, or river corridors.

Trips accommodated: Since trails are typically fully separated from motor vehicle traffic, they accommodate a wide range of users, including children, seniors, and people with disabilities. However, connectivity to destinations is often limited, reducing usefulness for transportation trips. Trail corridors are commonly used for longer pedestrian trips.

Considerations: Providing frequent spurs from a trail to local pedestrian facilities can increase the trail's function as a transportation corridor. Excessive bicycle and pedestrian volumes on popular trails may warrant wider trails and separation of modes.

Connectivity to Transit

Improvements to a community's pedestrian and bicycle networks can be mutually beneficial to its transit system, enhancing multimodal safety and increasing the number of people walking, bicycling, and taking transit. Connections between pedestrian, bicycle, and transit networks can support trips that combine multiple modes. To make multimodal trips safer and more attractive, connections to and amenities at transit stops and stations must accommodate people walking, bicycling, and using wheelchairs. Unsafe or uncomfortable conditions for active transportation may deter transit use or prevent it altogether. In fact, the 1990 American with Disabilities Act prohibits the discrimination of people with disabilities, including the design and construction of all public transportation infrastructure. Pedestrian and transit facilities must accommodate people with disabilities.

Sidewalks, trails, bikeways, and crossings that expand the active transportation network while enhancing the transit network should be major priorities for the City of Fort Worth. Active transportation connectivity to transit can be grouped into the three categories described below.

Transit Stops

- Every bus stop must provide access via an 8'x5' boarding and alighting area, an accessible route, and a 4'x2.5' waiting space for wheelchair users in the bus shelter, if present.
- Transit-friendly street design features at transit stops include curb extensions, floating bus stops, shelters and benches, and lighting.
- Secure bicycle parking, bikeshare services, and real-time transit information can further enhance pedestrian and bicycle connectivity to transit.

Routes To/From Transit Stops

- Accessible routes complying with the American with Disabilities Act must be provided to accommodate trips to and from transit stops by people with disabilities, which also benefit children and seniors.
- Sidewalks, bike lanes, and crosswalks can fill the gap between a person's transit stop and their origin or destination.
- Access sheds around transit stations (described on page 6) should be defined to guide the development of bicycle and pedestrian infrastructure projects.

Supportive Land Use

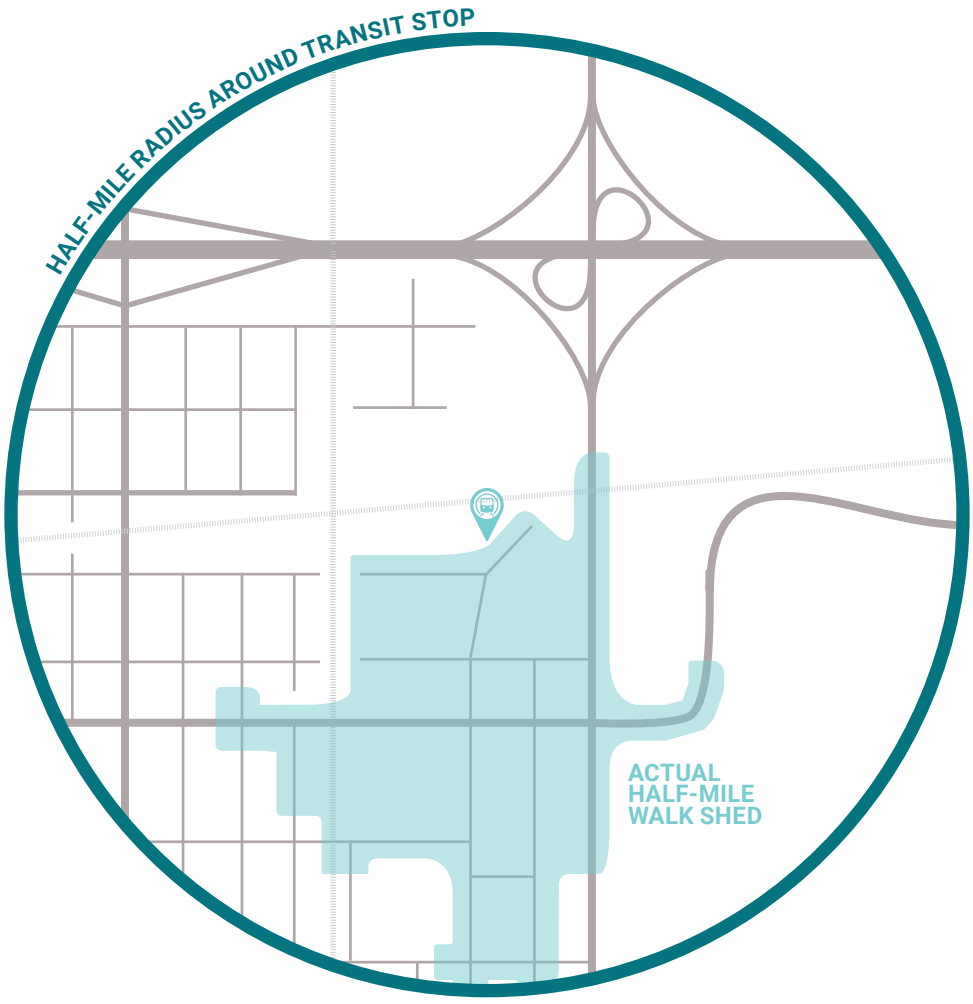
- Station location planning should include an assessment of built-form conditions including ownership and assembly patterns, future growth scenarios, and physical impact on property development.
- Land use codes and station area plans should comply with the "Five Ds" of transit planning: density, design, diversity, distance to transit, and destination connectivity.
- Transit providers should adopt urban design standards to promote community identity. Strategies include human-scale development, community amenities, distinctive identifying features, cultural context, and seamless neighborhood connections.

Access Sheds

Access sheds define reasonable travel areas around transit stops. Also known as catchment areas, access sheds vary in size depending on the transportation mode. For instance, the Federal Transit Administration states that pedestrian improvements within half a mile of a transit stop and bikeway improvements within three miles of a transit stop serve as connections to transit.

Access sheds can also vary in shape depending on how reasonable travel distances are defined. In more traditional access shed analyses, a pedestrian access shed may be defined as any area within a certain distance of a transit stop, as the crow flies. However, transportation planners are increasingly using network analysis to determine how far a pedestrian could walk given the existing street network or the existing sidewalk and trail network. The figure below is an illustrative example that compares access sheds using these two different definitions. Communities can establish their own travel distance thresholds given local context and activity.

The consideration of transit access sheds supported the selection of bicycle network structures and pedestrian priority areas, informed the identification and prioritization of active transportation infrastructure projects, and will guide the design and implementation of those projects in the future. Filling small gaps and overcoming barriers can greatly expand and improve bicyclist and pedestrian access to transit while leveraging the existing active transportation network. Providing connections is particularly impactful where major barriers, manmade and natural, increase trip distances or prevent active transportation trips altogether.



Bicycle Network Principles

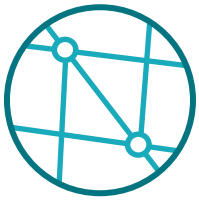
Bicycle networks are interconnected bicycle facilities that allow people to safely and conveniently get where they want to go. Complete bicycle networks should follow these principles:

Safety

The frequency and severity of crashes are minimized and conflicts with motor vehicles are limited.

Comfort

Conditions do not deter bicycling due to stress, anxiety, or concerns over safety for bicyclists of all ages and abilities.



Connectivity

All destinations, including transit stops, can be accessed via the bicycle network and there are no gaps or missing links.

Equity

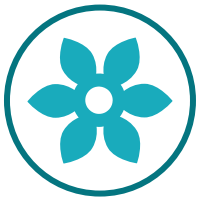
All communities are able to use the bicycle network to easily and directly access destinations.

Directness

Routes are direct to minimize bicycling trip distances and times.

Cohesion

Distances between parallel and intersecting bikeways are minimized.



Attractiveness

Bikeways direct bicyclists through lively areas and personal safety is prioritized.

Unbroken Flow

Delays from stopping at intersections and getting around barriers are reduced or eliminated.

Networks Based on Facility Types and Expected Users

Bicycle networks may be comprised of different types of bicycle facilities that provide bicyclists with varying degrees of separation from motor vehicle traffic. While there may be practical reasons for implementing networks with different types of facilities, these choices will impact the number and types of riders that should reasonably be expected to use the network. Intuitively, a network consisting of separated bike lanes and bicycle boulevards will attract substantially more bicyclists than the same network structure consisting of bike lanes and shared lane markings. The percentage of Americans who might be expected to use each network type, listed below, are derived from Jennifer Dill's and Nathan McNeil's "Four Types of Cyclists? Examination of Typology for Better Understanding of Bicycling Beheavior and Potential" and "Revisiting the Four Types of Cyclists: Findings from a National Survey."

Shared Lane Markings (Sharrows)

Striped Bike Lane

Separated Bike Lane

Traffic-Tolerant Bicycle Network

Facility types: Primarily shared roads

Expected users (% of population): Highly confident (4-7%)

Potential bicycle mode share: 1% (based on national and international examples)

Examples: Numerous U.S. cities with this network type

Level of Comfort: Very Low

NCTCOG Regional Survey Citizen Preference: Low

Basic Bikeway Network

Facility types: Primarily bike lanes

Expected users (% of population): Somewhat confident (5-9%), highly confident (4-7%)

Potential bicycle mode share: 2-3% (based on national and international examples)

Examples: Tucson, AZ (2.6%), Philadelphia (2.2%) (current Census bicycle commute mode share statistics)

Level of Comfort: Medium

NCTCOG Regional Survey Citizen Preference: Moderate

All Ages and Abilities or Low-Stress Bicycle Network

Facility types: Separated bike lanes, shared use paths (trails), bicycle boulevards, and bike lanes - buffered or otherwise (where appropriate)

Expected users (% of population): Interested but concerned (51-56%), somewhat confident (5-9%), highly confident (4-7%)

Potential bicycle mode share: 5-50% (based on national and international examples)

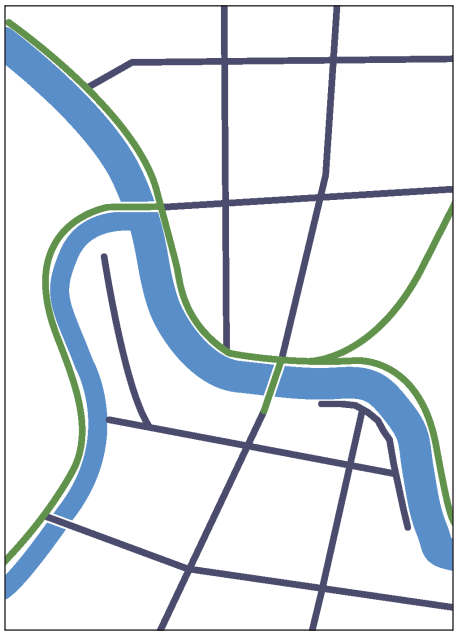
Examples: Davis, CA (16.6%), Boulder, Co (9%), Portland, OR (6.3%); Numerous European examples (current Census bicycle commute mode share statistics)

Level of Comfort: High

NCTCOG Regional Survey Citizen Preference: Very High

Recommended Bicycle Network Structures

To reflect Fort Worth's multiple centers, take advantage of the existing trail system, and address the eight bicycle network principles (see page 2), the bicycle network structures recommended for the Fort Worth Active Transportation Plan are the **Skeleton Network** and **Connected Neighborhood Networks**. The combination of high-comfort trails, on-street and street-adjacent bicycle facilities, and neighborhood networks will support daily neighborhood trips, connect city activity centers, and provide long-distance routes for people bicycling.

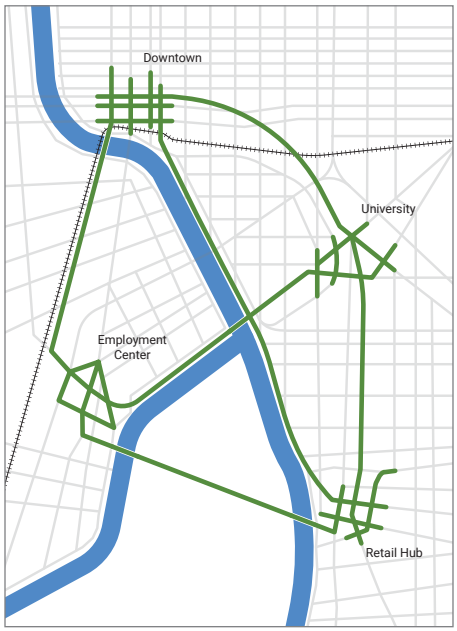


Skeleton Network (Spine & Ribs)

What it is: A spine corridor supports uninterrupted longer-distance trips and "ribs" provide connections to local destinations. The ribs are often on-street facilities connecting to a trail spine, but may also be trails.

Trips accommodated: The skeleton network supports both recreational trips along the spine and transportation trips using the ribs.

Considerations: The range of users supported depends on the quality and separation from motor vehicles of the facilities and density of the on-street facilities. Ribs should be spaced as regularly as practicable to connect neighborhoods and local/regional destinations to the network. Distance between ribs will likely exceed the distance between parallel bike routes in the Grid Network.



Connected Neighborhood Networks

What it is: Neighborhood networks connected by "distributor routes" across the city.

Trips accommodated: Serves local transportation trips and recreational trips (e.g. to parks) as well as crosstown trips to other neighborhoods and employment centers.

Considerations: May benefit cities with large land areas and multiple activity centers and neighborhoods with active local retail. The quality of the network depends on the quality of the facilities and connectedness of local networks. Some riders may have to go out of their way to access the distributor route.

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