APPENDIX F

F

ACTIVE TRANSPORTATION PLAN

Corpus Christi Metropolitan Planning Organization

ACTIVE TRANSPORTATION PLAN

Approved by the Transportation Policy Committee – December 5, 2024

CORPUS CHRISTI MPO
METROPOLITAN PLANNING ORGANIZATION

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EXECUTIVE SUMMARY

PLAN PURPOSE

The Active Transportation Plan presents a shared vision for the development of a safe and functional Active Transportation Network of pedestrian and bicycle facilities and amenities within the Corpus Christi Metropolitan Planning Area (MPA).

The Active Transportation Plan provides a comprehensive assessment of current mobility issues, needs, trends and priorities and serves as a framework for the cities within the Corpus Christi MPA to make informed decisions regarding active transportation infrastructure, policies and investments. The Active Transportation Plan outlines goals and objectives that guide the network development, as well as recommendations and implementation strategies that integrate the concepts of Complete Streets and Micro-Mobility.

PLAN DEVELOPMENT

The Active Transportation Plan is structured in the following main elements:

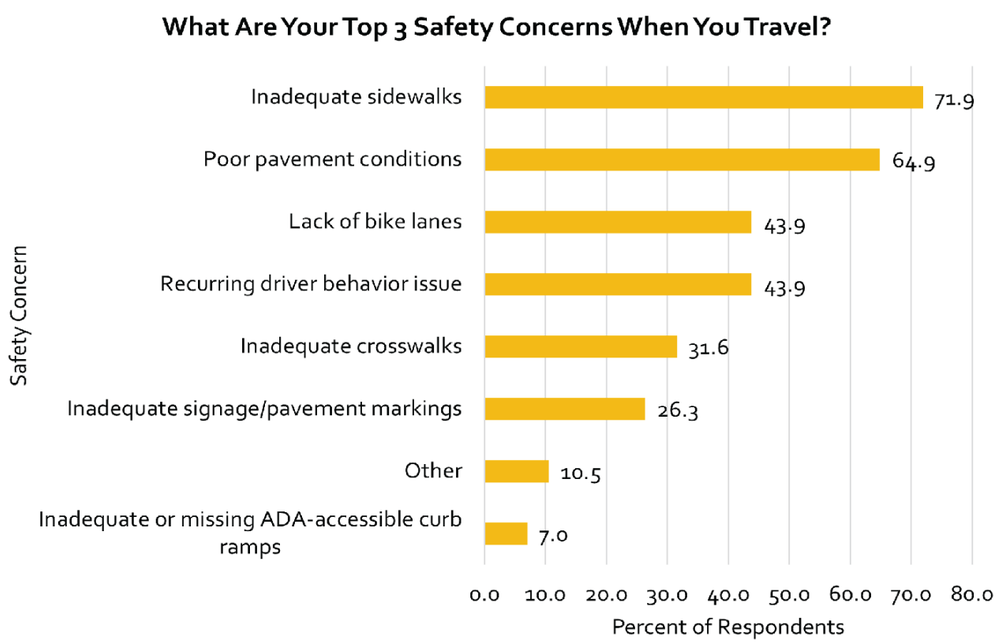
Review of Existing Conditions, Plans and Codes

The Active Transportation Plan's vision, goals and objectives were defined, and existing pedestrian, bicycle, transit and traffic data were collected. Current and previous plans and codes were reviewed to document existing active transportation policies and efforts, identify opportunities and ensure that proposed recommendations support broader objectives.

Public and Stakeholder Input

The public involvement process included in-person and virtual meetings with key stakeholders from municipalities and environmental justice advocacy groups, committee meetings, meetings with the general public and an online public survey with an interactive mapping activity.

Exhibit ES-01: *Main Safety Concerns when Using Active Transportation, according to survey respondents*



Source: Corpus Christi MPO Active Transportation Survey Results

Active Transportation Network Development

The network planning and development phase included analyzing and assessing the existing bike and pedestrian (bike/ped) network, incorporating local plans and Capital Improvement Program projects, identifying priority network connections and selecting bike/ped facilities.

Recommendations and Implementation Plan

The Active Transportation Plan provided recommendations on facility design and policy, a project listing with a proposed implementation schedule, the recommended priority network and policy/code language for active transportation elements.

KEY OBSERVATIONS

Identified Issues and Needs

Based on public input, stakeholder comments, consultant team analysis, and general observations, the following insights were made on the current state of active transportation in the Corpus Christi MPA:

Sidewalks and Crosswalks

Urbanized areas typically have sidewalks on both sides of the street in residential neighborhoods, but many older sidewalks are only 4 feet wide, lack maintenance and connectivity and are often not ADA-compliant. Sidewalks along arterial roads often lack sufficient buffer from traffic. Crosswalks are almost always provided at signalized intersections but are often spaced too far apart for convenient pedestrian access.

Bicycle Facilities

Before 2016, bike lanes in the Corpus Christi MPA were built without considering adjacent traffic speeds and volumes. The adoption of the Strategic Plan for Active Mobility in 2016 led to a focus on off-street and low-volume/low-speed roadway bicycle facilities, resulting in a mostly discontinuous bicycle network.

Public Activism, Environmental Justice and ADA Advocacy

Public input and stakeholder interviews revealed that the cycling community prefers protected bike facilities and that they are frustrated with their voices not being heard regarding walking and bicycling safety. Representatives of organizations that support disadvantaged groups and promote environmental justice expressed concerns regarding the general lack of well-maintained and ADA-compliant sidewalks, bicycle facilities and bike/ped amenities such as benches, bike racks, shaded areas and shelters.

Safety

Driver behavior towards cyclists was also an issue. Concerns with safety in the Corpus Christi MPA were mostly raised regarding the lack of sidewalks and separation between bike/ped users and traffic, especially on higher-speed/higher-volume roadways. Safety at bus shelters and in public transit was also highlighted as an issue that discourages pedestrians and bicyclists from using public transit and its amenities.

Opportunities

Several opportunities for bike/ped improvements have been identified that can aid in the development of the proposed Active Transportation Network. The opportunities include, but are not limited to:

- Capital Improvement Program (CIP), Infrastructure Maintenance Program (IMP) and Bond Program Projects
  - CIP, IMP and Bond Projects in the City of Corpus Christi and CIP projects in the City of Portland include bike/ped improvements that were incorporated into the proposed Active Transportation Network
- Local Plans
  - Area Development Plans (ADPs) include a listing of short-, mid- and long-term projects focused on bike/ped improvements that were incorporated into the Active Transportation Plan network
- New Harbor Bridge and Trestle Bridge
  - The new Harbor Bridge will have a shared-use path (SUP) along the bridge's east side and landings with SUP connections to the existing local street network
  - Funding has been allocated to construct a hike and bike trail atop the railroad trestle foundations over Oso Bay
- Complete Streets
  - To provide dedicated space on a roadway to create areas where bicyclists feel safe to ride, adaptaptation of the eixisting pavement allocations to motor vehicles can be accomplished using pavement markings to provide sufficient motor vehicle capacity while dedicating lanes and buffers for bicycling
  - The provision of bike lanes along a roadway can provide and extra level of comfort for pedestrians walking along the street
  - Where there are currently no sidewalks, the provision of a sidewalk along one or both sides of the street can greatly enhance the safety and mobility of pedestrians
  - Provision of shared use paths along busy arterials can provide essential active transportation links to local desinations and to cross physical barriers and busy streets

PLAN RECOMMENDATIONS

Network of Designated Facilities

Recommendations were created to address identified issues and needs from key stakeholders and the public and to leverage upcoming opportunities. The recommended Active Transportation Network map is shown on the right. The facilities are categorized as on- or off-street to accommodate users of different comfort levels and in different contexts:

Network Formulation

The Active Transportation Network development process considered the following steps:

- Expanding upon what works - extend existing trails, add more shared-use paths, trails and protected bikeways along roadways
- Enhancing what exists - transitions, ADA-compliance
- Adding local connections - parks, schools, Area Development Plans
- Creating a core network - key attractions, destinations
- Accommodating multiple user groups - local trips as well as longer-distance travel

The network is divided into a listing of short-term, medium-term and long-term projects in Chapter 5: Recommendations and Implementation.

Sidewalk Network

A program of sidewalk network enhancements and expansion is recommended, as described in Chapter 4: Active Transportation Network Development in the Corpus Christi MPA.

Policies and Programs

A set of code, policy and program recommendations are proposed to promote the funding, implementation and maintenance of the Active Transportation Network.

Supporting information is provided in Appendix A: Complete Streets Program Guide, Appendix C: Micro-Mobility Plan and Ordinance and Appendix G: Funding Opportunities.

Prioritization Heirarchy

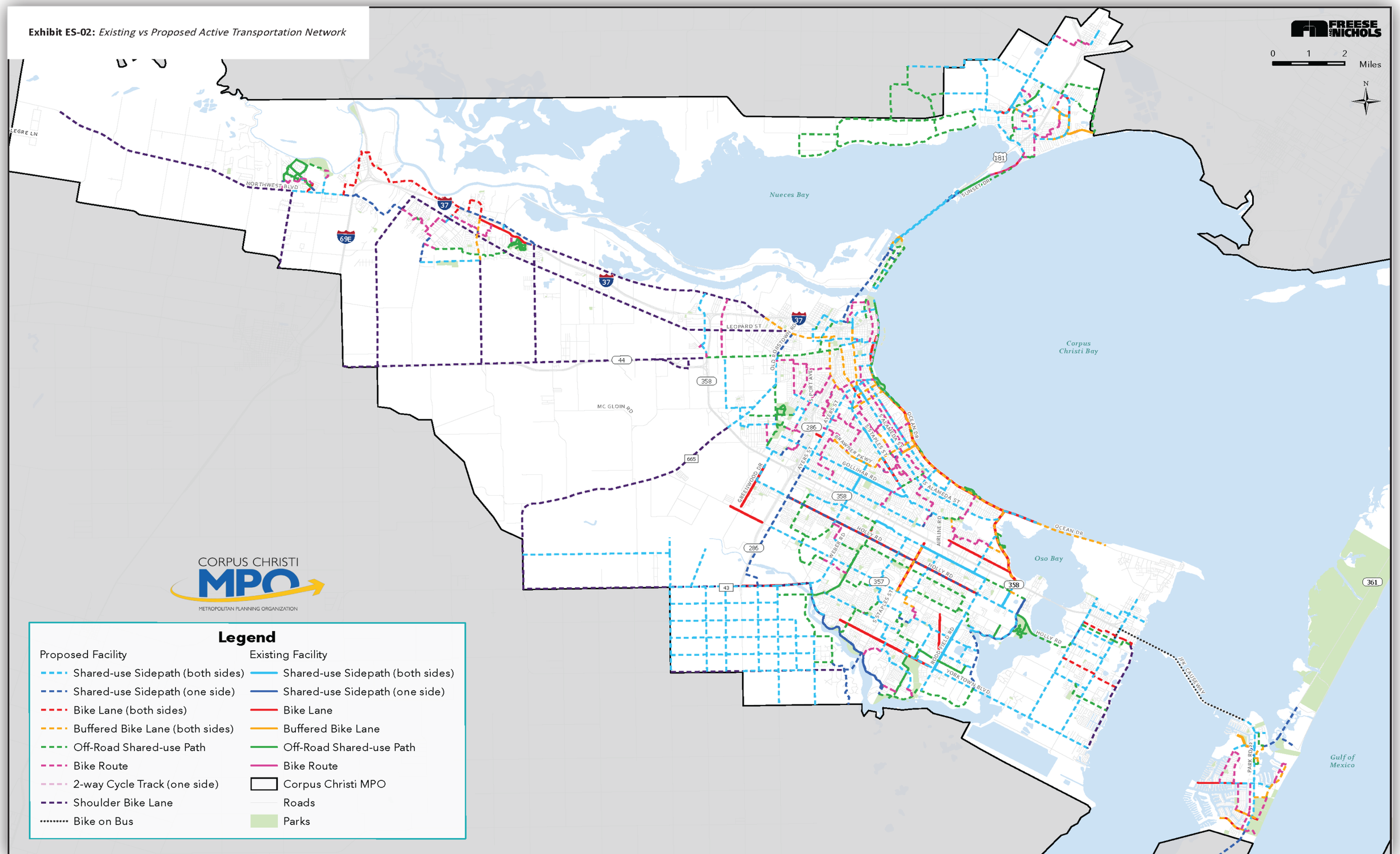
A three-tier hierarchy for prioritization of the advancement of the network of active transportation faciltities, as described in Chapter 5:

Tier I - The primary network of trails, shared use paths and bike lanes that provide connectivity to the high profile desinations and locations in the region. The elements of the Tier I network should be continuously advanced for funding and implementation of a high quality network.

Tier II - The second tier of projects, though equally important, would be completed in conjunction with ongoing CIP projects. These active transportation elements may advance short segments of the larger network to a logical intermin terminus.

Tier III - The third tier includes the remaining trails, shared use paths, bike lanes and routes that connect neighborhoods, schools and parks. These would be implemetned as opportunities arise in conjuction with development of adjacent land and as special funding becomes available under state and federal programs for active transportation and parks.

Exhibit ES-02: *Existing vs Proposed Active Transportation Network*



CORPUS CHRISTI MPO
METROPOLITAN PLANNING ORGANIZATION

Legend

Proposed Facility	Existing Facility
Shared-use Sidepath (both sides)	Shared-use Sidepath (both sides)
Shared-use Sidepath (one side)	Shared-use Sidepath (one side)
Bike Lane (both sides)	Bike Lane
Buffered Bike Lane (both sides)	Buffered Bike Lane
Off-Road Shared-use Path	Off-Road Shared-use Path
Bike Route	Bike Route
2-way Cycle Track (one side)	Corpus Christi MPO
Shoulder Bike Lane	Roads
Bike on Bus	Parks



1. INTRODUCTION

1. INTRODUCTION

This chapter provides a summary of the 2050 Regional Active Transportation Planning process.

PLAN PURPOSE

The Active Transportation Plan presents a shared vision for the development of a safe and highly functional Active Transportation Network of pedestrian and bicycle facilities and amenities within the Corpus Christi MPA.

The Active Transportation Plan provides a comprehensive assessment of current mobility issues, needs, trends and priorities and serves as a framework for the cities within the Corpus Christi MPA to make informed decisions regarding active transportation infrastructure, policies and investments. The Active Transportation Plan outlines goals and objectives (Exhibit 1-03 on page 1-2) that guide the network development, recommendations and implementation strategy that integrate the concepts of Complete Streets and Micro-Mobility.

PLAN BACKGROUND

The Corpus Christi Metropolitan Planning Organization (MPO) worked with local governments and partner agencies to develop a comprehensive bicycle and pedestrian facility inventory, a data-driven needs assessment, extensive public outreach and stakeholder engagement and a thorough review of relevant case studies. This Active Transportation Plan serves as a guide for regional collaboration and standards for the region's future network.

WHAT'S IN THE ACTIVE TRANSPORTATION PLAN

The Active Transportation Plan includes an inventory of existing and planned active transportation facilities, an analysis of existing data and policies, summary of public and stakeholder engagement, guidance and recommendations on facility design and policy (the Complete Streets Program Guide in Appendix A), recommended priority network and an implementation plan with project priorities.

ABOUT THE CORPUS CHRISTI MPO

The Corpus Christi MPO serves as the MPO for Nueces and San Patricio Counties. The Corpus Christi MPA (Exhibit 1-01) encompasses the entire existing urbanized area and contiguous area anticipated to become urbanized within a 20-year forecast period. The MPA is the area to which transportation planning funds are allocated and where the Corpus Christi MPO coordinates regional transportation planning initiatives with counties, cities, the Corpus Christi Regional Transportation Authority (CCRTA) and the Texas Department of Transportation (TxDOT).

VISION, GOALS AND OBJECTIVES

The vision statement in Exhibit 1-02 outlines the overarching aspirations and desired future outcomes upon which goals and objectives are built. It provides high-level guidance focusing on the pragmatic balance between the aspirations and current realities. The vision sets the tone and direction for strategic initiatives, fostering alignment and clarity in organizational purpose.

Goals serve as outcome-based, broad statements that encapsulate longer-term aspirations. They are concise, straightforward and relatable, guiding efforts toward tangible achievements. Aligned with local and regional objectives, goals provide a clear direction for strategic planning and action, ensuring coherence and synergy across various initiatives.

Objectives outline specific, measurable targets that break down larger goals into manageable components, providing a clear roadmap for implementation and progress tracking. They are characterized by their clarity, specificity and relevance to the Active Transportation Plan's overarching goals. Objectives are often designed using the SMART criteria — specific, measurable, attainable, relevant and timely — to ensure they are realistic and actionable. The goals and objectives of this Active Transportation Plan are outlined in Exhibit 1-03 on page 1-2.

Exhibit 1-02: *Vision Statement*

Vision Statement

The Corpus Christi MPO region is seen by residents and visitors as a safe place where walking and biking represent a viable and resilient travel option for all, regardless of age, ability, race, ethnicity, or income.

Exhibit 1-01: *Location of the Study Area*

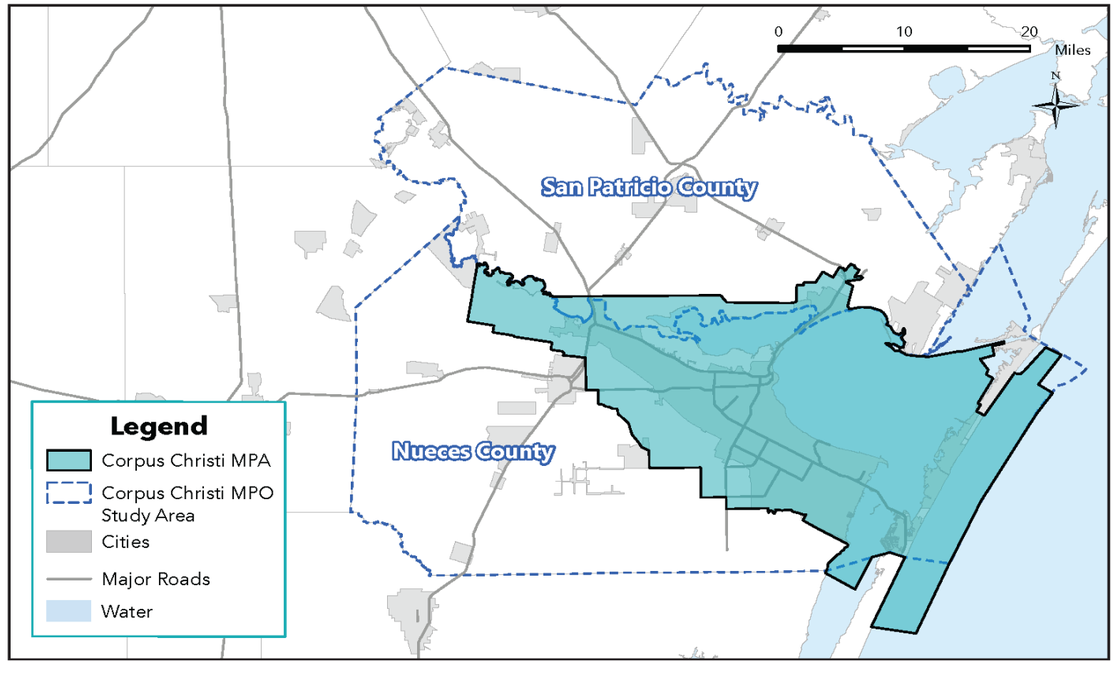


Exhibit 1-03: *Goals and Objectives*

Goal: Safety

Eliminate fatalities and reduce serious injuries for active transportation users

Objectives

A. By 2050, eliminate all traffic fatalities and reduce severe injuries by 50% compared to the 2023 baseline.

B. By 2028, secure an increasing proportion of safety funding for active transportation.

C. By 2028, ensure utilization of the National Association of City Transportation Officials (NACTO) Urban Street Design Guide and the Complete Streets Design Manual for all local project designs to support bike/ped projects that create a low-stress network for bike/ped users and use context-sensitive design.

D. By 2028, complete an inventory and conditions assessment of the existing Active Transportation Network, prioritize noted deficiencies and establish procedures for monitoring conditions and updating the assessed inventory.

Performance Measures

- Fatal and serious injury crashes within the Corpus Christi MPO region
- Annual funding for safety projects related to active transportation
- Local adoption of Active Transportation Plan and its design guidance elements
- Inventory of Active Transportation Network and conditions, with priorities for improvements

Goal: System Performance

Improve active transportation connectivity and mobility

Objectives

A. Annually create 5 miles of new on-street protected bicycle facilities or off-street bike/ped facilities within the Corpus Christi MPA.

B. Annually construct or repair 5 miles of Americans with Disabilities Act (ADA)-compliant sidewalks within the Corpus Christi MPA.

C. Increase active transportation activity within the MPA by implementing improved or new bike/ped connections to residential areas, community facilities, shopping areas, tourist attractions, employment concentrations, greenways and regional parks. Enhance the user experience by providing amenities (physical and visual) and wayfinding along the route.

Performance Measures

- Miles of on- and off-street bicycle facilities/trails
- Miles of ADA-compliant sidewalks
- Active Transportation mode share data (U.S. Census American Community Survey (ACS) dataset)

Goal: Promote Activity

Promote use of active transportation for healthy lifestyle

Objectives

A. Annually promote and actively participate in nationally recognized active transportation events, such as Bike to Work Week or Walk to School Day.

B. Annually promote and acitvely participate in local events focusing on active transportation such as Bike the Bay.

C. Annually promote the benefits of active transportation.

D. Annually promote driver education and awareness of bicyclists and pedestrians using our roadways.

Performance Measures

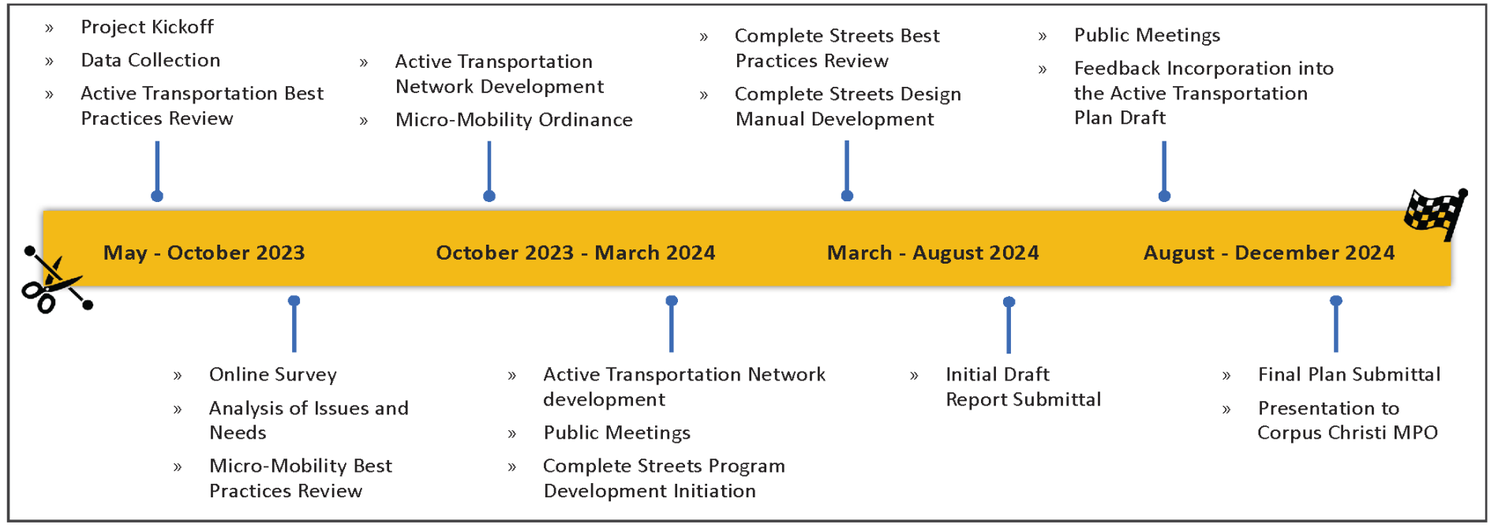
- Number of occasions or events promoted by MPO or member cities
- Number of participants in bicycle/pedestrian events
- Number of promotional or instructional items regarding bicycle/pedestrian benefits or safety

PLANNING PROCESS AND TIMELINE

The development of the Active Transportation Plan was an 18-month process involving extensive public and stakeholder involvement to obtain the vision and goals of the project, data collection, analysis and review. Outlining the sequence of activities and key milestones illustrates the thoughtful and systematic approach undertaken to ensure the project's success.

The timeline of the project was from May 2023 until October 2024 and served as a roadmap for guiding the project through its various stages and ensuring that all objectives were met within the set timeframe. Exhibit 1-04 outlines each phase in the planning process and its place on the project timeline.

Exhibit 1-04: *Plan Development Timeline*



ACTIVE TRANSPORTATION IN THE CORPUS CHRISTI MPA

Elements of a High-Quality Transportation Network

The overall investment in streets rights-of-way and full spectrum of user needs must be considered when transportation investments are constructed or reconstructed. A decision-making framework can then be constructed which prioritizes different modes based on land-use context and the hierarchy of functional purposes of the road.

There are well documented differences in the experience of non-motorized users on roads with 20 mph, 25 mph, 35 mph and 45 mph speed limits. Additional guidance is needed for when and how to construct or retrofit these roads. Roads that are designed with only vehicles in mind often yield higher than desired free flow speeds and makes creating a connected Active Transportation Network significantly more expensive and difficult. A high-quality Active Transportation Network is a cornerstone of resilient communities and involves integrating a series of essential elements that promote equity, health and safety, accessible design, connectivity and coordination of citizens and public institutions.

By addressing these critical components, cities can create an environment that encourages walking, cycling and other non-motorized forms of transport, ultimately enhancing the quality of life for all residents. For more information about elements of a high-quality Active Transportation Network with visual examples, please refer to the Street Design for Active Transportation section on page 4-1, or the Appendix A: Complete Streets Program Guide.

Benefits of Active Transportation

- It provides an opportunity for physical activity
- Children who walk or ride to schools are more independent and more likely to continue healthier lifestyles
- Healthier communities reduce the impacts on our healthcare systems
  - Reduces population obesity rates and reduces the chance of heart disease
  - Improves mental wellbeing with links to reduced anxiety and depression
- It enhances social connections and engagement with the local community

Previous Planning Initiatives

Planning for active mobility requires consideration of citywide and local plans to ensure equity and connectivity when developing a comprehensive walking, biking and rolling network. All the plans reviewed are listed in Exhibit 1-05. This Active Transportation Plan builds upon previous plans and studies conducted by municipalities and other agencies. Plans most essential to the Active Transportation Plan are further explored in the Review of Existing Plans and Codes section beginning on page 2-5.

Exhibit 1-05: *List of Reviewed Plans*

Name	Agency
2016 Strategic Plan for Active Mobility (SPAM)	Corpus Christi MPO
Metropolitan Transportation Plan (MTP)	
Program for Addressing Discrimination (PAD)	
2023-2026 Regional Safety Action Plan (Draft)	
Comprehensive Plan (Plan CC)	City of Corpus Christi
Parks, Recreation & Open Space Master Plan	
Bayside Area Development Plan	
Downtown Area Development Plan	
Flour Bluff Area Development Plan	
London Area Development Plan	
Southside Area Development Plan	
Westside Area Development Plan	
Northwest Boulevard (FM 624) Corridor Plan	
Padre/Mustang Island Area Development Plan	
Padre/Mustang Island Mobility Plan	
TIRZ #3 Traffic and Planning Analysis	
Mobility CC	
ADA Master Plan	
Bus Stop and Transfer Facility ADA Assessment	CCRTA
Fleet Forward 2022 Report	
Comprehensive Plan (Plan Portland 2040)	City of Portland
Campus Master Plan	Texas A&M University Corpus Christi
2022 ADA Self-Evaluation and Transition Plan	TxDOT
Texas Bicycle Tourism Trails Study 2018	
Public Right-of-Way Accessibility Guidelines	U.S. Department of Justice

COMPLETE STREETS AND MICRO-MOBILITY OVERVIEW

Complete Streets Overview

Federal Highway Administration (FHWA) states that the goal of Complete Streets is to offer an equitable, comfortable, connected and safe transportation network that serves pedestrians, bicyclists, public transportation users, children, older individuals, individuals with disabilities, motorists and freight vehicles. Complete Streets are designed with the safety and comfort of all road users, as well as the natural and human environment, in mind. To achieve this, planning, implementation and evaluation efforts prioritize safety, connectivity, equity and sustainability throughout the transportation network.

Building Complete Streets involves planning, designing, constructing, maintaining and operating roadways and public rights-of-way with all users in mind to make the transportation network safer. While Complete Streets use a multimodal approach that factors in a variety of transportation modes (walking, biking, rolling, driving, ridesharing, transit, freight delivery and more), there is no one-size-fits-all approach for Complete Streets. What a Complete Street looks like in practice will vary depending on community context and needs. It is not always possible to accommodate all modes on a single street due to right-of-way and other constraints. A practical approach to Complete Streets also focuses broadly on building Complete Networks to provide connectivity for different modes of travel. Complete Networks may use parallel routes to facilitate access that variously prioritizes different modes throughout an area while ensuring the safety of all roadway users. Creating Complete Streets also requires safety data analysis and safety countermeasure identification and implementation.

Complete Streets is a key component of FHWA's implementation of the Safe System Approach, which is the framework of the USDOT's new comprehensive National Roadway Safety Strategy (NRSS). The NRSS establishes an ethical imperative that no one should die or be seriously injured while using the street network. The NRSS also provides concrete steps that the U.S. Department of Transportation (USDOT) will take to address this crisis systemically and prevent roadway deaths and serious injuries.

Micro-Mobility Overview

Micro-mobility refers to the use of small, lightweight vehicles, such as electric scooters, bicycles, electric bikes and small electric vehicles, for short-distance trips. While these vehicles are often available through sharing services, allowing users to rent vehicles for short periods and return them at designated locations, private ownership of electric scooters is much more common than rental usage. Micro-mobility has gained popularity in many cities worldwide as these smaller vehicles help reduce traffic congestion, improve air quality and promote healthy, active lifestyles. However, challenges such as safety, infrastructure constraints, funding, resiliency and regulatory development and oversight remain key considerations for widespread adoption.

SYSTEMIC ISSUES AND NEEDS

The following insights on the current state of active transportation in the Corpus Christi MPA were made based on public input, stakeholder comments, consultant team analysis and general observations.

Sidewalks

Urbanized areas typically have sidewalks on both sides of the street in residentially developed neighborhoods. As stated on page 13-1 of FHWAs Course on Bicycle and Pedestrian Transportation, "Sidewalks require a minimum width of 5.0 feet if set back from the curb or 6.0 feet if at the curb face. Any width less than this does not meet the minimum requirements for people with disabilities." Most older sidewalks in the Corpus Christi metropolitan area are 4-feet wide, have had little maintenance and are in varying degrees of disrepair. Many older sidewalks are not ADA-compliant and cities are gradually progressing to retrofit compliant ramps at street crossings. In some developments, no sidewalks are present and retrofitting sidewalks into these areas can be problematic. Federal regulations require that all newer sidewalks built within the last 10 years must be ADA-compliant.

Sidewalks along arterial roadways in urbanized areas are often situated abutting the curb-face and, therefore, lack sufficient buffer from the adjacent higher volume and higher speed traffic.



Sidewalk at curb-face with insufficient buffer from traffic on Santa Fe Street, Corpus Christi, TX

Crosswalks

Crosswalks are often placed to enhance sidewalk use and provide safety. Factors that can affect placement include:

- Traffic control, such as stop signs and traffic signals
- Sidewalk location
- Student attendance zone
- Traffic volume
- Pedestrian age
- Proximity to school or transit stop locations

A key consideration for placement is making sure the distance between controlled crossings is within the ¼ mile walking distance that most pedestrians consider a reasonable walking distance.



Crosswalk with additional pedestrian signs on signalized intersection of Ocean Drive and Del Mar Boulevard

Crosswalks are almost always provided at signalized intersections. However, the distance between controlled crossings can be over the 1/4-mile walking distance most pedestrians consider a reasonable walk to get there. Bus stop locations, school locations and alignment of opposing streets from neighborhoods influence the desire for controlled crossings.

In addition to signals, cities in the Corpus Christi MPO have installed rectangular rapid flashing beacons (RRFB) and pedestrian hybrid beacons (PHB) to assist pedestrians to cross the street. These crossing safety treatments have proven to be highly effective, increasing pedestrian safety and encouraging bicycling, walking and transit usage and should be implemented as required throughout the region.

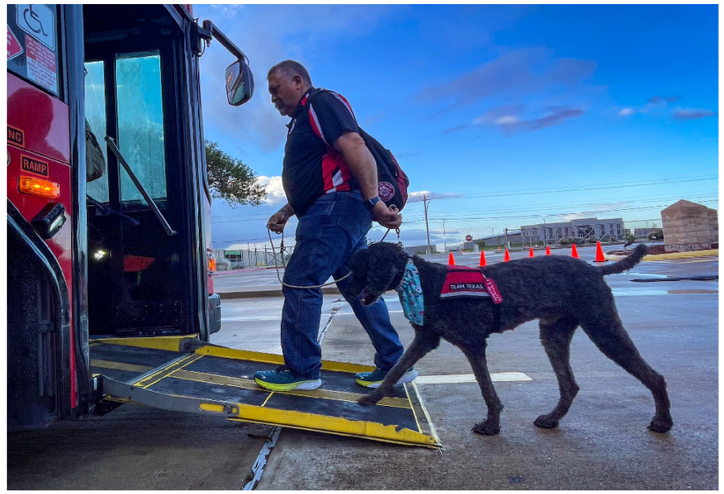


Shared-use path on Staples Street, Corpus Christi, TX

Bicycle and Micro-Mobility Facilities

Prior to 2016, the cities in the Corpus Christi MPO region constructed bike lanes without consideration of adjacent traffic speeds and volumes. In 2016, the MPO adopted the Strategic Plan for Active Mobility, which favored the provision of off-street bicycle facilities or facilities on low-volume/low-speed local roads and collectors to support the overall safety of the user.

The development of the Strategic Plan for Active Mobility network of facilities has been opportunistically developed along with other capital improvement projects. As such, the current state of the bicycling network is a mostly discontinuous set of assorted bicycle facilities.



Transit vehicle with accessible elements. (Source: CCRTA)

Transit Service Access

Many transportation-disadvantaged residents rely on public transportation to access public services and to maintain an active and healthy lifestyle. The bike-on-bus capabilities of the bus route network expand the range of the transit service area and offer great potential for expanding the Active Transportation Network. This is a key consideration for people who cannot, or choose not to, drive. There are 10,666 households in Nueces and San Patricio Counties that do not have access to a car.

While the homeless are highly dependent on transit, their behavior at bus shelters and on buses is seen as a barrier to the expansion of transit ridership and a drain on maintenance programs.

Safety

Speed is the main factor in a majority of pedestrian and bicyclist deaths. As vulnerable road users, bicyclists and pedestrians are very sensitive to the relative safety of their journey along and crossing roadways. Providing some degree of separation for the user groups and managing traffic speeds should be considered in the planning and design of the Active Transportation Network. It is still common for agencies to establish design speeds 10 mph higher than the anticipated posted speed as a "safety factor". It is still common for agencies to establish design speeds 10 mph higher than the anticipated posted speed as a "safety factor" when it actually does the opposite. Roadways designed for higher speeds will tend to operate at these higher speeds.

Public Support and Activism

The 2013 Corpus Christi MPO Bike Plan recommended the establishment of a Bicycle/Pedestrian Advisory Committee to assist in the advancement of active transportation improvements and was created shortly after plan adoption. After several years of active involvement in providing input into the design of the city roadways and trails, this committee was dissolved at the direction of the City Council.

Currently, cycling advocates are highly frustrated that their voices are not heard regarding walking and bicycling safety. They are also frustrated by the current level of investment in maintenance of existing bicycle and pedestrian facilities within Corpus Christi and the MPO region.



(Source: Valley Transportation Authority)

Local activists bring energy that can be utilized to revitalize local initiatives such as:

- Participation in Safe Routes to School programs
- Host Bike to Work and other citywide celebrations and modal promotions
- Development of local champions within municipal governments
- Supplemental support to City staff on grant writing, identification of maintenance issues, and monitoring of bicycle and pedestrian facility conditions
- Participation in the formal and informal review of facility development or decommissioning
- Increasing awareness of and accommodation for the needs of the mobility challenged

On the Horizon

Upcoming projects and initiatives are bringing a sense of momentum to the Corpus Christi MPO region and presenting opportunities to catalyze bicycle and pedestrian facility investments.

The new Harbor Bridge, scheduled for completion in late 2025/early 2026, will have a barrier-separated bicycle and pedestrian shared-use path (SUP) along the bridge's east side and landings with SUP connections to the existing local street network. Additional bicycle and pedestrian network connections to and from the Harbor Bridge crossing should be locally programmed to be in place as soon as possible after the new Harbor Bridge is completed. At a minimum, connections should be programmed for access to North Beach attractions and to the Shoreline/Ocean Drive corridor.



Harbor Bridge Sidewalk Talks event poster. (Source: Harbor Bridge Project)

Funding has been obtained for the construction of a pedestrian bridge across an inlet of the Oso Bay using the remnant foundations of a former railroad trestle, providing for the extension of the Holly Road Park bikeway to connect to the existing 12-foot shared-use path along Flour Bluff Road. The completion and enhancement of the bicycle and pedestrian facilities along Ennis Joslin Road would set the stage for establishing a 20-mile-long multimodal passageway from Flour Bluff to North Beach.

TxDOT is also preparing a Statewide Bicycle Tourism Plan and a Statewide Active Transportation Plan. The funded Trestle Bridge across the Oso is a link included in the Statewide Bicycle Tourism Plan network. The preliminary network of the Statewide Bicycle Tourism Plan for the Corpus Christi MPA indicates a bicycle connection to Corpus Christi via the SH 44 corridor roadway shoulders. Strategically, these could connect to a potential rail-to-trail system using an abandoned railroad corridor parallel to Agnes Road which could then connect to tourist destinations in central portions of Corpus Christi. The Statewide Active Transportation Plan is currently under development and a draft plan for public review is scheduled to be available in fall 2024.

Focus of The Active Transportation Plan

The focus of the Active Transportation Plan is to:

- Use a Complete Streets approach to identify a balance of needs for all modes of transportation to destinations, right-sizing streets as needed to introduce bicycle and pedestrian accommodations
- Develop recommendations for specific, implementable facilities and treatments
- Prioritize the implementation of the recommendations to create an increasingly usable and connected network
- Leverage local resources to increase overall cycling activity in the region
- Initially focus on low-cost, high benefit improvements



2. EXISTING CONDITIONS AND PLANS

2. EXISTING CONDITIONS AND PLANS

This section provides a general overview of the area's population, employment and current utilization of its transportation network. As part of the assessment of existing conditions, Corpus Christi MPO collected available data on existing and planned trails, bike lanes, separated bike lanes, shoulders, and sidewalks. Collected data is a resource available to local governments to assist in future planning.

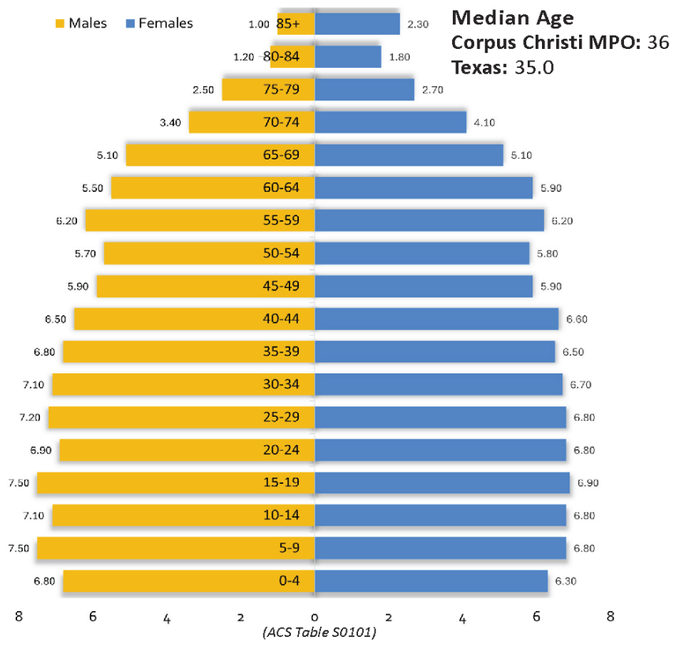
COMMUNITY SNAPSHOT

Data presented in the Community Snapshot section was sourced from the 2021 American Community Survey (ACS) 5-Year Estimates, and represents the full two-county study area, unless indicated otherwise.

Population and Employment in the MPO Planning Area

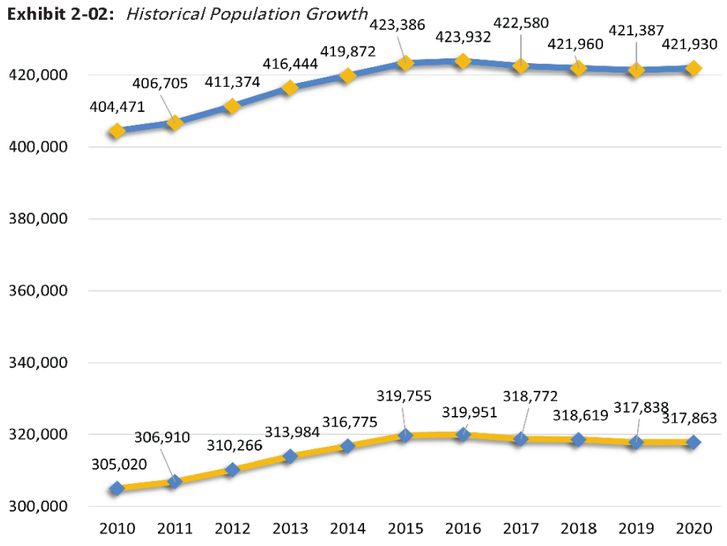
The 2021 ACS indicates that the Corpus Christi MPO area has a slightly higher median age (Exhibit 2-01) compared to the state of Texas. Woods and Poole also conducted a demographic forecast of the MPO planning area and found that in 2050, the median age will rise to **43.73**, suggesting that the Corpus Christi MPO planning area population is aging.

Exhibit 2-01: *Age Profile in 5-Year Increments*



(ACS Table S0101)

Exhibit 2-02: *Historical Population Growth*



(Texas Demographic Center, 2010-2020 Intercensal Population Estimates)

Exhibit 2-03: *Household Income*



(ACS Table S2504)

According to the Texas Demographic Center, the population in the City of Corpus Christi has been decreasing since 2016 (Exhibit 2-02). Decreasing population presents both challenges and opportunities that the project team considered when developing the Active Transportation Network.

Compared to the state of Texas, the Corpus Christi MPO has a lower median household income (Exhibit 2-03), a higher concentration of people with disabilities, and a greater number of households without vehicles and households in poverty (Exhibit 2-04). This suggests that there may be a greater need for accessible and more affordable transportation options, such as walking and biking.

Exhibit 2-04: *Community Overview*

	Total Population (U.S. Decennial Census)	Zero Car Households (ACS Table S2504)
Corpus Christi MPO	421,933	6.7%
Texas	30,506,523	5.2%

	Population 65+ (ACS Table S0101)	Language Other than English at Home (ACS Table S1601)
Corpus Christi MPO	13.2%	33.8%
Texas	12.5%	35.1%

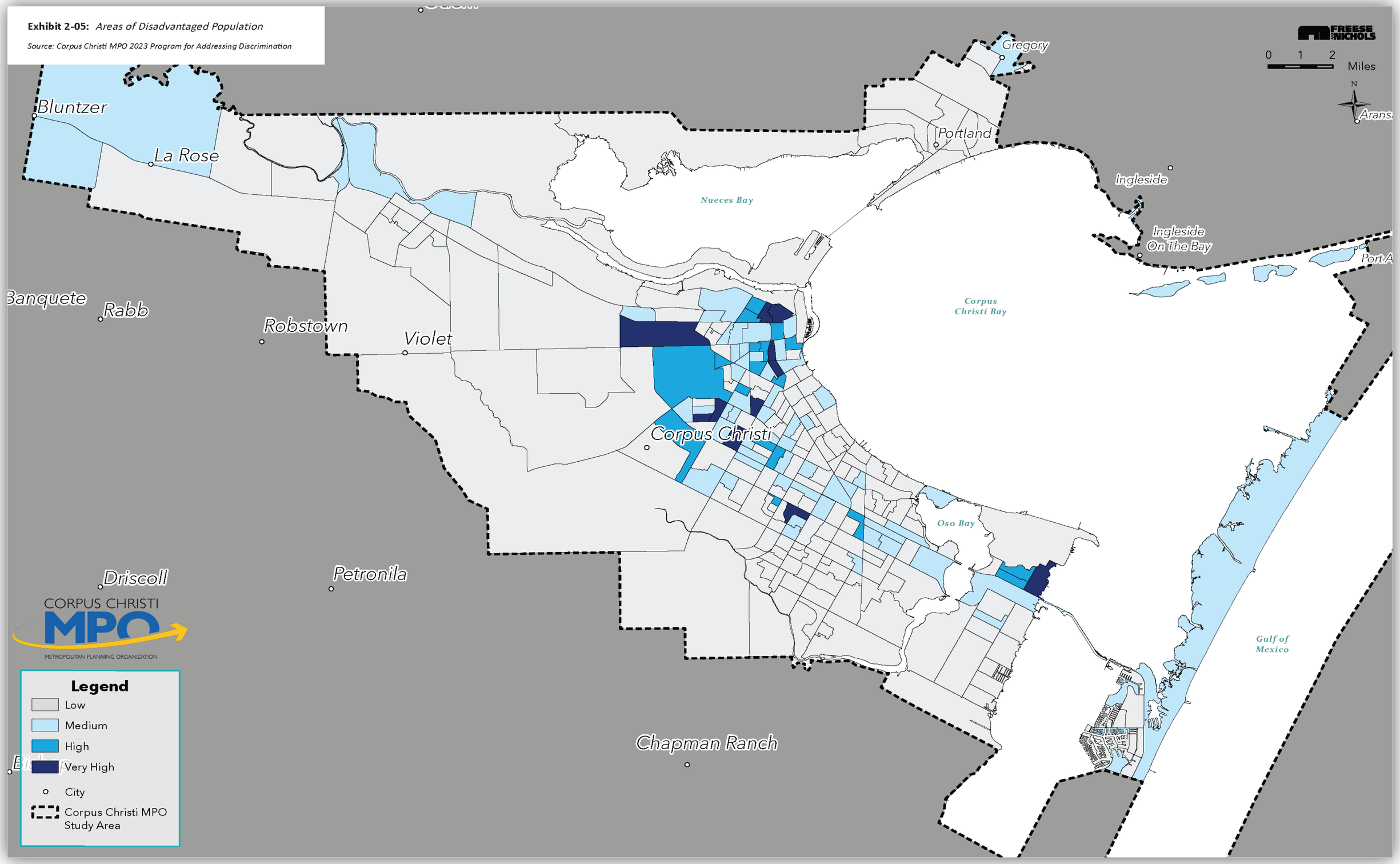
	Households in Poverty (ACS Table S1101)	Disabled Population (ACS Table S1810)	No High School Diploma (ACS Table S1501)
Corpus Christi MPO	17.1%	13.5 %	14.4 %
Texas	13.3%	11.4 %	13.8 %

Disadvantaged Populations

Corpus Christi MPO's 2023 Program for Addressing Discrimination shows the areas with the most disadvantaged population. Several factors including minority population, low-income population, car ownership, persons with disability and others are synthesized to create an Areas of Disadvantaged Populations Score (ADPC Sore), shown in Exhibit 2-05 on page 2-2. Disadvantaged populations are mainly concentrated near Downtown Corpus Christi, in the Central City area as well as the Flour Bluff area.

Exhibit 2-05: *Areas of Disadvantaged Population*

Source: Corpus Christi MPO 2023 Program for Addressing Discrimination



Inflow and Outflow of Workers

The analysis performed by the 2021 LEHD Origin-Destination Employment Statistics (LODES) dataset in Exhibit 2-06 reveals that most people live and work within the Corpus Christi Metropolitan Planning Area. The MPO Planning Area also sees a relatively equal amount of inflow and outflow of daily workers.

Exhibit 2-07 lists the top destinations of workers outside the City of Corpus Christi. The City of Corpus Christi remains the top destination for all workers.

Exhibit 2-06: *LODES Analysis of Corpus Christi Metropolitan Planning Area*

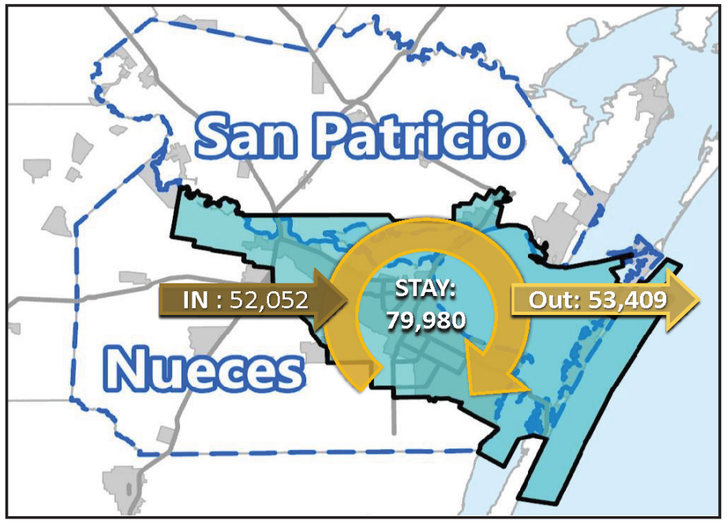


Exhibit 2-07: *Top Destinations of City of Corpus Christi Workers*

Work Destination	Percent of Workers
Corpus Christi	61.8%
San Antonio / Portland	Each 2.3%
Robstown	1.3%
Kingsville	1.1%
Houston	1.0%
Alice / Brownsville / Ingleside	Each 0.8%
All Other Locations	27.3%

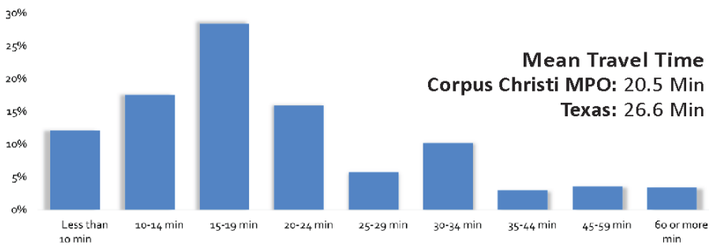
Commuting

The MPO planning area's average commute time to work is just over 20 minutes, which is 6 minutes faster than average commute times in Texas (Exhibit 2-08).

Majority of people leave for work between 7 a.m. and 8 a.m, as shown in Exhibit 2-09. Over 20% of people also leave for work after 9 a.m.

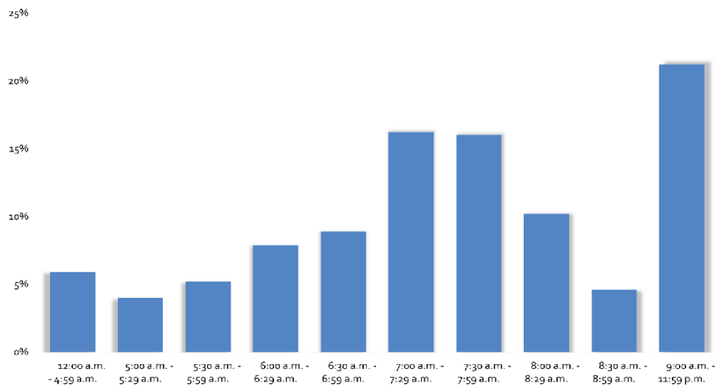
Exhibit 2-10 reveals that over 90% of people drive alone or carpool to work and only a small percentage of workers walk, bike, or use transit, following the statewide trend. Over 4% of people work from home and do not have a commute.

Exhibit 2-08: *Commute Time to Work in Minutes*



(ACS Table S0802)

Exhibit 2-09: *Time of Departure to Go to Work*



(ACS Table S0802)

Exhibit 2-10: *Means of Transportation to Work*

(ACS Table S0801)

	Drive Alone	Carpool	Walk	Bike	Use Public Transportation	Work from Home
Corpus Christi MPO	**82.8 %**	**9.4 %**	**1.2 %**	**0.2 %**	**1.1 %**	**4.4 %**
Texas	**77 %**	**9.7 %**	**1.5 %**	**0.2 %**	**1.1 %**	**9.1 %**

REVIEW OF EXISTING PLANS AND CODES

Current and previous plans were reviewed to determine existing conditions, document existing efforts, identify opportunities and ensure that proposed recommendations support broader objectives. This integration helps to create a more connected and accessible network.

Review of Plans

Strategic Plan for Active Mobility

The Strategic Plan for Active Mobility was adopted in March 2016 and promoted cycling as a viable transportation option for individuals of varying capabilities. It sought to provide clarity on the allocation and design of bicycle infrastructure, focus on the needs of commuters and casual riders rather than competitive cyclists, and enhance accessibility and safety for all cyclists.

Plan CC

Plan CC is Corpus Christi's Comprehensive Plan that outlines the community's long-term vision for land use, transportation, infrastructure, economic development and other key aspects to guide and meet the needs of future growth and development. Elements of Plan CC also included ADPs of each subregion in the Corpus Christi area. These 11 ADPs explored mobility needs and recommendations on the local level and were an essential part of developing the Active Transportation Network. For more information, refer to the Review of Corpus Christi Area Development Plans section on page 2-7.

MobilityCC

MobilityCC is the transportation element of Plan CC. MobilityCC presents a structured approach to address interconnected transportation challenges including planning, design, operation, maintenance and implementation.

The plan includes the City's Urban Transportation Plan (UTP) establishing functional classifications and right-of-way standards (Exhibit 2-11), the ADA Master Plan (see the Corpus Christi ADA Master Plan section on page 2-6) and the Trails Master Plan.

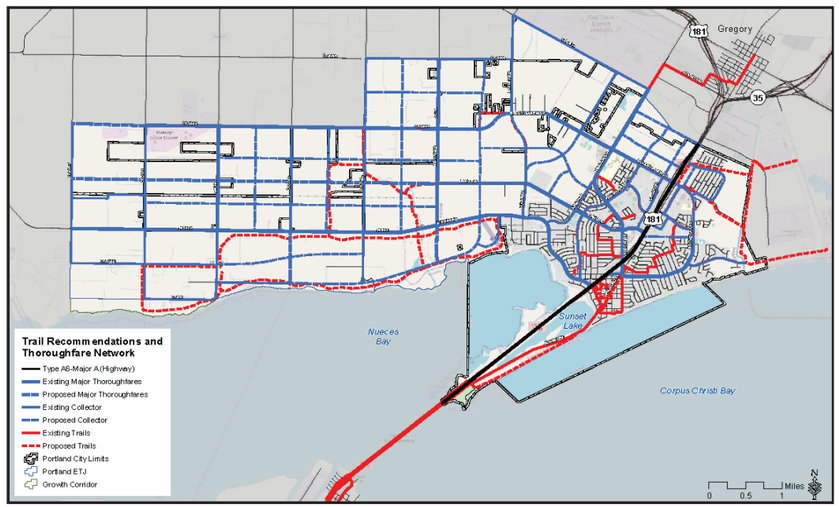
The UTP was implemented by the City's CIP, the Unified Development Code, and other City codes and ordinances.

The plan lists several recommendations that include roundabouts at certain intersections, bike/ped treatment standards on intersection crossings, mid-block crossings, signalization, road diet potentials and ADA access that the project team considered during the Active Transportation Network development.

Exhibit 2-11: *Corpus Christi Urban Transportation Plan*



Exhibit 2-12: *Portland Trail and Thoroughfare Network Recommendations*



Plan Portland 2040

The Plan Portland 2040 Comprehensive Plan established a long-term vision for the community. Its Transportation chapter outlined a complete network of thoroughfares and a trail system. Recommendations include an extensive network of proposed collectors, minor arterials and off-roadway trails on the western side of Portland and some proposed trails and collectors on the eastern side of Portland (see Exhibit 2-12). Future development and population growth have been identified in these areas.

The chapter also provides street design standards with shared-use paths and on- and off-street bike facilities. According to the plan, Portland began installing its first bike facilities in 2021.

Texas Bicycle Tourism Trails Study

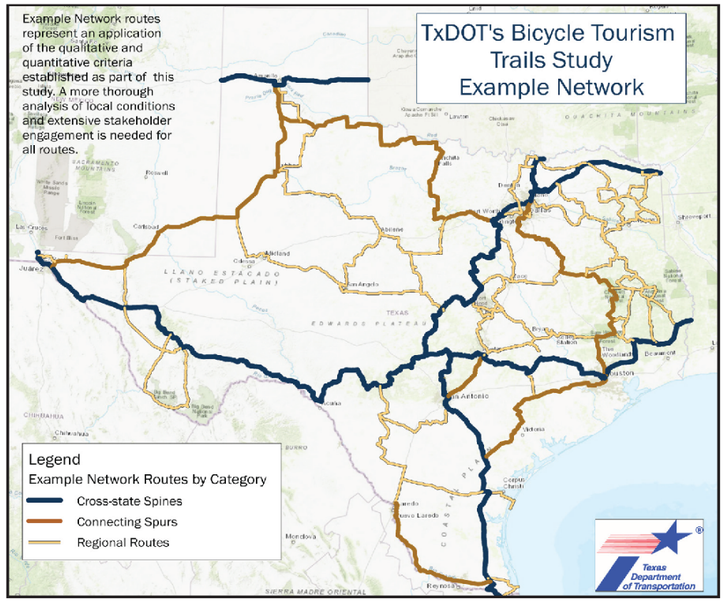
In response to the 2005 Texas Bicycle Tourism Trails Act, TxDOT collaborated with its Bicycle Advisory Committee to investigate the development of a statewide bicycle tourism trail network. The products resulting from this study serve as an initial high-level network analysis for statewide bicycle tourism and considerations for system implementation and long-term development.

These tourism trails have the potential to attract bicyclists from around the world, showcase communities across the state and boost economic development. The development of a bicycle tourism network in Texas is envisioned to be a long-term collaborative process built incrementally over many years in partnership with multiple public, private and nonprofit partners.

Exhibit 2-13 on page 2-5 indicates a regional route that would enter the Corpus Christi MPA along SH 44, using the existing roadway shoulders of the corridor. Approaching Corpus Christi, SH 44 is grade-separated near the Corpus Christi International Airport and the route would run along the shoulder lane of the service roads and then shift over to Agnes Street at South Padre Island Drive (SPID).

The Active Transportation Plan recommendations discuss a potential alternative alignment of the trail through Corpus Christi.

Exhibit 2-13: *TxDOT Bicycle Tourism Trails Study Example Network*



Padre/Mustang Island Mobility Plan

This Mobility Plan, published in 2023, builds upon the 2021 Padre/Mustang Island ADP discussed on page 4-31. The plan focuses on analysis and recommendations for developing a comprehensive multimodal network in the area. The main issues and needs highlighted in the plan include:

- Lack of or gaps in sidewalks and designated crosswalks in residential neighborhoods and beach access roads
- Pedestrians using medians as a refuge when crossing wide roadways
- Lack of bicycle facilities and signage about road-sharing
- Need for driver education on rights of bicyclists, golf cart/ Neighborhood Electric Vehicles (NEV) users
- Need to provide more bicycle network and safety features to promote cycling among average users
- Lack of bike/ped connections between neighborhoods and beach access points

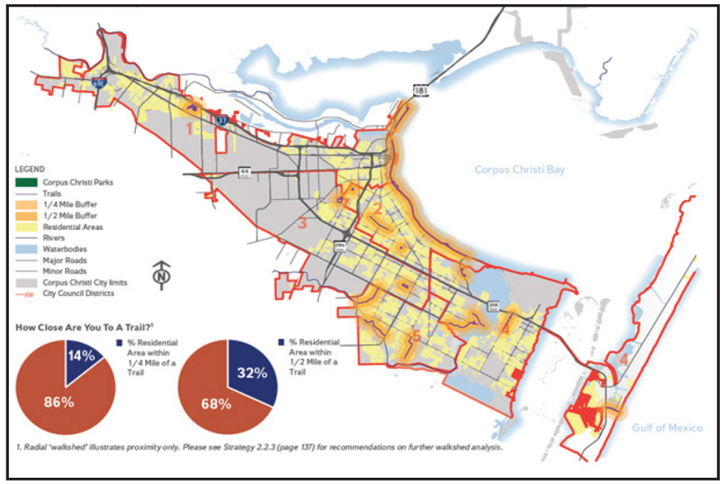
Corpus Christi Parks, Recreation & Open Space Master Plan

This plan was developed as a guide for City officials and stakeholders to determine the most efficient and equitable way to meet the recreational needs of residents over the a 5- and 10-year period with short-, mid- or long-term prioritized projects, programs, policies and practices.

The plan identified 185 parks and 27 miles of multi-use trail segments throughout the City. Over 50% of the trails were found in good condition, while the rest had issues with cracking or upheaval and many of the parks were not accessible to persons with physical disabilities.

The plan identified trails as "one of the most important recreational facilities in the City and the most frequently used," and recommended increasing the number of trails within half a mile of existing trails. Walking and biking trails also have the highest priority ranking from the plan's proposed projects. The Master Plan project recommendations placed a priority on ensuring that all facilities were brought up to an ADA-compliant standard.

Exhibit 2-14: *Parks, Recreation & Open Space Master Plan Trail Accessibility*

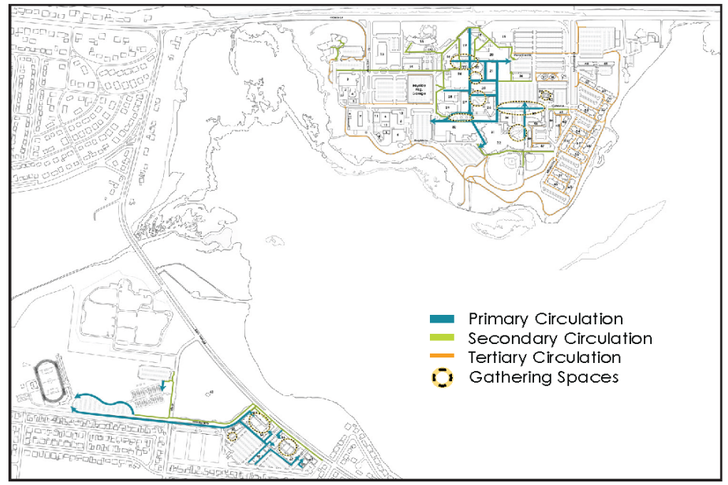


Texas A&M University - Corpus Christi Campus Master Plan

The 2021 Campus Master Plan builds upon the previous 2013 plan and guides the Texas A&M University - Corpus Christi (TAMU-CC) campus facilities' development for the next 10 years. Campus needs were evaluated based on enrollment, usage, open space and infrastructure.

Included in the Master Plan was a student survey which found that only 11% of respondents liked the walkability of the campus. Specific recommendations included the need to improve lighting and walkways, add a wayfinding system, enhance pedestrian crossings to promote hike and bike trails and beach access, construct additional shaded outdoor spaces, consider operation of future shuttle service between Momentum and Island Campuses, and construct a loop road on the Island Campus to alleviate congestion and provide transit access.

Exhibit 2-15: *Texas A&M University Corpus Christi Pedestrian Circulation*



ADA Transition Plans

Public Right-of-Way Accessibility Guidelines (PROWAG)

In August 2023, the U.S. Department of Justice collaborated with the U.S. Department of Transportation and FHWA to develop PROWAG to ensure that pedestrian facilities in the public rights-of-way are accessible by people with disabilities at all times - during business as usual, maintenance, or alterations done to the pedestrian facilities as defined by the final rule.

The key features discussed in the guideline included pedestrian access routes and alternate routes, accessible pedestrian signals, crosswalks, transit stops and on-street parking.

PROWAG requires the provision of curb ramps on street-level pedestrian walkways whenever streets, roadways, or highways are altered. Resurfacing, rehabilitation, reconstruction, historic restoration, or changes or rearrangement of structural parts or elements of a facility, among other things, constitute an alteration under the ADA. This means that where resurfacing a street "involves work on a street or roadway spanning from one intersection to another, and includes overlays of additional material to the road surface, with or without milling", the accessibility and usability of the pedestrian walkway for persons with disabilities must be ensured. These standards are enforceable by law, and TxDOT now uses PROWAG as its de facto "standards".

TxDOT ADA Self-Evaluation and Transition Plan

TxDOT updated its 2004 ADA Transition Plan in February 2022. Since 2004, TxDOT has authorized over $280 million in funding to remove identified barriers and plans to spend $500 million between fiscal years 2022-2025.

The 2022 update identified barriers on TxDOT's physical assets, services and means of communication, as shown in Exhibit 2-16. A total of 4,419 miles of sidewalk, 131,920 curb ramps, 4,582 island curb cuts, 6,156 bus stops, and 52,179 pedestrian signal pushbuttons were evaluated, as well as 157 facilities including TxDOT administrative facilities and safety rest areas. This information comprises the Pedestrian Access Inventory (PAI).

The plan proposed to construct pedestrian infrastructure on various streets; the majority of the projects focus on traffic signal improvement. The list of projects scheduled for implementation in TxDOT's Corpus Christi planning area can be found in Appendix F.

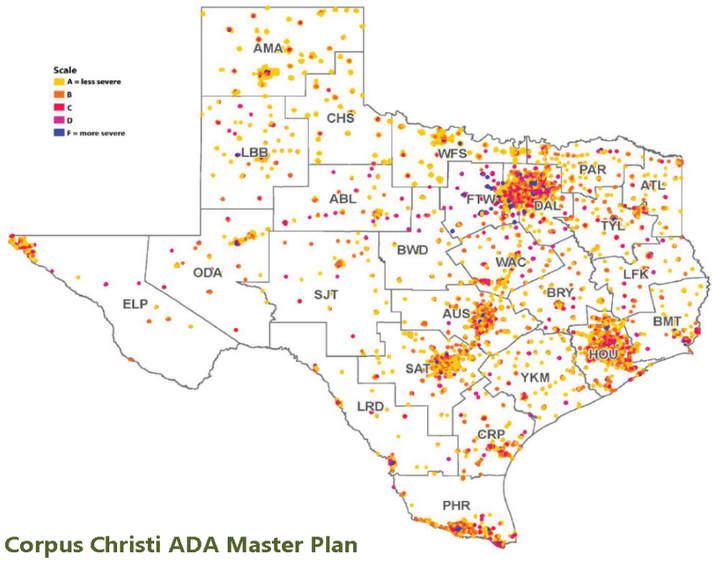
The plan included an implementation schedule to eliminate these barriers systematically over continuous four-year planning cycles.

The process, led by the individual district or division, involves use of an online tool called the TxDOT Comprehensive Accessibility Program (TCAP) WebApp which "references an ArcGIS system housing the PAI data, facility data, notations of locations for grievances, and reporting."

To ensure comprehensive ADA compliance in transportation projects, all planned projects are first reviewed using the TCAP WebApp to validate and incorporate any necessary remediation. TxDOT staff is trained to understand the DOJ/DOT interpretation of "alteration versus maintenance" for ADA compliance inclusion.

It is essential to document and identify the limits and assets scheduled for remediation in the TCAP WebApp, and report any excluded accessibility elements for continued monitoring. District-specific protocols are used to manage and document accessibility improvements at key project stages, while public requests and grievances are continually monitored and logged for additional considerations. Finally, projects are completed with the required governmental oversight, closed within the TCAP WebApp, and finalized with comprehensive reporting.

Exhibit 2-16: *TxDOT ADA Transition Plan Pedestrian Access*



Corpus Christi ADA Master Plan

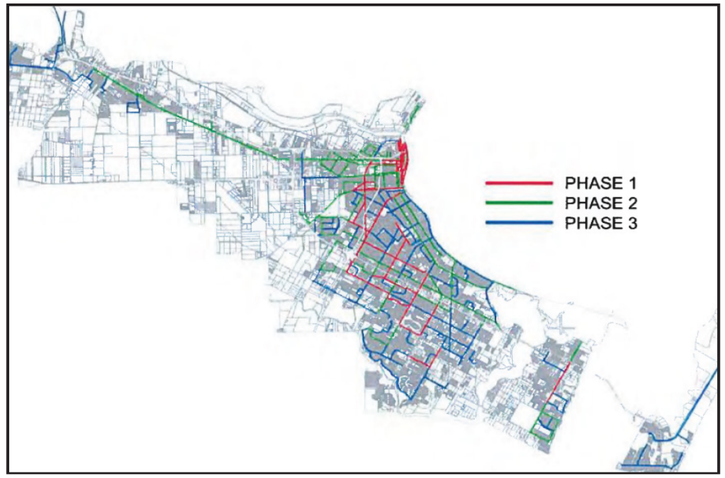
In September 2012, the City of Corpus Christi adopted the ADA Master Plan. The plan developed an interconnected network of accessible routes (Exhibit 2-17) that were divided into three phases:

- Phase I - routes connecting City/State/Public Buildings
- Phase II - routes connecting Major Transportation Routes
- Phase III - routes connecting Places of Public Accommodation

The plan recommended an annual funding goal of 3.5 million dollars per year to finance the implementation of this plan, with a goal of fully implementing the plan in the following 20 years. Partnerships with CCRTA, Nueces County, TxDOT, the Corpus Christi MPO, the U.S. Department of Housing and Urban Development (HUD) and area school districts are recommended for funding.

It is a policy of this plan that all future infrastructure improvement projects, private or public, within the City's jurisdiction should be constructed in conformity with this plan, and that the City Engineer should not approve plans in conflict with this plan unless there is no practicable alternative or the design exceeds the plan's design requirements and the Texas Accessibility Standards.

Exhibit 2-17: *Corpus Christi ADA Master Plan: ADA Accessible Routes Inventory*



CCRTA Bus Stop and Transfer Facility ADA Assessment

The Corpus Christi Regional Transportation Authority (CCRTA) conducted an assessment of its passenger facilities for ADA compliance in 2022. Using online and field research, a total of 567 stops (40.9% of total stops) were determined to be non-ADA compliant, with the most common issue being boarding and alighting area issues (71.3% of non-compliant stops).

Based on the identified issue of many non-ADA compliant bus stops, the report provided recommendations for how to address the need for improvement in compliance. Recommendations in the plan included:

- Use a corridor segment-based approach to increase efficiency
- Seek opportunities to "piggyback" on partner jurisdiction projects
- Seek Infrastructure Investment and Jobs Act (IIJA) grants
- Measure and report progress and benefits

The report noted that the data collected should be used to develop a plan for upgrading the facilities and provide improved mobility and access. Further information on the CCRTA Bus Stop and Transfer Facility ADA Assessment can be found in the Bus Stop ADA Access Assessment section on page 2-10.

Review of Corpus Christi Area Development Plans

The project team reviewed all existing Area Development Plans (ADPs) in the City of Corpus Christi. The majority of the ADPs offer a listing of short-, mid- and long-term projects that include categories of parks and trails improvements, transit improvements, health and safety improvements, utility/infrastructure improvements and street improvements. All proposed bicycle and pedestrian projects were incorporated into the proposed Active Transportation Network.

For bike/ped-specific recommendations included in the network, please refer to the Corpus Christi Area Development Plans section on page 2-14. For a complete list of proposed street infrastructure projects from the reviewed ADPs, please refer to Appendix F.

Review of Current and Planned CIP, IMP, and Bond Program Projects

The project team also reviewed all current and planned CIP projects, IMP projects, and Bond Program projects in the Corpus Christi MPO area. The City of Corpus Christi has all types of the projects planned, while the City of Portland has only CIP projects planned. All of the reviewed projects that were related to active transportation facilities were incorporated into the proposed Active Transportation Network.

For more information on the projects incorporated in the Active Transportation Network, please refer to the Current and Planned CIP, IMP and Bond Projects section on page 2-11. For a complete list of all the current and planned projects in the MPO planning area, please refer to Appendix F.

Review of Codes in the Corpus Christi MPO Area

The creation of a sustainable region-wide bicycle and pedestrian network requires supportive local policies, practices, and initiatives. This section contains a review of existing ordinances that accommodate active transportation facilities and users.

Municipal codes are the primary legal authority that establish standards that regulate the use of land and its development. Tailoring codes to fit a community's specific needs could enable development into a pattern that fits a city's vision. Codes are a strong tool that should be used to encourage active transportation.

Using codes to increase active transportation improves the community's connectivity, enhances mobility and manages transportation resources. Assessing how a city currently uses its code to promote active transportation helps locate functioning areas and what areas should be enhanced. Comparing the standards of Corpus Christi and Portland to those of peer cities within the state, such as the Cities of Austin, El Paso or Houston, will help examine what is working to promote active transportation. These examinations will help adapt and recommend codes that fit the context of Corpus Christi and Portland.

Corpus Christi Code of Ordinance

Corpus Christi is implementing active transportation standards in their required improvements, sidewalk standards and buffer areas. An example of promoting active transportation in Corpus Christi is incentivizing developers to reduce parking spaces by reducing parking requirements.

Portland Code of Ordinance

Portland has sections on bike paths, outlined in Exhibit 2-19 on page 2-8, allowing the City to enforce standards that promote the usage of bicycles.

Exhibit 2-18: *Corpus Christi Code Sections Mentioning Active Transportation*

Location in the Code	Language
3.5.4 A 5. PUD Zoning Map Amendment Review Criteria	The development contains a planned and integrated comprehensive transportation system providing for a separation of pedestrian and vehicular traffic, to include facilities such as roadways, bicycle ways and pedestrian walkways.
3.30.2 C 4. Required Improvements	The following improvements are considered required for the purposes of this article: sidewalks, walkways and bicycle facilities.
4.5.1 C Resort Commercial Districts	The Resort Commercial zoning districts provide for a wide variety of commercial activity such as tourist, water-oriented, retail commercial and indoor or outdoor amusement uses which reflect the character of a resort area. Emphasis is placed on establishing scenic and/or pedestrian corridors, walking and bike paths, amenities and public open spaces.
6.8.17 G 3 Parking Reductions	3. Bicycle parking spaces may be installed to alleviate parking spaces if the development is located adjacent to a bicycle lane or off road bike path required in the bicycle mobility plan or adjacent to a street with an existing bike lane or existing off road bike path. The provision of the bicycle parking spaces can be used to reduce required parking up to 10% as follows: a. Six short term bicycle parking spaces (bike racks) for every one vehicle space; and/or b. Six short term bicycle parking spaces (bike racks) for every one vehicle space; and/or
7.2.4 F Bicycle Parking	The Assistant City Manager of Development Services may authorize a reduction in the number of required off-street parking spaces for development or uses that make special provisions to accommodate bicyclists. Examples of accommodations include bicycle lockers, employee shower facilities and dressing areas for employees. The amount of reduction permitted shall be as stated in a Bicycle Parking Manual published by the Department of Development Services.
7.9.10 B Maintenance and Irrigation of Zoning District Buffer Yards	Other permitted uses and structures, including pedestrian, bike or other trails, allowed within a zoning district buffer yard shall be maintained to provide for their safe use.
7.9.15 A Permitted Use of Buffer Area	A buffer may be used for passive recreation and picnic facilities and may contain pedestrian or bike trails, provided: 1. No existing plant material shall be eliminated, other than nuisance exotics 2. The total width of the buffer shall be maintained; and 3. All other requirements of this Section shall be met.
8.1.4 A Type of Improvements Required	A. Streets, including but not limited to pavement, curb and gutter, sidewalks, roadside ditches, hike and bike trails, alleys, bridges and street lighting;
8.2.2 Sidewalks	A. Required Improvements: 3. All paved hike and bike trails shall satisfy the minimum construction specifications for sidewalks of the City. C. Administrative Exceptions for Sidewalk Improvements An administrative exception may be granted to the standard in paragraph 8.2.2.A only when the following conditions are met: 1. Sidewalks shall not be required along each side of a street right-of-way where such street is a permanent dead-end street and where there is pedestrian access from the permanent dead-end street to a paved hike and bike trail. In such instances, a sidewalk only shall be required on one side of the street right-of-way, or 2. Sidewalks shall not be required along street rights-of-way where each lot fronting on such street has direct access from the side or rear to a paved hike and bike trail.

Source: City of Corpus Christi Code of Ordinances, 06/2024

Exhibit 2-19: *Portland Code Sections Mentioning Active Transportation*

Location in the Code	Language
CH. 6 Sec. 610 A Sidewalks and Bike Paths	When Required. Concrete sidewalks shall be included within the dedicated rights-of-ways of all streets except where replaced by bicycle paths when required by the City under circumstances specified in subsection D. below.
CH. 6 Sec. 610 B Sidewalks and Bike Paths	Sidewalk Design Standards. 1. A typical residential sidewalk shall be four (4) feet in width and a typical nonresidential sidewalk shall be five (5) feet in width; however, the City may require wider sidewalks in certain circumstances. 2. Sidewalks shall be placed on both sides of streets unless expressly waived by the City. 3. All sidewalks shall be constructed of concrete no less than four (4) inches in thickness with expansion joints as needed. 4. The property side edge of the sidewalk shall set back one (1) foot into the right-of-way, unless otherwise approved by the City. 5. All sidewalks shall be constructed in conformance with City, Texas Architectural Barriers Act and Americans with Disabilities Act standards. 6. A grass or City-approved landscaped strip at least three (3) feet wide shall separate all residential sidewalks from adjacent curbs. Sidewalks may be built adjacent to curbs when so approved by the City.
CH. 6 Sec. 610 C Sidewalks and Bike Paths	Pedestrian Ways Requiring Additional Right-of-Way. The City may require additional right-of-way for sidewalks and/or bike paths outside of street rights-of-way in order to facilitate pedestrian access to schools, parks or other nearby streets. These sidewalks or bicycle paths shall be located in rights-of-way at least twelve (12) feet in width. Such rights-of-way shall be indicated on the plat.
CH. 6 Sec. 610 D Sidewalks and Bike Paths	1. School Access. A bicycle path may be required within the rights-of-way of any new street, other than a Minor Street, if said street segment is within a two (2) mile radius of a public school. Such bicycle path may be substituted for one of the required sidewalks. 2. Bicycle Path Standards. Such paths (paved surface) shall be paved with a smooth concrete or asphalt surface and otherwise conform to U.S. Department of Transportation Standards. Where exclusive bikeways are developed, they shall be a minimum of eight (8) feet in width for a two-way bikeway. Where sidewalk bikeways are developed, a twelve (12) foot combined sidewalk and two-way bikeway shall be required. A bike lane developed on the same grade as a roadway shall incorporate a painted stripe in the roadway and be a minimum of four (4) feet in width.
CH. 6 Sec. 620 D Park Site Dedication:	Any land used for bike paths and pedestrian ways shall be credited toward the required five (5) percent for parks.

Source: City of Portland Code of Ordinances, 06/2024

Code of Ordinances in Other Cities

Austin

Austin (Exhibit 2-20) includes detailed regulations on a variety of active transportation topics. Efforts to increase mobility are seen in sections that discuss pedestrian zones, details from their criteria manual and visuals.

Exhibit 2-20: *Austin Code Sections Mentioning Active Transportation*

Location in the Code	Language
25-6-351 Sidewalk installation in subdivision	A person who subdivides property shall install sidewalks in a subdivision in accordance with the Transportation Criteria Manual. A preliminary subdivision plan and a final plat must indicate the location of a proposed sidewalk.
4.1.1 Sidewalk A	Sidewalk widths shall be consistent with the specifications in Table 2-2 and Table 2-3 in Section 2.7.1 and shall be installed consistent with the requirements of the LDC and any applicable development approvals. Sidewalks must be ADA compliant. If a plan adopted by ordinance conflicts with these requirements, the strictest criteria shall be used. In areas with no other requirements, the minimum clear widths shall be 5 ft. for Level 1 streets and 6 ft. for all Level 2 and higher streets.
4.1.1 Sidewalk J	If a new sidewalk is constructed, street trees shall be provided, unless the street is a Level 1 street with insufficient right-of-way to accommodate the minimum width of 6 ft. required for street trees.
4.1.2 Shared-use paths	Shared-use paths combine bike and pedestrian space into one path. To maintain safe operations for both modes of travel, the path must be wide enough to safely separate both users. Separated bike and pedestrian paths are the preferred design, as they are safer for both street users.
4.1.2 Shared-use paths G	Minimum clear width shall be 8 ft. for a shared-use path that is one way for bicycles and 10 ft. for a shared-use path that is two-way for bicycles. Minimum vertical clearance for a shared-use path shall be 8 ft. Other considerations may go into the required width of a shared-use path, including likelihood of heavy pedestrian and bicycle use or a planning document such as the Austin Bicycle Plan or Austin Urban Trails Plan, at the discretion of the appropriate director.
4.1.3 Flexible design within the pedestrian zone	When constraints exist such as trees, grades, or other natural elements and additional easement or ROW is not possible to accommodate Section 4.1.1(C) or 4.1.2(C), sidewalks and shared-use paths can be built in flexible ways to avoid impacts to the facility clear width and compliance with PROWAG and TAS requirements. Use of design strategies such as suspended sidewalks and meandering paths to avoid impacts is permissible with approval of applicable staff. Meandering paths should avoid sharp turns or transitions and gradually transition no more than 1 ft. off path per 5 ft. of sidewalk length and maintain a straight section no less than the width of the sidewalk between transitions, where able. Refer to the City of Austin Standard Details for design requirements for suspended sidewalks.
4.2.41 Pedestrian Island E	Either design of pedestrian islands shall provide a minimum width of 8 ft. for the pedestrian path crossing through the island and a minimum median width of 4 ft.
5 Bikeway and urban trails	Bikeways are contained within the Bicycle and Street Edge Zone of a street. This zone within a street's cross section is composed of three separate components: A. Bike Lane - The space in which the bicyclists operate. This space is located between Tree and Furniture Zone (in the Pedestrian Zone, defined in Section 4) and the Buffer Zone. B. Buffer Zone - The street buffer that separates the bike lane from the vehicle traffic or parked cars. C. Parking (where applicable) - On-street Parking (refer to Section 9).
5.1.2.2 Bikeway width A	The minimum width of a one-way protected on-street bike lane is defined in Tables 2-2 and 2-3. A constrained width of 5 ft. with an 18 in. buffer and is only allowed for passage around obstructions as provided for in Section 5.3.2.4.
5.1.2.2 Bikeway width C	Bikeway recommended width varies by Street Level but is recommended to be 7 ft. to 8 ft. wide to facilitate sweeping, passing and social/side by side riding. In constrained conditions this width can be narrowed to 6.5 ft. which is the minimum width that allows sweeping with City of Austin narrow sweepers and side by side.

Source: City of Austin Code of Ordinances, 06/2024

El Paso

El Paso (Exhibit 2-21) discusses the importance of having a purpose statement. Purpose statements guide the direction of standards. The clear vision spells out the goals of active transportation in ordinances.

Exhibit 2-21: *El Paso Code Sections Mentioning Active Transportation*

Location	Language
13.04.045 Sidewalks in new development A 1	Local Residential Street b. Where required, sidewalks shall be installed on both sides of the local residential street right-of-way and shall be located adjacent to the property line and parallel to the curbline.
13.04.045 Sidewalks in new development A 2	Arterial Street a. Sidewalks shall be required on all arterial street classifications, except on arterial streets which meet the following criteria as determined by the city plan commission. b. Required sidewalks may be located adjacent to and parallel with the curbline when all of the following apply: i. The sidewalk is a minimum of seven feet wide; and ii. The sidewalk is wide enough to provide a minimum clear width of three feet at encroachments, including street lights, traffic signs, traffic control devices, utility installations, or other facilities.
19.15.010 Adequacy of streets and thoroughfares D	Major and minor arterials, collectors and other thoroughfares appearing on the city's adopted bike plan shall have bicycle facilities installed in accordance with the Street Design Manual. For major and minor arterials, collectors and other thoroughfares not appearing on the city's adopted bike plan, bicycle facilities may be constructed on one side or both sides of the street.
19.21.010 Purpose and applicability	Purpose. Sidewalks are required as a part of subdivision plat approval as outlined within this chapter and in Title 13, Chapter 04 to help the City of El Paso achieve the following: 1. Promote the mobility, health, safety and welfare of residents, property owners and visitors to the City of El Paso and to implement objectives and strategies of the El Paso Comprehensive Plan; 2. Improve the safety of walking by providing separation from motorized transportation and improving travel surfaces for pedestrians; 3. Improve public welfare by providing an alternate means of access to transportation and social interaction, especially for children, other citizens without personal vehicles, or those with disabilities; 4. Facilitate walking as a means of physical activity recognized as an important provider of health benefits; 5. Establish minimum criteria for the development of sidewalks as a part of the pedestrian element of the transportation system within the city and its extraterritorial jurisdiction (ETJ).
19.21.020 C General Requirements	Location and Width of Sidewalks. Unless noted otherwise: 1. Sidewalks shall have a minimum clear path width of a minimum of five feet on local streets in all zoning districts primarily intended for single-family residential development when located adjacent to the property line. Sidewalks located next to the curb along local streets shall be a minimum five feet in width. Sidewalks along arterials shall have a minimum of five feet in width; 2. Sidewalks shall have a minimum clear path width of a minimum of five feet in all other locations; 3. Sidewalks in areas determined to be high pedestrian traffic areas or pedestrian-oriented developments by the CPC may be required to be wider than the minimum widths listed herein by the CPC.
20.14.090 Bicycle parking required	Bicycle parking facilities shall be provided for new buildings or facilities, additions to or enlargements of existing buildings, or for changes in the use of buildings or facilities that result in the need for additional auto parking facilities in accordance with the parking requirements in Article I of this chapter and where required in table, Section 20.14.050(C).
20.14.100 Number of bicycle spaces	The number of required bicycle parking spaces shall be calculated as shown in table, Section 20.14.050(C) of this chapter. Where the calculation of the required bicycle parking results in fractions of spaces, the number of spaces shall be rounded to the next highest whole number for fractions of 0.5 or greater.
20.14.110 Standards A	Individual bicycle parking spaces shall be a minimum of seventy-five inches long by twenty-four inches wide for each space. Where double-sided multi-racks are utilized resulting in overlapping of bicycle parking spaces, the minimum bicycle parking space for two bicycles shall be one hundred inches long by thirty-six inches wide.
20.14.110 Standards B	Bicycle parking racks shall be located in areas visible from public ROW and, shall be provided with adequate lighting if intended for use after dark.
20.14.110 Standards G	Racks shall be placed a minimum of twenty-four inches away from walls and other elements that may create an obstacle to accessing the bike parking spaces.

Source: City of El Paso Code of Ordinances, 06/2024

Houston

Houston (Exhibit 2-22) stresses the importance of facilities for bicycles. This includes sidewalks and parking stations for bicycles.

Exhibit 2-22: *Houston Code Sections Mentioning Active Transportation*

Location	Language
Sec. 40-557. - Sidewalk Standards (a)	The minimum unobstructed width of a sidewalk required by this article shall be as prescribed by the design manual.
Sec. 40-557. - Sidewalk Standards (d)	All sidewalks shall be constructed in a manner consistent with technical standards and design requirements of the design manual and applicable state and federal disability rights laws.
Sec. 42-654. - Bicycle parking. (b)	One bicycle space shall be required for every 20 dwelling units in an apartment, as those terms are defined in section 26-472 of this Code.
Sec. 42-654. - Bicycle parking. (c)	This section shall prevail over the minimum number of bicycle spaces otherwise required by this Code.

Source: City of Houston Code of Ordinances, 06/2024

Code Recommendations

The codes and ordinances found in both cities contain a number of regulations that allow for active transportation and enforce compliance with ADA standards. The existing foundation for active transportation and ADA compliance could be enhanced by covering other bike/ped elements. Introducing ordinances that cover ADA-compliant curb ramps to improve accessibility and incentivizing development to include multi-modal transportation are examples that could be made to supplement the current ordinances to increase the quality of life for all users.

For more specific recommendations, refer to Chapter 5. Recommendations and Implementation.

EXISTING BICYCLE NETWORK

The Corpus Christi MPO has compiled data on existing bicycle infrastructure. Currently, the Corpus Christi MPO encompasses over 119 miles of on- and off-street bicycle facilities (see Exhibit 2-24). The City of Corpus Christi accounts for the majority of these dedicated bike facilities, comprising 90% of the total, while the City of Portland constitutes the remaining 10%. No other cities or unincorporated communities within the MPO planning area are known to have dedicated bicycle facilities.

On-street bike lanes without a buffer comprise over half of the MPO planning area's existing bike facilities (54%). Bike routes, which are also on-street facilities, comprise just over 2% of the existing bike facilities.

Shared-use sidepaths adjacent to the street (16.95%) and shared-use paths away from streets (15.92%) provide paths that are wider than traditional sidewalks and serve both cyclists and pedestrians and comprise a large portion of the network. In a few locations, such as on the path adjacent to Oso Parkway, the path is signed for pedestrians only (no bicycles) due to its width of about 7 to 8 feet..

More important than the quantity of facilities is the appropriateness of each facility and the connections made to destinations and to the rest of the broader network.

Currently, there are bike lanes striped on streets adjacent to travel lanes with posted speed limits of 40 mph or higher, which should be reconsidered for a change of bicycle facility type. These include:

- Holly Road: Ayers Street to Rodd Field Road
- Airline Road: Rodd Field Road to Saratoga Boulevard
- Staples Street: Williams Drive to Saratoga Boulevard
- Yorktown Boulevard: West of Rodd Field Road to Everhart Road

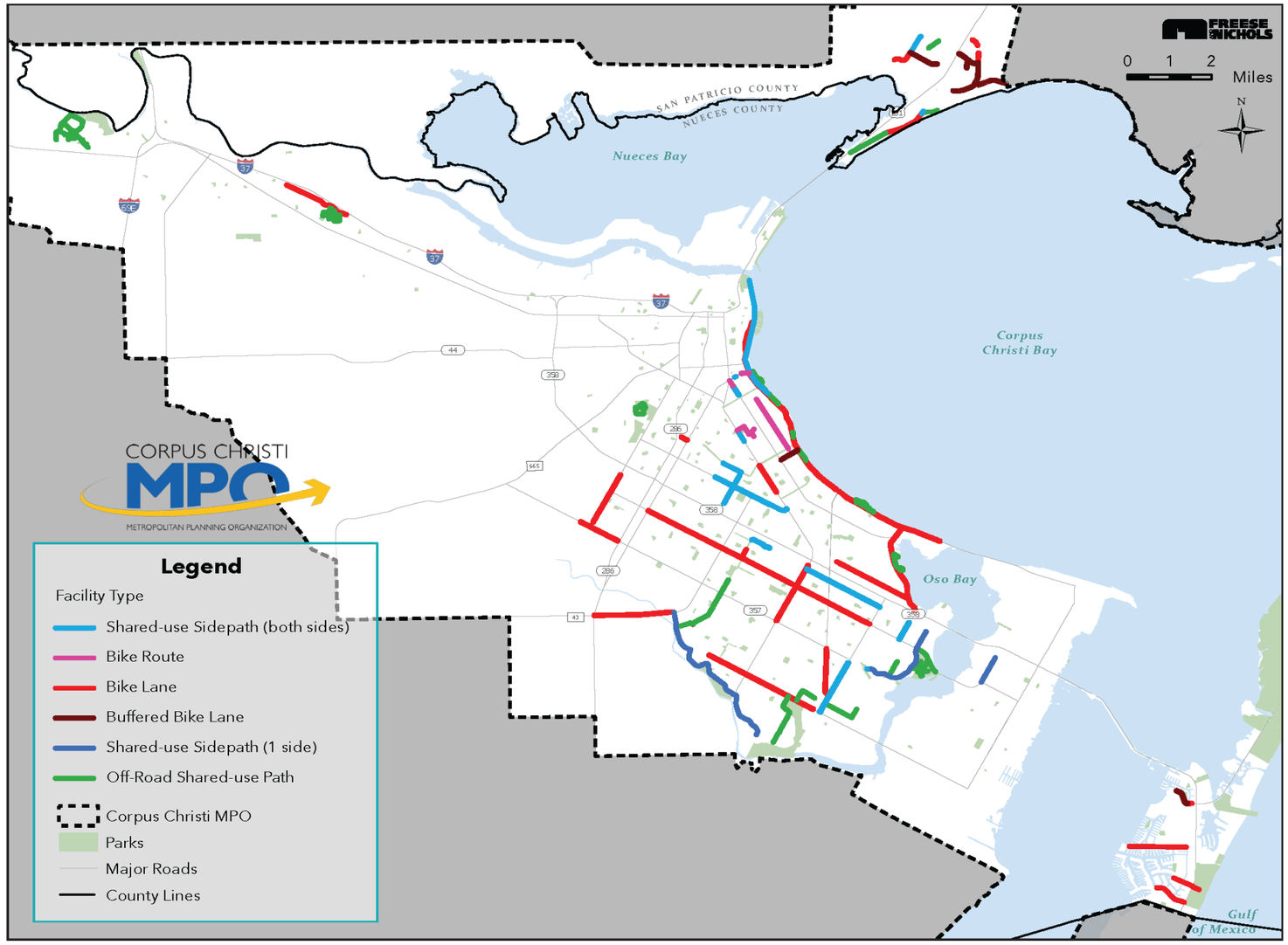
Exhibit 2-23: *Total Length of Each Bicycle Facility Type in Corpus Christi MPO*

Facility Type	Corpus Christi	Portland	Total Length (miles)	Percent of Total
Bike Lane	62.24*	3.06	65.30	54.9%
Shared-use Sidepath (both sides)	17.50	0.52	18.02	15.1%
Off-Road Shared-use Path (Hike&Bike Trail)	17.38	1.57	18.95	15.9%
Buffered Bike Lane	1.57	6.22	7.79	6.5%
Shared-use Sidepath (one side)	6.32		6.32	5.3%
Designated Bike Route	2.67		2.67	2.2%
Total Length (Miles)	**107.68**	**11.38**	**119.06**	**100%**

* 59.18 miles are within Corpus Christi city limits and 3.06 miles are found outside of the Corpus Christi city limits.

Source: 2023 Corpus Christi MPO Bicycle Inventory.

Exhibit 2-24: *Existing Designated Bicycle Facilities in the Corpus Christi MPO as of 2023*



Source: 2023 Corpus Christi MPO Bicycle Inventory.

Bike Score

Bike score is developed by the Walk Score® company that also develops walk scores and transit scores for cities and communities around the United States.

Bike score, illustrated in Exhibit 2-25, measures how accessible various parts of the MPO planning area are for biking. The score is based on designated bicycling infrastructure from the Open Street Map. It measures bikeability on a scale of 0-100 and analyzes existing bike facilities, topography, bike commuting mode share, destinations and roadway connectivity. In the methodology, bike paths are twice as valuable as bike lanes and three times more valuable than shared infrastructure (sharrows).

The score does not take into account heat, wind, roadway conditions or shade.

Score breakdown:

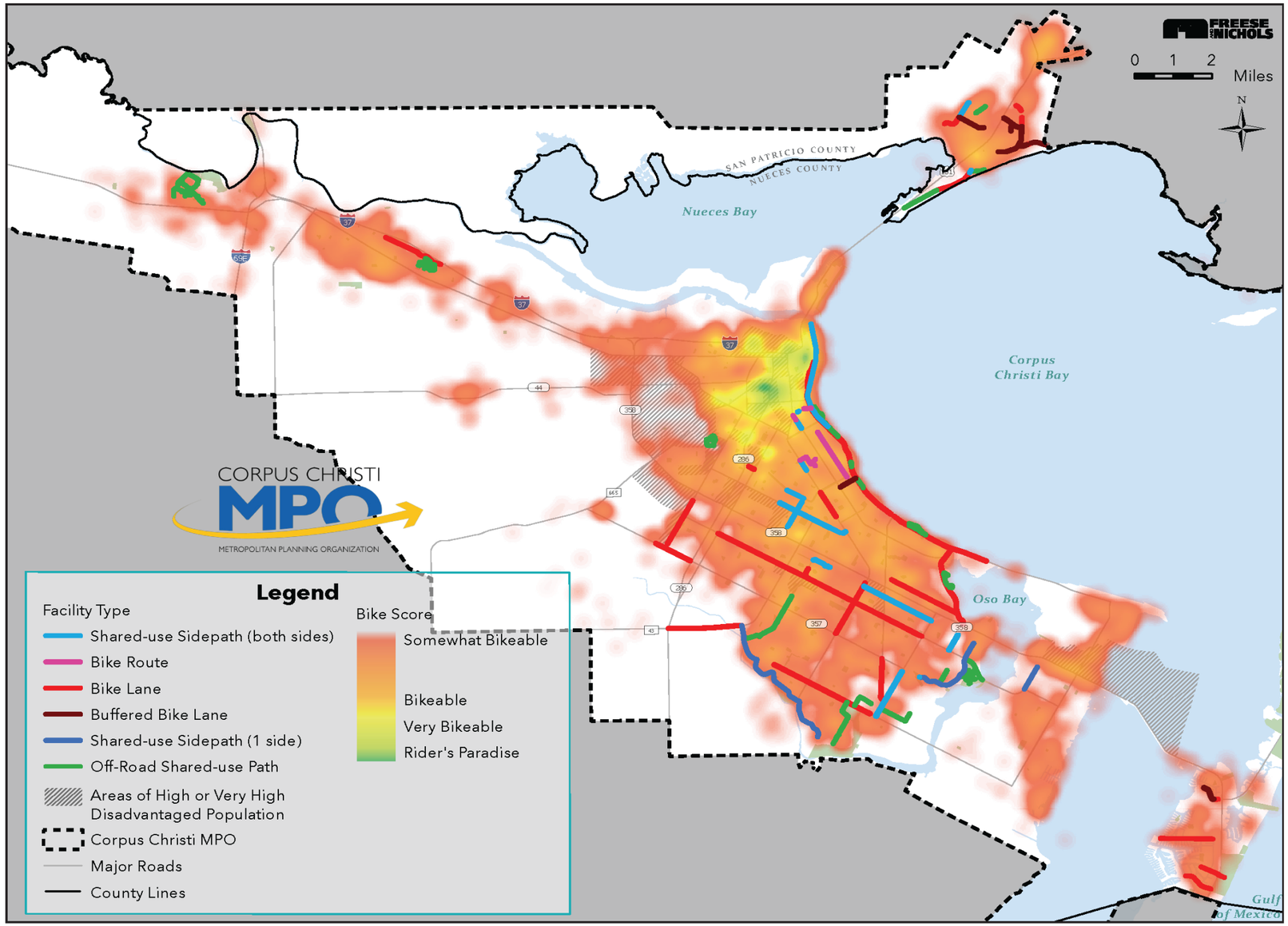
- **90 - 100: Rider's Paradise** (daily errands can be accomplished on a bike)
- **70 - 89: Very Bikeable** (biking is convenient for most trips)
- **50 - 69: Bikeable** (some bike infrastructure)
- **0 - 49: Somewhat Bikeable** (minimal bike infrastructure)

The bike score reveals that the most bikeable areas in the Corpus Christi MPO are in Downtown and Central City districts in Corpus Christi. Flour Bluff, Mustang Island, Southside and Northwest Corpus Christi are areas that have the lowest bikeability scores.

The bike score is based on extracting information on existing bike facilities from the Open Street Map. As such, for the purpose of this Active Transportation Plan, the bike score serves as a high-level tool for the project team to evaluate and compare the bikeability of different neighborhoods in the Corpus Christi MPO area.

For comparison purposes, areas of high or very high disadvantaged population are shown on Exhibit 2-25 to highlight areas that could benefit greatly from becoming more bikeable.

Exhibit 2-25: *Bike Score in the Corpus Christi MPO Planning Area*



Source: Walk Score®, Corpus Christi MPO 2023 Program for Addressing Discrimination

Existing Bike Facilities

Exhibit 2-26 through Exhibit 2-31 show examples of the types of bicycle facilities currently provided in the Corpus Christi MPO area.

Bike Lane



Exhibit 2-26: *Bike Lane on Ocean Drive in Corpus Christi*

Off-road Shared-Use Path



Exhibit 2-29: *Off-road SUP on Brawner Parkway in Corpus Christi*

Bike Route



Exhibit 2-28: *Bike Route on Swantner Drive in Corpus Christi*

Buffered Bike Lane



Exhibit 2-27: *Buffered Bike Lane on Lang Road in Portland*

Shared-use Sidepath (one side)



Exhibit 2-30: *SUP (on one side) on N. Shoreline Boulevard in Corpus Christi*

Shared-use Sidepath (both sides)



Exhibit 2-31: *SUP on both sides on Williams Drive in Corpus Christi*

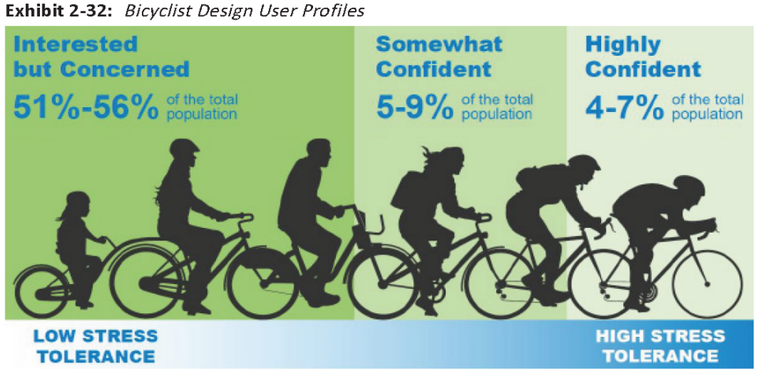
Typical Active Transportation User Profile

According to FHWA's 2019 Bikeway Selection Guide, there are three types of general bikeway users, as shown in Exhibit 2-32:

- **Interested but Concerned Bicyclist**
  - The largest group of the Active Transportation Network users
  - Lowest tolerance for traffic stress
  - Prefers off-street or separated bike facilities, may bike on sidewalks even if bike lanes are provided
  - Most recommended design user profile as it can accommodate users of all ages and skills
- **Somewhat Confident Bicyclist**
  - Other names include Enthused or Confident Bicyclist
  - Generally comfortable on most types of bike facilities
  - Prefer low-volume roadways, but can tolerate high-volume roadway for short distances to avoid longer/detour travel
- **Highly Confident Bicyclist**
  - Smallest group of Active Transportation Network users
  - High tolerance for traffic stress and is comfortable on high-volume roads
  - Will ride even on roads without bike lanes
  - Prefer direct routes and avoid streets with dense pedestrian or slow-moving bicycle traffic

The Corpus Christi MPO region is diverse and so are the people who live here. Using demographic data, surveys, and extensive meetings with members of the public, the project team expanded upon the FHWA Guide and developed profiles of different types of current and potential users of the Active Transportation Network (see Exhibit 2-33). This Active Transportation Plan is designed to accommodate the specific needs of these—and other—users.

Exhibit 2-32: *Bicyclist Design User Profiles*



Source: FHWA 2019 Bikeway Selection Guide

Exhibit 2-33: *Active Transportation User Profiles*



Jose is a retiree living in Nueces County. Once a week he needs to run errands and appointments in Corpus Christi. Jose would love it if he could walk to all his destinations on well-maintained and shaded sidewalks.



Ashley and Jake live in Corpus Christi with their two kids. They like going out to walk and bike but have found limited opportunities to take the kids out in places that are safe for them.



Mike is a father of two living in Nueces County. His parents live down the street. He doesn't feel safe allowing the kids to walk or bike to their grandparents' house, but wants to keep the family active. Mike would love to see hike and bike trails and better connectivity and maintenance for sidewalks in the area.



Gabriel is an unhoused person in Nueces County. He has limited support and relies on walking to access his daily needs. Occasionally he uses public transit when given a bus pass.



Karen lives in central Corpus Christi and uses a wheelchair for getting around. She needs to get across town to work and attend medical appointments. She does not drive or bike, and she relies on public transportation. She hopes there are better sidewalks so she can commute easier.



Bryan is a serious cyclist living in urban Nueces County who loves to bike for exercise and entertainment. He often rides with a group of cyclists on city streets after work and on weekends.



Elizabeth is a sophomore at Del Mar College. She loves the convenience of biking to class and to run errands, but her bike was stolen last year and she has been nervous parking her bike around town ever since.



Sarah is a fifth grader whose school is a few streets away from her house. This is the first year Sarah has been allowed to walk to school by herself.



Chris is a senior citizen living in suburban Nueces County. He does not drive and lives far from public transportation. He's still very active in his community and regularly walks to visit family and friends who live nearby.



Luciana and Alejandro are a young couple living in Central Corpus Christi. They enjoy riding their bikes on city streets after work and on weekends.

MICRO-MOBILITY

Micro-mobility includes small, low-speed wheeled vehicles like bikes and scooters. This form of travel complements active transportation by providing easier first- and last-mile trips as well as more flexible and accessible short-distance travel that encourages physical activity and reduces reliance on cars. While safety and other issues must be addressed, micro-mobility can provide an alternative mode of transportation for those who cannot or do not wish to travel by car.

Lime is currently the only commercial provider of micro-mobility services in Corpus Christi, with approximately 800 scooters in service. Existing micro-mobility services have defined zones where use is restricted:



Low-Speed Zones - Lime vehicles can be operated at a limited speed. Your vehicle will gradually slow down. In Corpus Christi, this covers much of North Shoreline Boulevard and limits speed to 10 mph.

No Parking Zones – Your ride cannot end in these zones.





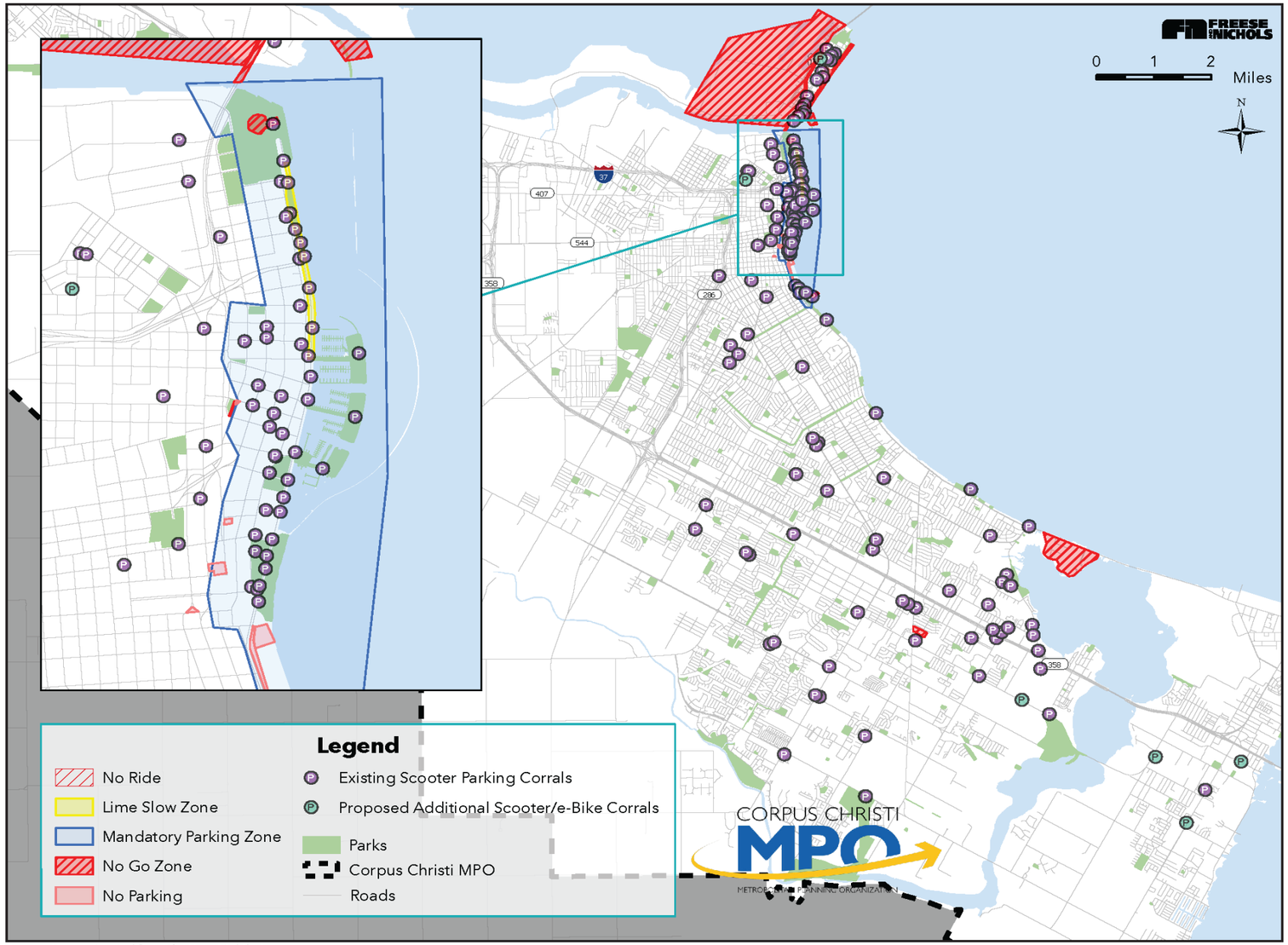
Mandatory Parking Zones – Within these zones, you must end your ride at a designated parking spot. These zones help alleviate the issue of dockless micro-mobility vehicles like scooters taking up a significant portion of the public right-of-way.

No Go Zones – No Lime vehicles can travel. Your vehicle will gradually come to a Stop.



For more information about micro-mobility elements, refer to the Micro-mobility section on page 4-8. To see the full Micro-Mobility Plan and Ordinance for the Corpus Christi MPO area, refer to Appendix C.

Exhibit 2-34: *Micro-Mobility Network within the City of Corpus Christi*



Source: Lime, extracted from the Lime Mobile App

WALKABILITY

Sidewalk Network

In addition to the shared-use paths, the Corpus Christi MPO area has an extensive sidewalk network with over 2,700 miles of sidewalks. Total length of sidewalks per city is outlined in Exhibit 2-35, and a map of the entire sidewalk network is illustrated in Exhibit 2-36.

Exhibit 2-35: *Total Length of Sidewalks per City*

City	Total Length (Miles)	Percent of Total
City of Corpus Christi	2,503	92.6%
City of Portland	157	5.8%
City of Gregory	27	1%
Other	15	0.6%
Grand Total	**2,702**	**100%**

Source: Corpus Christi MPO Sidewalk Inventory 2023

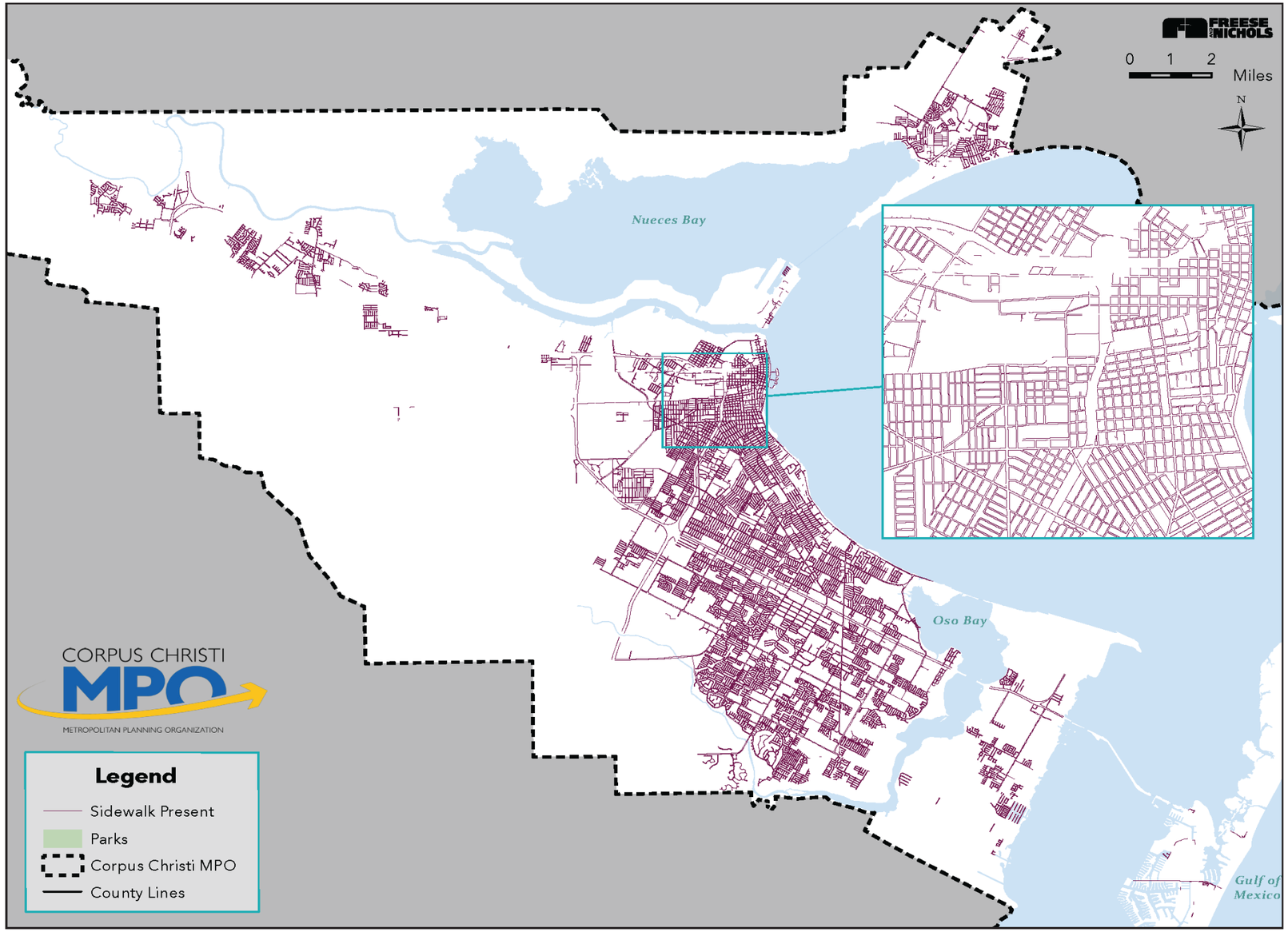
Sidewalk Coverage Around Schools

Exhibit 2-37 on page 2-16 illustrates the existing sidewalk network in relation to school locations. A sidewalk network around schools is crucial for ensuring the safety and well-being of students and it enhances accessibility for all students ensuring equitable access to education.

The exhibit shows the existing coverage of the sidewalk network within a 1/4-mile radius from schools, revealing areas where the network is incomplete and additional connections are needed. These gaps in the network are particularly notable in the Flour Bluff ISD, Portland-Gregory ISD and all ISDs west of Corpus Christi ISD.

Exhibit 4-44 in Chapter 4 presents an example of a Safe Routes to Schools assessment and plan of improvements for the Flour Bluff ISD schools complex. The plan indicates needed sidewalks, ramps, crosswalks and other safety enhancements to encourage walking and bicycling to school be students living within 1/2 mile of the school. Each Elementary and Middle School within the Corpus Christi MPO planning area would benefit from having a Safe Routes to School Plan. Overlaying the Active Transportation Network with the student locations would help to focus the priority of the improvements along the routes to school.

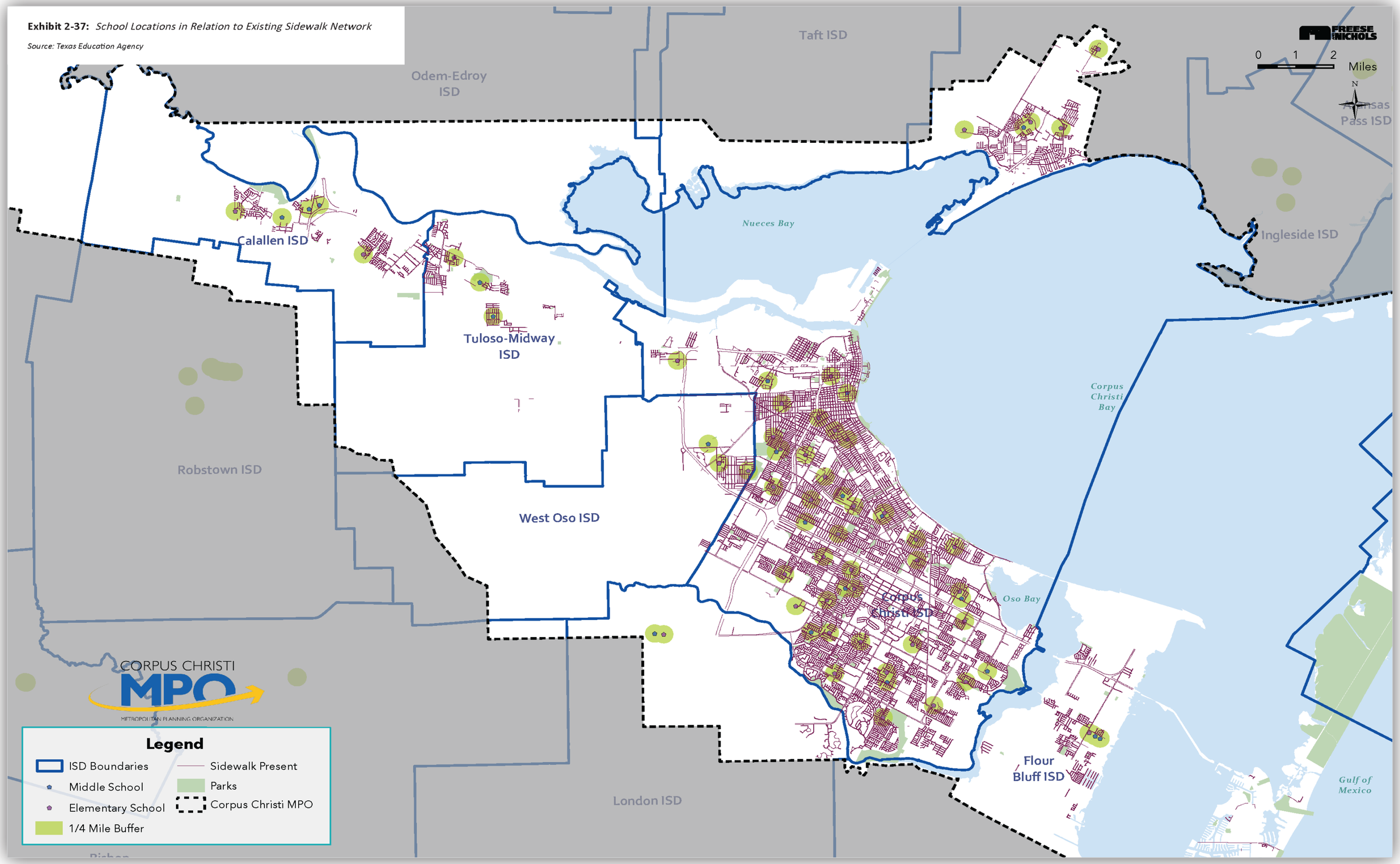
Exhibit 2-36: *Existing Sidewalk Network in the Corpus Christi MPO Area*



Source: Corpus Christi MPO Sidewalk Inventory 2023

Exhibit 2-37: *School Locations in Relation to Existing Sidewalk Network*

Source: Texas Education Agency



Walk Score

Exhibit 2-38 shows the walkability of each address in the Corpus Christi MPO area. The score is based on data sourced from Open Street Map, Google, Factual, Great Schools, the U.S. Census, Localeze and places added by the Walk Score user community.

Walk score measures walkability on a scale of 0-100 and analyzes walking routes to amenities such as grocery stores, schools, parks, retail and food destinations. The score also analyzes pedestrian "friendliness" by analyzing population density and roadway characteristics such as block length and intersection density/spacing. Destinations within a 5-minute walk are given the most points and destinations with more than a 30-minute walk receive no points.

The score does not take into account heat, wind, roadway conditions or shade.

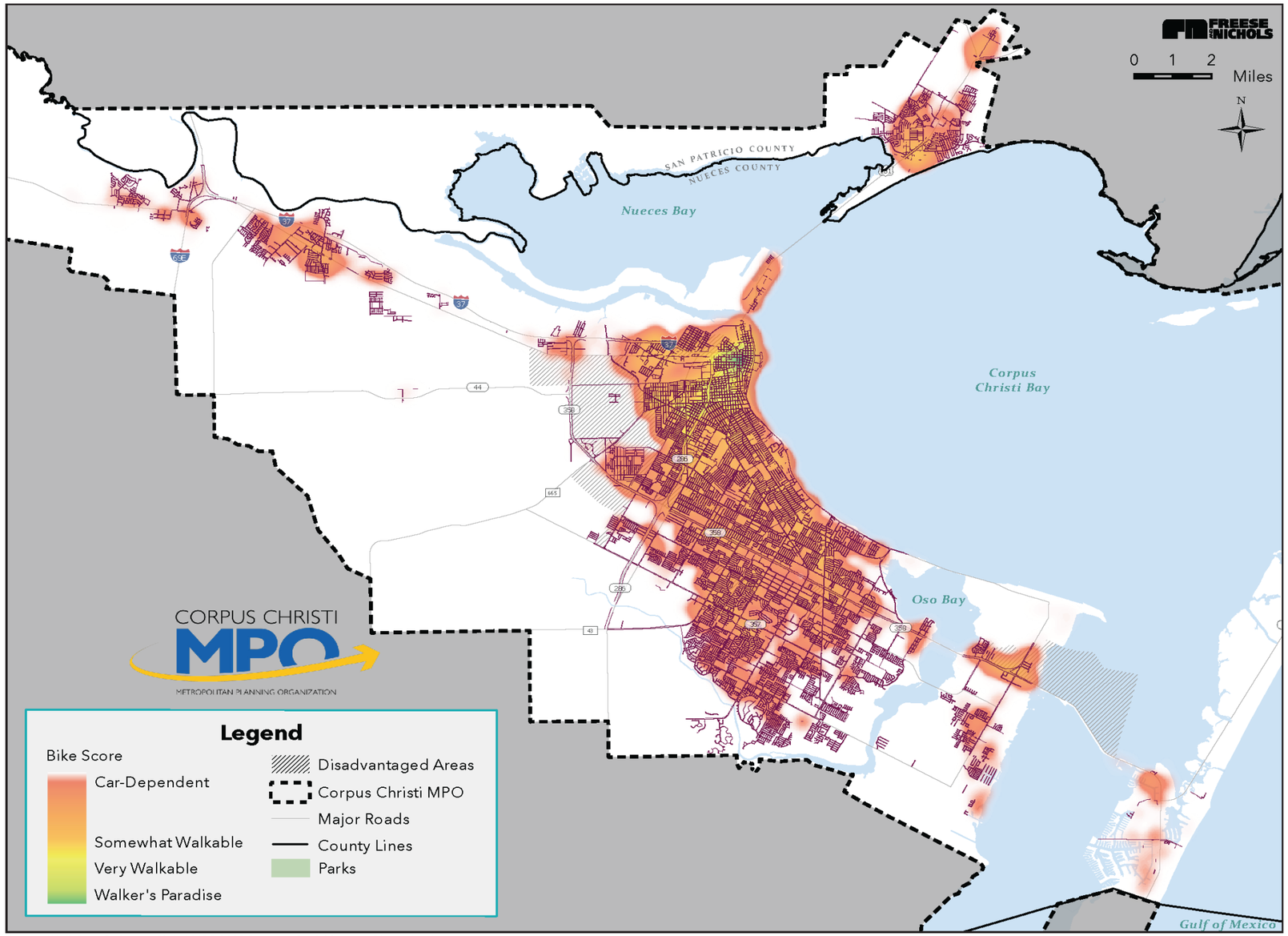
Score breakdown:

- **90 - 100: Walker's Paradise** (daily errands do not require a car)
- **70 - 89: Very Walkable** (most errands can be accomplished by foot)
- **50 - 69: Somewhat Walkable** (some errands can be accomplished by foot)
- **25 - 49: Car-dependent** (most errands require a car)
- **0 - 24: Car-dependent** (almost all errands require a car)

The walk score reveals that the most walkable areas in Corpus Christi MPO are in Downtown Corpus Christi and south of Downtown along SH 286 in Corpus Christi. Areas that need most attention to improve their walkability are Flour Bluff, Southside, and Calallen/Annaville in Corpus Christi.

For comparison purposes, areas of high or very high disadvantaged population are shown on Exhibit 2-38 to highlight areas that could benefit greatly from becoming more walkable.

Exhibit 2-38: *Walk Score in the Corpus Christi MPO Planning Area*



Source: Walk Score®, Corpus Christi MPO 2023 Program for Addressing Discrimination

EXISTING BIKE/PED USER GROUPS

Biking and running groups are vital to active transportation efforts as they raise awareness, advocate for better infrastructure and provide social support and safety, making these activities more accessible and appealing. Exhibit 2-39 lists most of the organizations in the Corpus Christi MPO area that regularly use pedestrian and bicycle facilities or promote walking and biking activities.

Exhibit 2-39: *List of Existing Bike/Ped User Groups in the Corpus Christi MPO Area*

User Group	Description
Knight Riders	A bicycle riding group for "fearless" bike riders.
Downtown CC Run Club	A group for all age groups and skill levels that meets for runs every Wednesday at 6:30 p.m. with happy hour afterwards.
Hype Byke	A bicycling & cycling gear store located in Downtown Corpus Christi that does weekly rides.
CC LED	A ride group for all ages that does night rides with LED lit bikes (though LEDs not required).
Glow Ride Tours	An organization that offers bike rentals and guided tours through Corpus Christi with LED-equipped bikes.
I-Bike CC	Advocates for implementation of protected bike lanes and dedicated biking trails in Corpus Christi.
Bikes For Kids	A group that hosts community activities to raise money for bikes for kids in need.
Corpus Christi Cycling	A Facebook group of 400+ people where bikers can plan group rides, routes and trade or donate cycling equipment.
CC Roadrunners	A running club that hosts weekly group runs and welcomes walkers, joggers and runners alike. The group hosts several events such as Dash 4 Cash, Thanksgiving Turkey Run, and Four for the Fourth.
Team Life Cyclers	Accommodates riders of all skill levels and attends various cycling events. Team "composed of regular people from different backgrounds in Corpus Christi, TX."
Wings of Texas	A nonprofit committed to helping people with disabilities be a part of the community. Organizes Run for a Reason 5k and 10k race in September where runners can opt to push an endurance wheelchair during the race.



Glow Ride Tours. *Source: Glow Ride Tours at glowridetours.com*



My Triumph Team: Wings of Texas Race. *Source: The Bend, provided by Wings of Texas.*

EXISTING BIKE/PED OUTREACH EVENTS

Outreach events also raise public awareness, encourage participation and demonstrate the feasibility and benefits of active transportation. This section lists a number of events in the Corpus Christi MPO area that are using active transportation modes such as biking, walking, running or rolling.

Other events or days that are not being organized in the Corpus Christi MPO area, but would be a great way to promote safe walking, biking and rolling are National Bike to Work/School Day, National Night Out, Earth Day activities, National Bike Month and others.

1. Conquer the Coast

- Major bike event held in September by the City
- Includes ride options for 66, 21 and 10 miles; thousands of cyclists attend every year

2. Beach to Bay Relay

- Annual event since 1976 on the 3rd Saturday in May (Armed Forces Day)
- Includes a six-leg marathon and/or full marathon (26.2 miles) beginning in North Padre Island and ending at McCaughan Park along the scenic Shoreline Drive

3. 4th of July Big Bang

- Held on 4th of July
- Free event for all of CC at downtown CC bayfront featuring fireworks, festivities and more



4. Harbor Half

- Event in November including half marathon & relay, 5K, 10K
- 704 participants and around 150 volunteers recorded in 2023

5. Jingle Bell Food Ride

- Charity event held in mid-December that collects and donates food to Coastal Bend Food Bank
- Includes 4-mile group-bike route and is in collaboration with Hype Byke store



6. Bike Rodeo

- Awareness event held by Corpus Christi Municipal Court in June 2024 to promote safe bike-riding specifically for children
- Four bikes are given away through a drawing and the first 500 kids to attend get a free helmet

PUBLIC TRANSIT

Transit Network

Transit in the Corpus Christi MPO area is provided by CCRTA. The CCRTA provides service to Corpus Christi, Flour Bluff, Padre Island, Portland, Gregory, Robstown and Calallen via 37 bus routes (four of which are express) and over 1,300 stops (see Exhibit 2-41 on page 2-20). CCRTA serves, on average, 2.3 million passengers per year.

Boardings

According to the CCRTA's Fleet Forward Long Range System Plan 2022 Report, high-volume bus stops in the RTA network have at least 30 passenger boardings on average each day (see Exhibit 2-40). Of those, the busiest ones are the Staples Street Station (1,157 boardings), Port Ayers Station (562), Southside Station (456), TAMU-CC (298) and Islander Way at Izzy (141).

CCRTA also collects data regarding bicycle boardings. In total, there were over 490,000 bicycle boardings recorded in the past five years. Over half of the total bicycle boardings were observed on routes 29 Staples, 27 Leopard and 19 Ayers.

Challenges to Safety

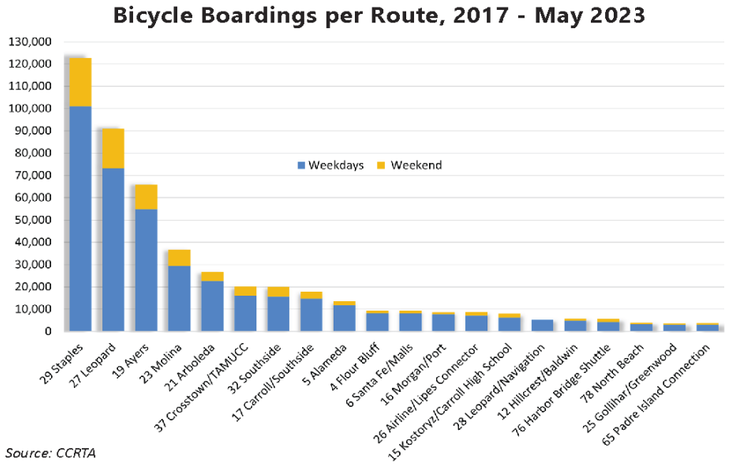
CCRTA's Safety and Security Department has identified safety at bus stops as an added concern of riders and the CCRTA staff, noting people living at the stops, leaving trash around and "demonstrating illicit behavior," which can discourage riders from using public transit and its amenities.

The agency addresses this concern in various ways, such as increasing security at certain stops, installing benches with separator bars and even removing some shelters and benches completely at locations where the issues are particularly severe such as the stop at Airline Road and Williams Drive.



Example of a bus stop bench with separator bars in Corpus Christi.
Source: CCRTA

Exhibit 2-40: *Bicycle Boardings*



Source: CCRTA

Future Improvements

CCRTA's Service Standards outline where, when and how public transit services and customer amenities are provided within its service area. To comply with these standards, CCRTA has plans to install or replace several bus shelters throughout its service area and has outlined criteria for identifying priority areas. Routes with a ridership of 30 or more daily boardings will be given priority. Additionally, stops with 10 or more daily passenger boardings and/or stops that meet one of the following criteria qualify:

- Newly constructed ADA-compliant infrastructure, including shelter pad or bus pad
- Medical, senior citizen activity centers, social service agencies, public or special needs
- Facilities within ¼ mile
- Major employment centers within ¼ mile
- Major grocery stores and shopping centers within ¼ mile
- Apartments, student dormitories, or senior housing with 100+ units within ¼ mile
- High schools, colleges, or universities within ¼ mile
- New major developments conducive to increasing ridership growth within ¼ mile
- Frequent wheelchair lift/ramp usage
- Major transfer point
- Locations where waiting times for riders may be longer (routes with less frequency)
- Pilot service criteria for new implementations and performance monitoring
- Demand response service performance measurements



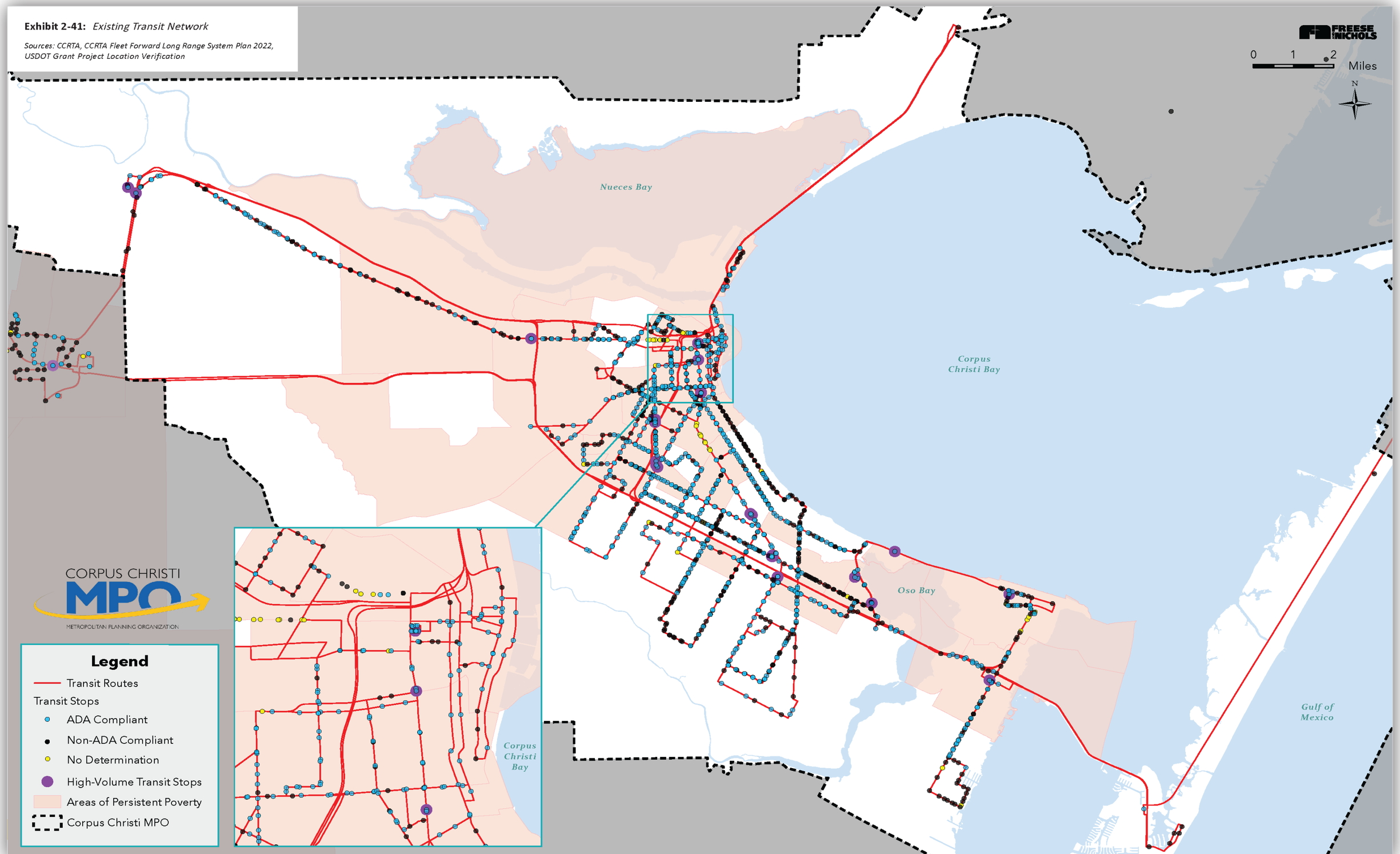
CCRTA's B-Line Paratransit service offers rides to people whose disabilities prevent them from using regular accessible fixed-route service.
Source: CCRTA



ADA-compliant bus stop in Corpus Christi.
Source: CCRTA

Exhibit 2-41: *Existing Transit Network*

Sources: CCRTA, CCRTA Fleet Forward Long Range System Plan 2022, USDOT Grant Project Location Verification



Transit Score

Exhibit 2-42 shows the transit accessibility in the Corpus Christi MPO area. The score calculates the relative "usefulness" of nearby routes, with usefulness defined as the distance of the address to the closest stop on each route, route frequency and mode of transit.

The score measures transit accessibility on a scale of 0-100. If an address distance to the nearest bus stop is more than a 30-minute walk, the location is not awarded any points. The score does not consider crosswalks, bus stop amenities and sidewalk conditions.

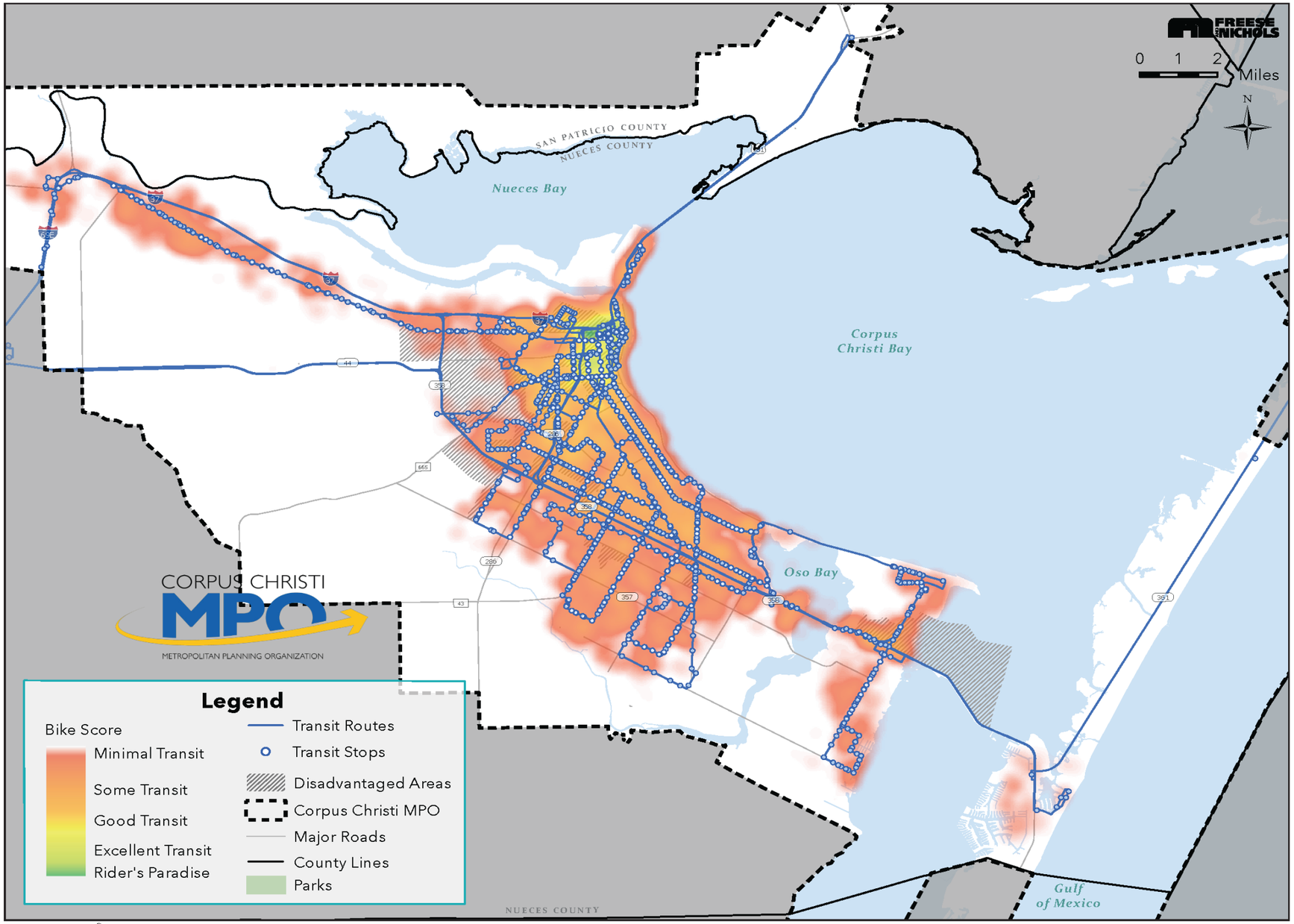
Score breakdown:

- **90 - 100: Rider's Paradise** (world-class public transit)
- **70 - 89: Excellent Transit** (transit is convenient for most trips)
- **50 - 69: Good Transit** (many nearby public transit options)
- **25 - 49: Some Transit** (a few nearby public transit options)
- **0 - 24: Minimal Transit** (it is possible to get on the bus)

The highest transit scores in Corpus Christi MPO are in Downtown and Central City in Corpus Christi. Compared to walk or bike scores, none of the areas ranked in the "Good Transit" category or higher.

For comparison purposes, areas of high or very high disadvantaged population are shown on Exhibit 2-42 to highlight areas that could benefit greatly from increased transit access.

Exhibit 2-42: *Transit Score in the Corpus Christi MPO Planning Area*



Source: Walk Score®, Corpus Christi MPO 2023 Program for Addressing Discrimination

TRAFFIC - ROADWAYS

FHWA Bikeway Selection Guide highlights traffic volumes and speed limit as factors that significantly influence the safety of bikers. As such, the project team gave them a special consideration when selecting an appropriate bikeway facility type during the network development.

Traffic Volumes

The Annual Average Daily Traffic (AADT) count is a standard measurement of traffic volume and provides the average number of vehicles along a segment of roadway over a 24-hour period.

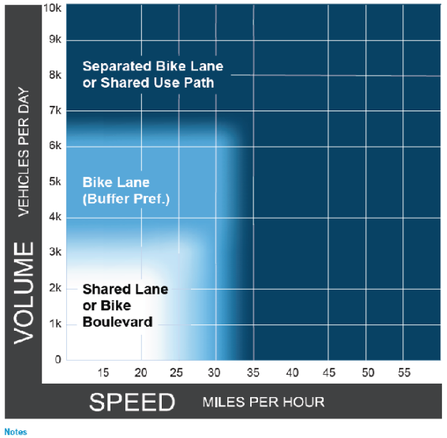
Traffic volumes within the Corpus Christi MPO area currently range from less than 100 vehicles per day to over 120,000 as shown in Exhibit 2-43. Local roads or roadways on the periphery of the MPO planning area have the lowest volumes while the highest are on SH 358 at 120,771 and SH 286 at 111,436.

Vehicle Speed

Exhibit 2-45 on page 2-23 shows the posted speeds on roadways in the MPO planning area. Speed limits of 30 mph and 35 mph are the most common.

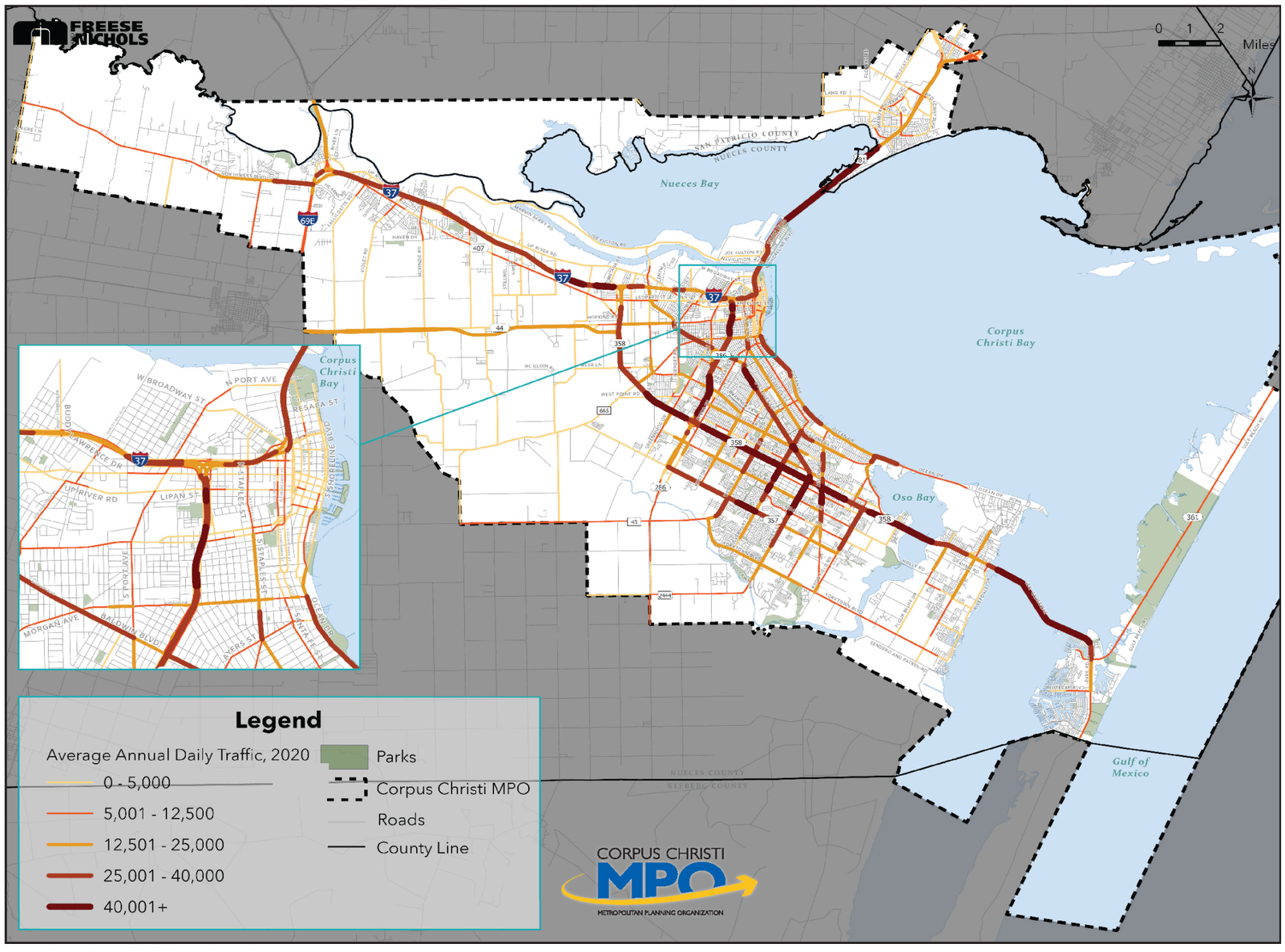
FHWA Bikeway Selection Guide suggests that with increasing speed limits, the buffer between traffic and the bicycle facilities should increase as well, see Exhibit 2-44. FHWA recommends adding a physical barrier or transitioning to off-roadway bicycle facilities when the speed limit reaches 35 mph and/or 7,000 vehicles per day.

Exhibit 2-44: *Preferred Bikeway Type for Urban/Rural Contexts*



Notes
1 Chart assumes operating speeds are similar to posted speeds. If they differ, use operating speed rather than posted speed.
2 Advisory bike lanes may be an option where traffic volume is <3K ADT.

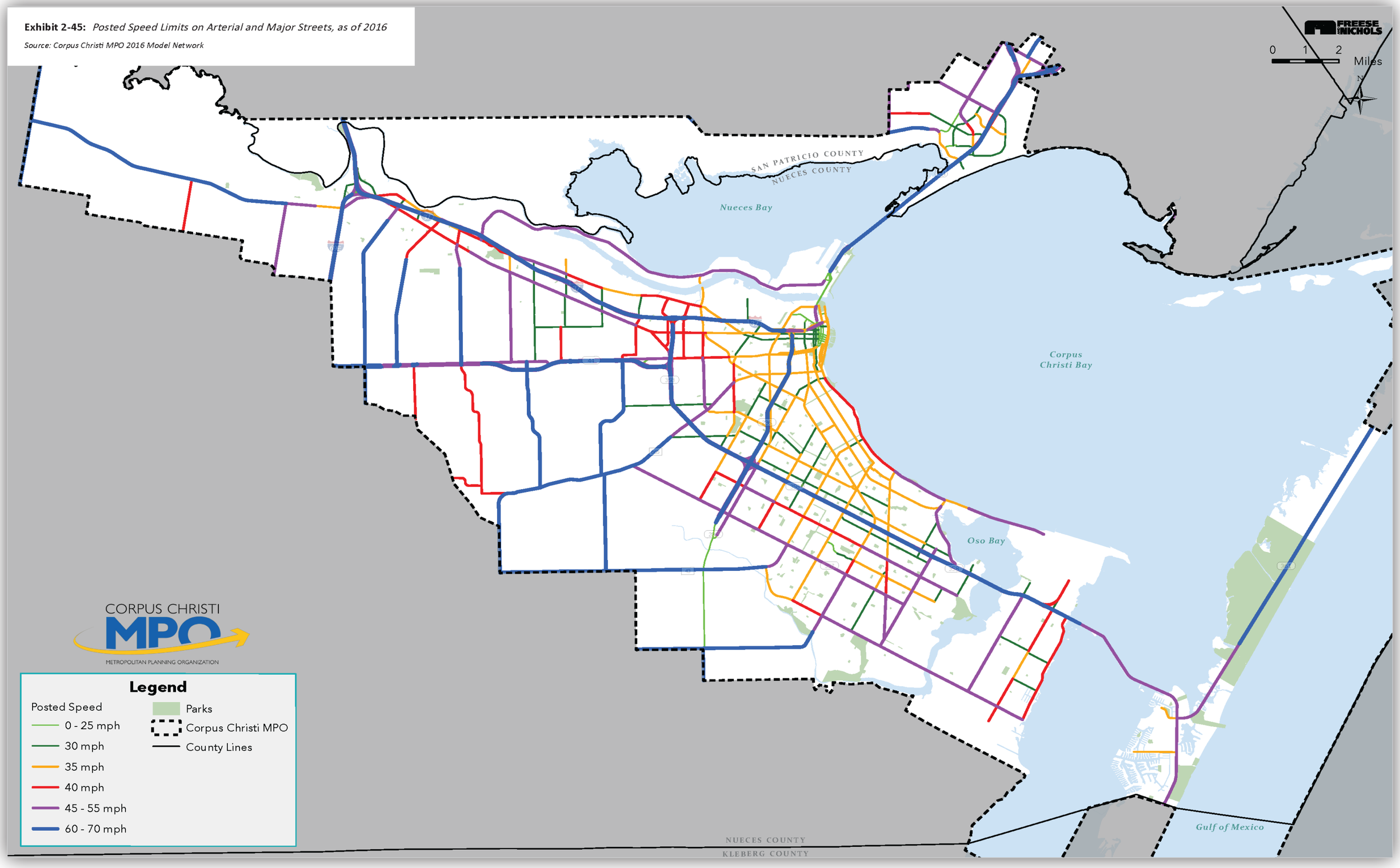
Exhibit 2-43: *Traffic Volumes 2016*



Source: Corpus Christi MPO 2016 Model Network

Exhibit 2-45: *Posted Speed Limits on Arterial and Major Streets, as of 2016*

Source: Corpus Christi MPO 2016 Model Network



Pavement Condition

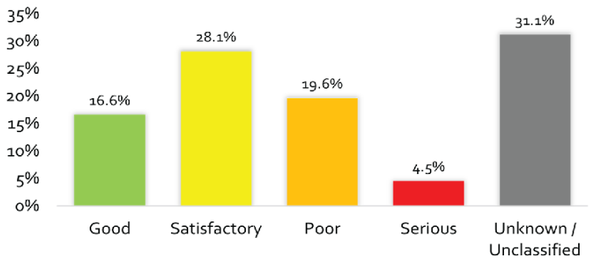
The pavement condition of the existing roadway network in the Corpus Christi MPO area was assessed in 2022.

With over 1,900 miles of pavement assessed, the analysis in Exhibit 2-46 reveals that at least 44% ranked in the "Satisfactory" or "Good" category compared to 24% of the pavement ranking in the "Poor" or "Serious" category.

Pavement condition analysis matters in prioritization of roadway projects, such as reconstruction or resurfacing. A roadway project creates an opportunity to include bike/ped facilities in the project's design and thus enhance the Active Transportation Network.

The Capital Improvement Programs for street overlay and/or reconstruction in the MPO member cities and counties have been reviewed for the upcoming opportunities for incorporating bicycle and pedestrian improvements.

Exhibit 2-46: *Pavement Condition Assessment*



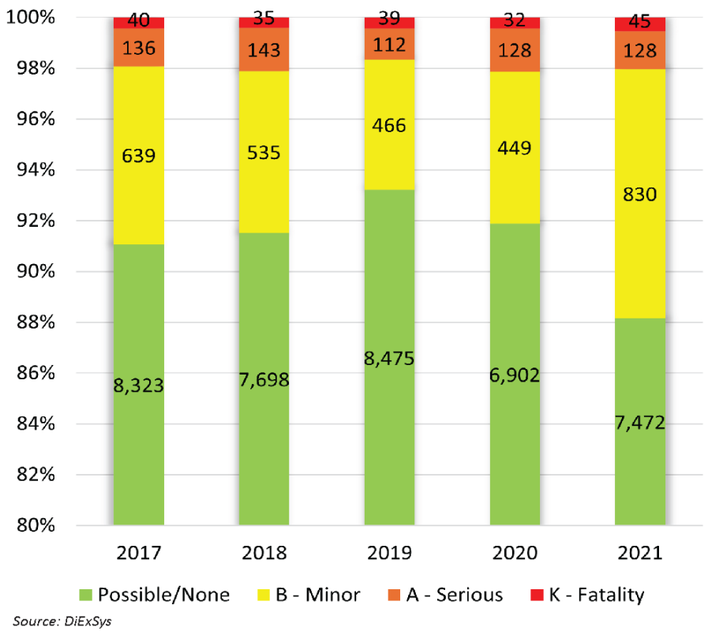
Vehicle and Bike/Ped Crashes

The number of vehicle crashes is important because it provides a real-life illustration of the impacts of operational and congestion issues in a city. There was a total of 42,627 crashes in Corpus Christi MPO between 2017 and September 2021; 191 resulted in fatalities.

Annually, the number of traffic collisions in the MPO planning area showed slight fluctuations from year to year, with 2020 having the lowest number of crashes. That might be explained due to the impact of the COVID-19 pandemic that resulted in lower traffic volumes. Exhibit 2-47 shows the distribution of severity of injury in each year. The graph reveals that the number of injury crashes grew in 2021, following the statewide post-pandemic trend in increased crashes.

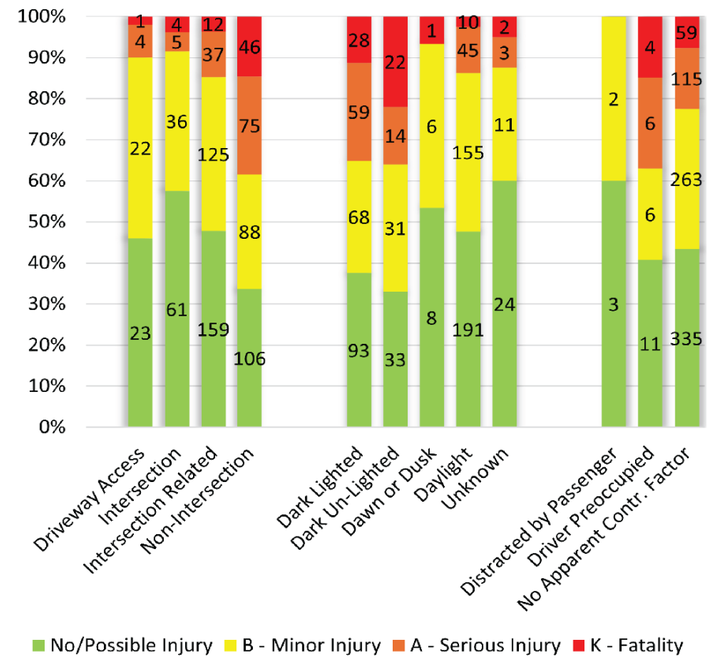
Of the total crashes, 804 included a pedestrian or pedalcyclist. Compared to all crashes, pedestrians and pedalcyclists sustained an injury or a fatality at a **six times higher rate**, which is also consistent with the statewide trends. Exhibit 2-48 also reveals that over 54% of the bike/ped crashes were intersection-related and over 43% happened when it was dark. The location of all bike/ped crashes in the Corpus Christi MPO area can be viewed in Exhibit 2-49 on page 2-25.

Exhibit 2-47: *Crashes by Year and Severity, 2017 - 2021*



Source: DiExSys

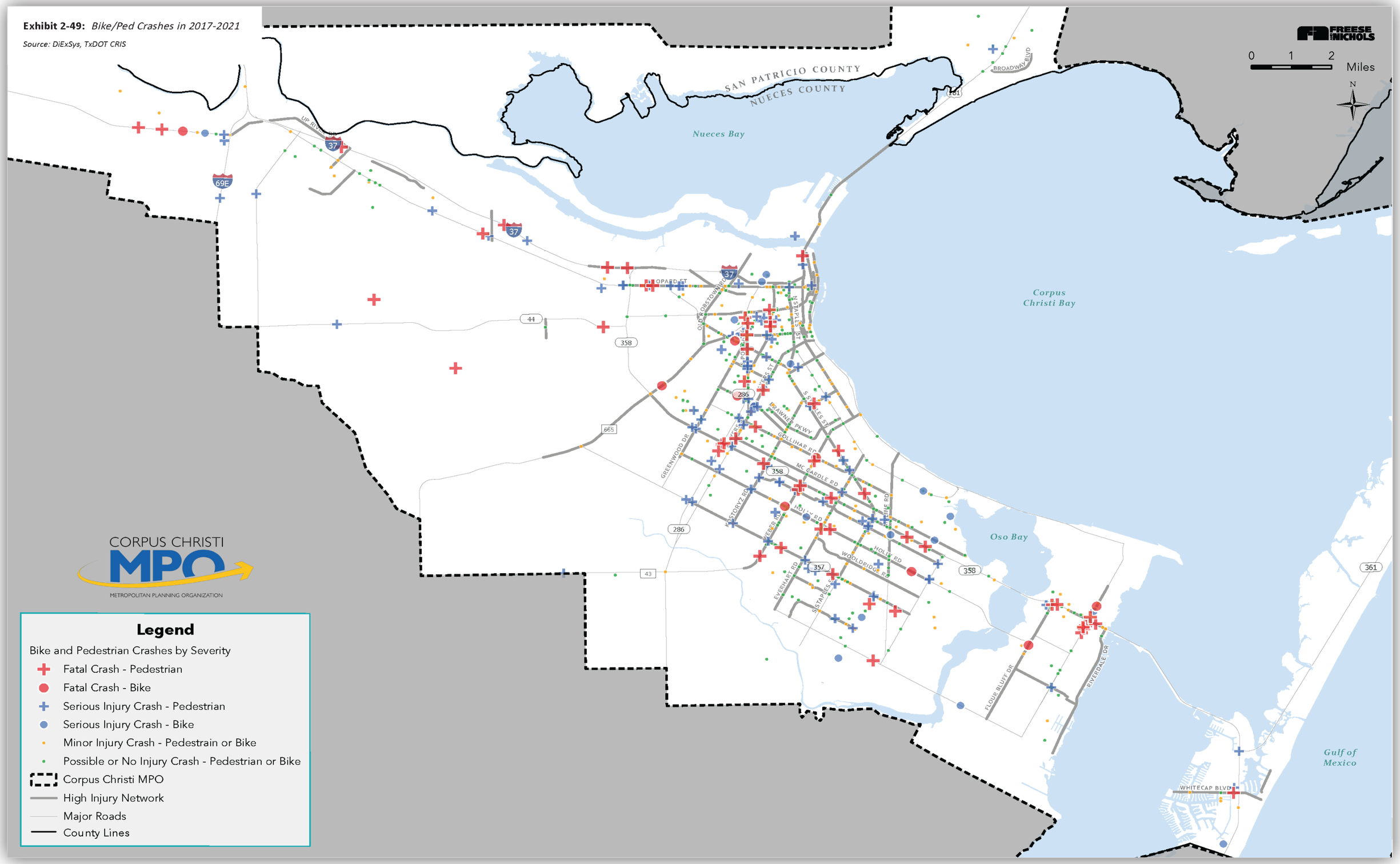
Exhibit 2-48: *Contributing Factors in Bike/Ped Crashes by Year and Severity, 2017-2021*



Source: DiExSys

Exhibit 2-49: *Bike/Ped Crashes in 2017-2021*

Source: DiExSys, TxDOT CRIS



CORPUS CHRISTI MPO
METROPOLITAN PLANNING ORGANIZATION

Legend

Bike and Pedestrian Crashes by Severity

- Fatal Crash - Pedestrian
- Fatal Crash - Bike
- Serious Injury Crash - Pedestrian
- Serious Injury Crash - Bike
- Minor Injury Crash - Pedestrain or Bike
- Possible or No Injury Crash - Pedestrian or Bike
- Corpus Christi MPO
- High Injury Network
- Major Roads
- County Lines



3. ISSUES, NEEDS AND OPPORTUNITIES

3. ISSUES, NEEDS AND OPPORTUNITIES

PUBLIC ENGAGEMENT SUMMARY

The project team coordinated with local government officials, stakeholders, and the public from throughout the region during two engagement phases. The first phase of engagement was held at the beginning of the project. Representatives provided input about existing, planned, and needed facilities in their communities. The second phase gave representatives an opportunity to review their input from previous meetings and included an online survey and public meetings. For more information on the engagement efforts, please refer to Appendix D.

Exhibit 3-01 outlines all meetings that the project team conducted and attended as part of their engagement efforts. General observations included:

- Homeless services, parks, Downtown and beach/shoreline seen as high-demand destinations for pedestrians
- A general lack of accessibility, sidewalks and bike lanes
- The average bicyclists generally prefers protected bike facilities
- The advanced bicyclists prefer long routes with minimal interruptions on low volume roadways, with outside lanes or shoulders that are in good condition
- The access for the disabled is generally good at building entrances, but the lack of street access, curb ramps and curb cuts creates significant problems as they have to traverse the street for access
- The lack of shade on pedestrian paths is an issue for all users, but especially the elderly
- The homeless are more reliant on walking and transit than cycling for their mobility needs
- More funding for day transit passes is needed so that the disabled can access health services and shopping
- Transit is increasingly becoming unaffordable for the disadvantaged
- Bus stops are often difficult to access due to lack of benches, shade, or sidewalk accessibility
- Current beach access for the disabled is extremely limited. The Parks and Recreation Department should consider placing “Moby Mats” at beach entrances to allow wheelchair access on the beach

During the in-person meetings, several roadways were routinely identified by the public and stakeholders as candidates for bikeway improvements or additions. Among others, these included:

- Holly Road
- JFK Causeway
- Ocean Drive
- Ennis Joslin Road

Exhibit 3-01: *Summary of In-Person Public and Stakeholder Engagement Efforts*

Date	Organization
Stakeholder Meetings	
June 14, 2023	City of Corpus Christi Planning Department
	Coastal Bend Center for Independent Living*
	City of Corpus Christi Parks & Recreation Advisory Group
	I Bike CC
June 15, 2023	Port of Corpus Christi
June 16, 2023	Hype Bike
	Choice Living Community*
July 26, 2023	Private Citizen
	Coastal Bend Council of Governments
	City of Corpus Christi / Bike Riders Forum
July 27, 2023	TAMU-CC Department of Education
July 28, 2023	Corpus Christi Parks and Recreation Department
	TAMU-CC Accessibility Study Author*
	City of Corpus Christi Homeless and Housing Services*
November 15, 2023	Timon's Ministries*
	Catholic Charities of Corpus Christi*
January 18, 2024	City of Corpus Christi Planning Department
July 2, 2024	City of Corpus Christi Planning Department
Corpus Christi MPO Meetings	
June 15, 2023	Technical Advisory Committee Meeting
November 16, 2023	2050 MTP Workshop
January 18, 2024	Technical Advisory Committee Meeting
September 19, 2024	Technical Advisory Committee Meeting
September 19, 2024	2050 MTP Workshop
Public Meetings	
January 16, 2024	Held in La Retama Public Library in Corpus Christi
January 17, 2024	Held in Portland Community Center
October 1, 2024	Held at Marvin Baker Middle School as part of MPO meeting about the MTP Update
October 2, 2024	Held at Seashore Middle Academy as part of MPO meeting about the MTP Update

* Environmental Justice Advocate (EJA). See Advocacy for Environmental Justice section on page 3-7 for further discussion of the EJA engagement.



Steering Committee Meeting, June 2023



Open House in Corpus Christi, January 2024

Survey Results

Corpus Christi MPO presented an opportunity for community members to express their opinions through an online survey. The survey was active from January 16 to May 1, 2024 and received 55 responses.

The results shown in Exhibit 3-02 indicate that walking is the most common mode of active transportation on a daily or weekly basis. Over 11% of respondents bike daily and another 24% bike at least weekly or monthly.

Exhibit 3-03 reveals that most people use active transportation to get to a social activity. Only 7% of respondents use active transportation to go to school. This number, however, does not represent children in primary or secondary education as the survey did not receive responses from people younger than 18 years old.

As Exhibit 3-04 illustrates, almost 50% of trips people take using active transportation are over 5 miles, and another almost 30% take trips that are between 2-5 miles long. Short trips are the least common, with only 7% of respondents taking trips that are less than a mile long, reinforcing previous observations that most trips are for social activities.

Exhibit 3-02: *Frequency of Usage of Active Transportation Modes*

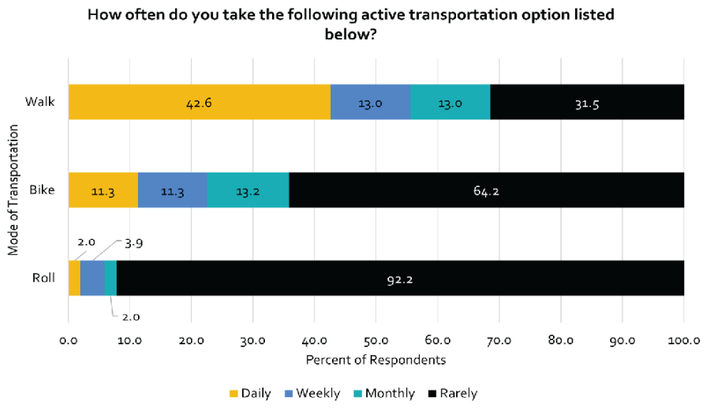


Exhibit 3-03: *Destinations of Trips Using Active Transportation*

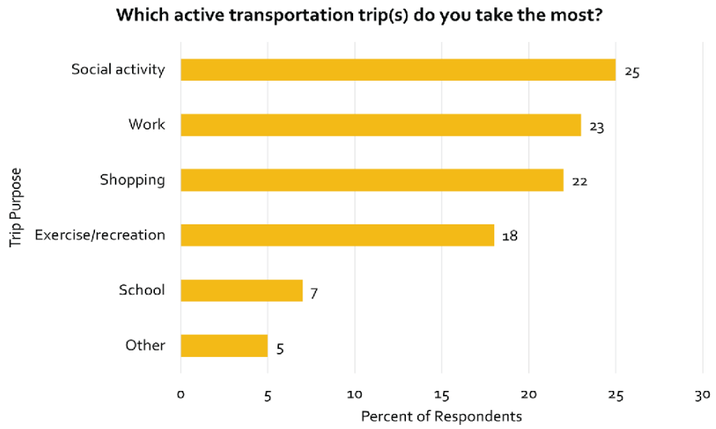
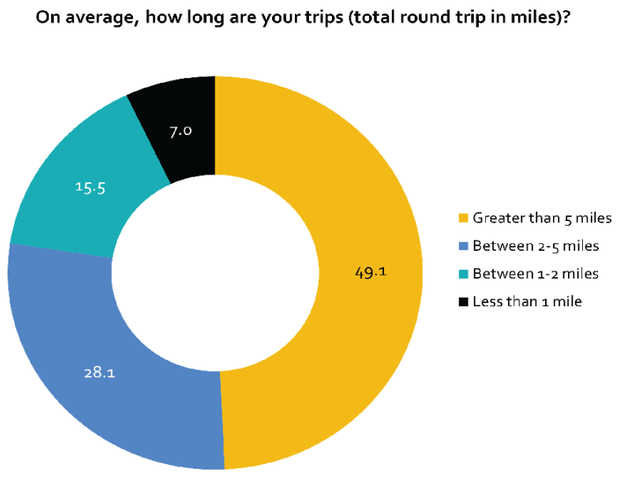


Exhibit 3-04: *Length of Trips Using Active Transportation*



Most people agree or strongly agree that the regional institutions and partners need to prioritize active transportation even if it means redirecting resources from other transportation needs. At the same time, over 40% felt neutral about the statement, as shown in Exhibit 3-05.

When asked about ranking the improvements to active transportation facilities, over 40% of respondents ranked sidewalk improvements as the top priority and sidepath improvements as the second highest priority, as illustrated in Exhibit 3-06.

Exhibit 3-05: *Redirecting Resources toward Active Transportation Agreement Scale*

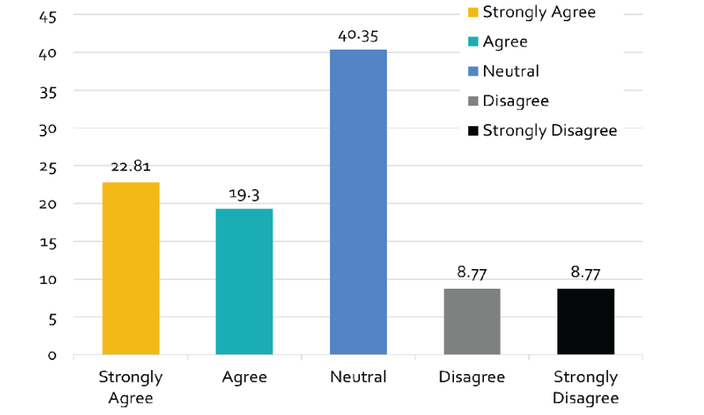


Exhibit 3-06: *Ranking the Improvements of Active Transportation Facilities*

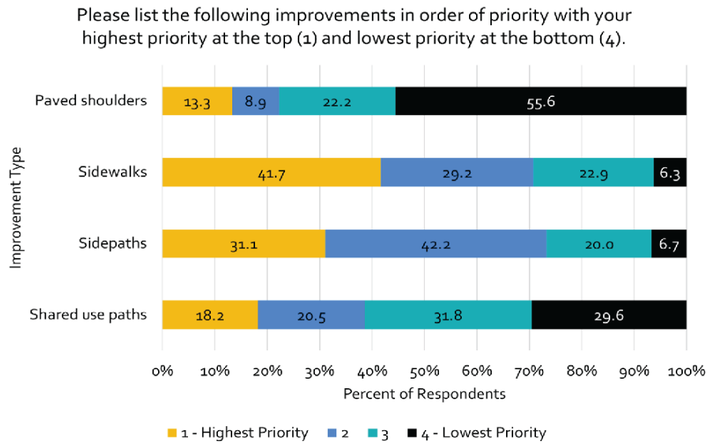


Exhibit 3-07 reveals that the survey respondents mostly feel very or somewhat safe when using active transportation modes in their neighborhood. Only around 18% of people feel very unsafe.

Exhibit 3-08 reveals that the top three safety concerns people see are inadequate sidewalks (over 70%), poor pavement conditions (almost 65%), and third place tied between lack of designated bike lanes and recurring driver behavior issues (44% each).

Those results align with responses in Exhibit 3-09 when asked to rank implementation of safety measures. The top three choices scoring 5 or higher call for more dedicated pedestrian and biking facilities, better pavement maintenance and traffic calming devices to slow down drivers and improve safety for active transportation users.

Most of the respondents of this survey identify as intermediate- or advanced-level bikers, as shown in Exhibit 3-10, which limits the viability of the survey results as it largely excludes the opinions of casual or potential new riders.

For a full summary of the survey results and comments, please refer to Appendix D.

Exhibit 3-07: *Feeling of Safety when Using Active Transportation*

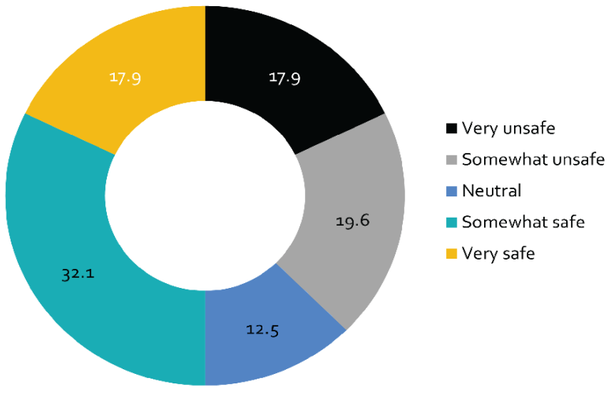


Exhibit 3-08: *Main Safety Concerns when Using Active Transportation*

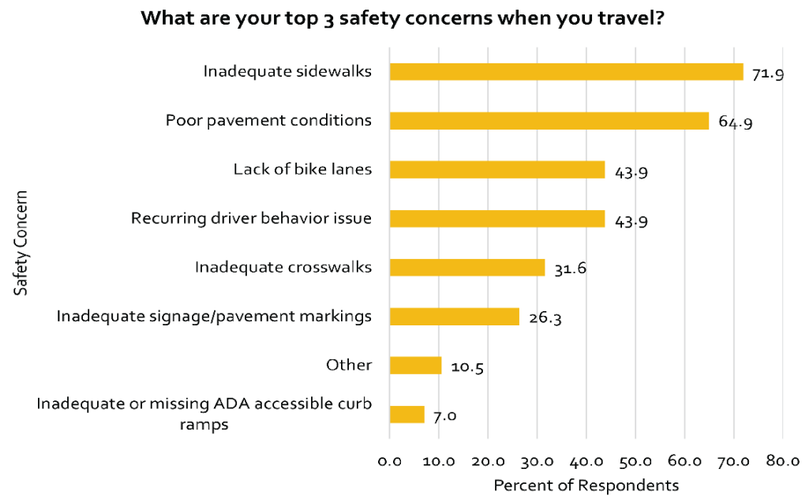


Exhibit 3-10: *Biking Experience Level of Respondents*

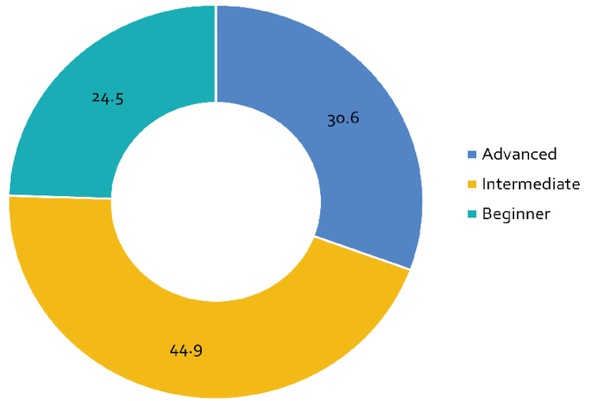
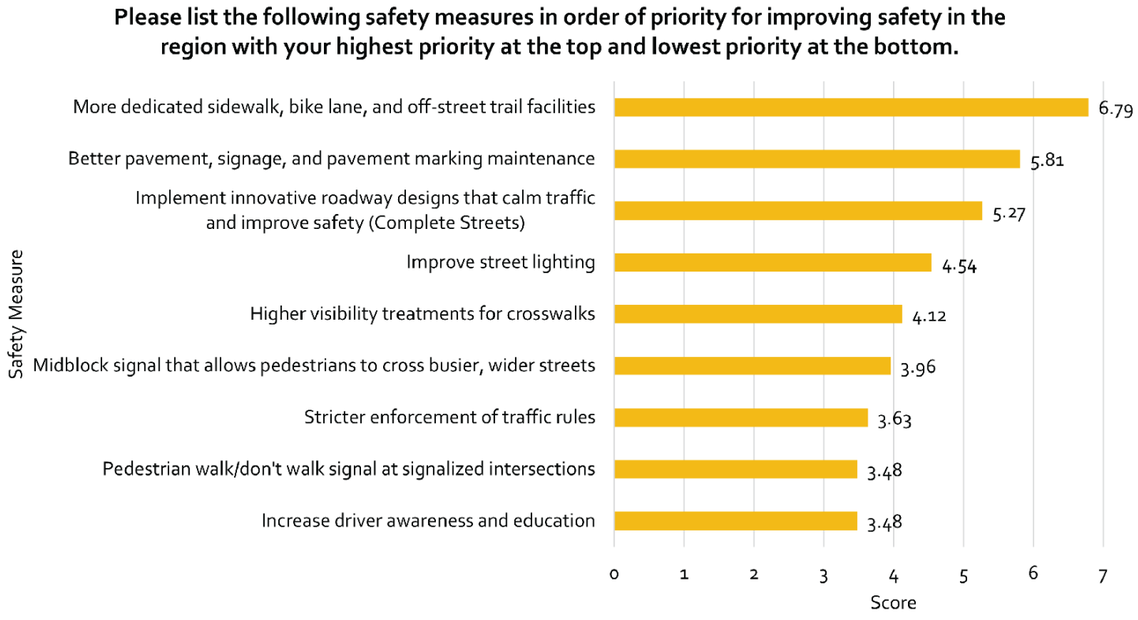


Exhibit 3-09: *Prioritization of Safety Measure Types*



Interactive Map Results

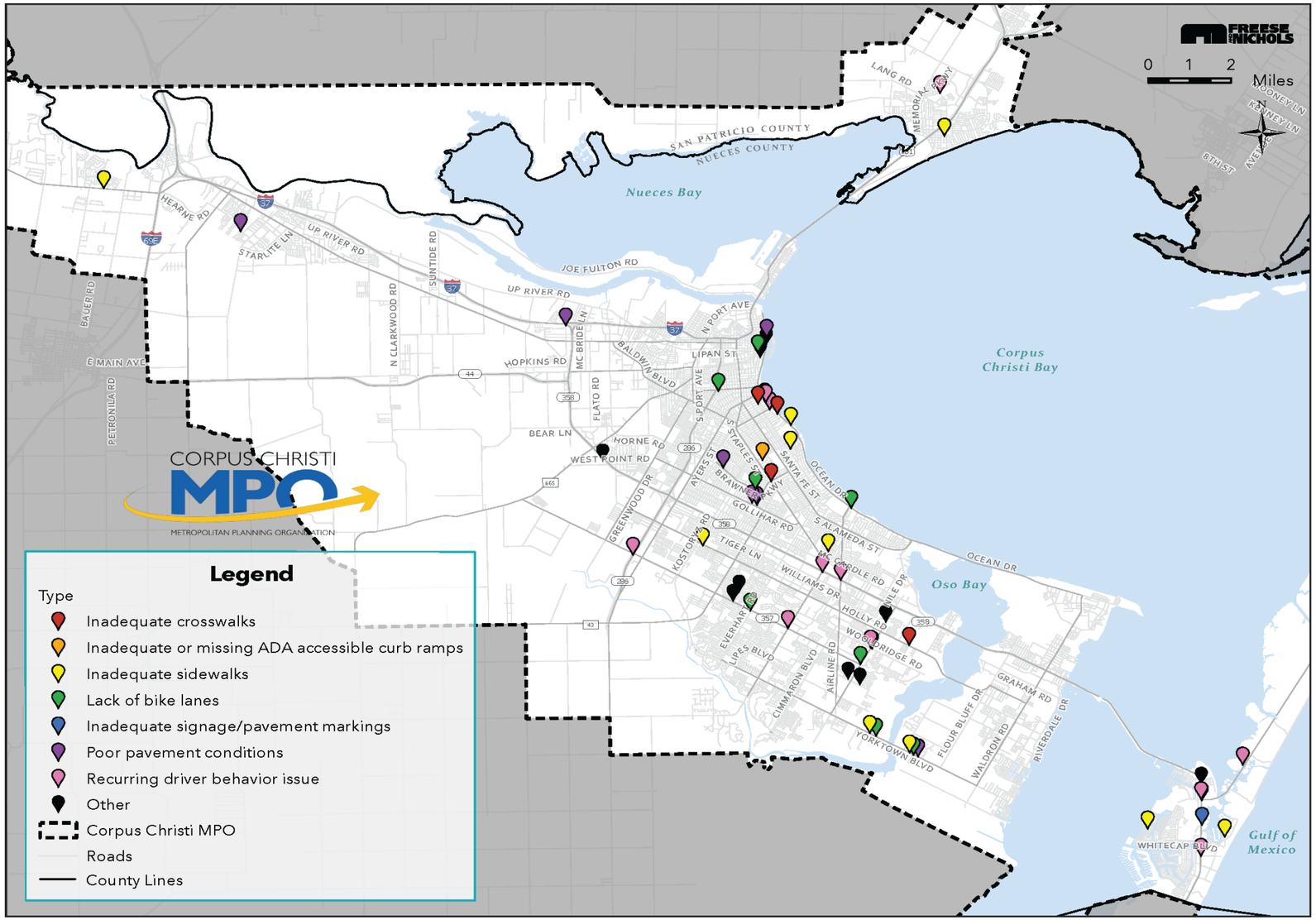
As part of their online engagement efforts, the survey was accompanied by an interactive map. This interactive map was also open to the public from January 16 to May 1, 2024 and received 55 responses. As shown in Exhibit 3-11, respondents had an option to place a marker on the map in locations where they experienced any of the following issues:

- Lack of bike lanes
- Poor pavement conditions
- Inadequate signage/pavement markings
- Recurring driver behavior issue
- Inadequate sidewalks
- Inadequate crosswalks
- Inadequate or missing ADA accessible curb ramps
- Other

Most of the comments in the "Other" option expressed concerns with missing sidewalks, bike lanes, or poor pavement conditions.

For a full summary of the interactive map comments, please refer to Appendix D.

Exhibit 3-11: *Locations of the Interactive Map Comments*



IDENTIFIED ISSUES AND NEEDS

During plan development, input from key stakeholders, community groups and the general public identified several key issues regarding active transportation within the Corpus Christi MPO area. These ideas were further evaluated during the project development process for verification and to determine priority areas. Common themes, as seen in Exhibit 3-12, were expansion and enhancement of protected and/or separated bicycle facilities, expansion of the trail network, improvements to existing bike/ped facilities, connections to destinations, continuation between facility types, and active transportation safety.

Protected and/or Separated Bicycle Facilities

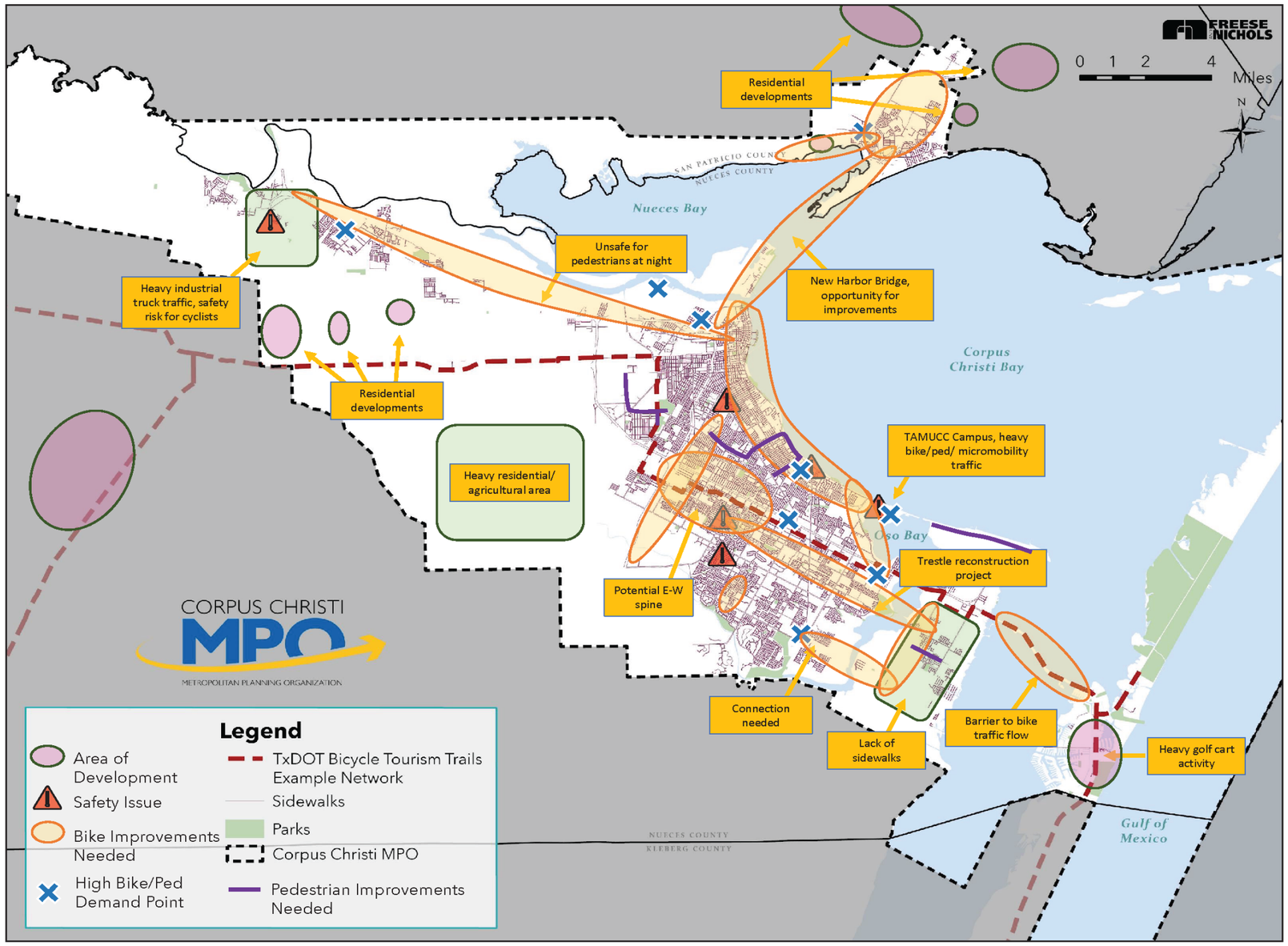
Many attending the public meetings and providing responses to online surveys were active bicyclists of various ability levels. A majority of bicyclists expressed the desire to have some degree of separation between bicyclists and motorists. Most also expressed that bicycling along paths shared with pedestrians is less desirable than having space on the roadway dedicated to bicycling, especially when there is high pedestrian activity. The provision of a striped buffer was seen as not as desirable as some physical element within that buffer space, whether it be bollards, curbs or other treatments.

Designated Bike Routes on Neighborhood Streets

Many of the bicyclists attending the public meetings and providing responses to on-line surveys indicated that they prefer riding along neighborhood streets that are relatively low volume and low speed and that allow them not to have to mix with pedestrians. They expressed a need to have traffic control at strategic crossings of arterial streets to provide the continuity of their bicycling route along lower volume/lower speed streets without having to ride along a busy street or share a path with pedestrians.

Specific usage of existing designated bike routes along such streets as Swantner Drive and others are used to form a network of neighborhood streets suitable for bicycling. Consideration should be given to adding traffic control at strategic low volume side street intersections with arterials to facilitate bicycle crossings for enhancing the neighborhood bike route network functionality.

Exhibit 3-12: *Identified Issues and Needs In Corpus Christi MPO Area Based on Public and Stakeholder Input*



Expansion of the SUP and Trail Network

When trails extend to where people want to go to eat, shop, play, socialize or work, or to other destinations, trails and SUPs become an important link in the transportation network. Many comments were received on the need to extend the trails and SUP network that has already been created to advance them to their next logical connections. Trails along the system of drainage ditches were pointed out as great opportunities.

Many expressed that a SUP at the back of curb is not a desirable bike/ped facility. Many do not like the green-colored one-way cycle tracks. Some have asked for a smoother riding surface than concrete with its frequent jointing.



Significant Barriers, Safety

Several significant barriers were identified:

SPID – Arterial intersections at SPID pose significantly aggressive settings to bicycle and pedestrian crossings. Some lower intensity locations for potential crossing enhancement near current bike/ped usage corridors were pointed out at Carrol Lane and Ennis Joslin Road.

Oso Bay – The new Trestle Bridge is seen as a great addition to the bicycling network. A Yorktown Boulevard bikeway is needed.

Ship Channel - The new Harbor Bridge is seen as a great addition to the bicycling network.

Major Street Intersections – Staples Street @ Del Mar Boulevard/15th Street, Ocean Boulevard @ Airline Road, and other intersections were identified as posing hazards for pedestrians and bicyclists, mentioning issues such as right turns on red. There are left turn conflicts with crosswalks, etc. The need for additional traffic control should be assessed.

Improve Existing Bicycle and Pedestrian Facilities

One-way Cycle Tracks - Several bicyclists have complained about the design treatment of the existing SUP/one-way cycle track at the street intersections. The cycle track ends and has to merge with the adjacent 5-foot wide sidewalk to enter the curb ramp. They would like to have the cycle track continued all the way to the street crossing, have a wider ramp and wider crosswalk.



Sidewalks – Many comments were made at public meetings, in online surveys and in the local media about the conditions of the sidewalks in neighborhoods. These comments were regarding deteriorated surfaces and buckling pavement that create walking hazards and nearly impassable conditions for persons with mobility impairments.

Upgrade Existing Bike Lanes – The Ocean Drive and Shoreline Boulevard bike lanes are well used and have opportunity to add buffers and/or bollards.

Bike Lanes on High Speed/High Volume Streets - There is an existing bike lane for over 7 miles along Holly Road, but speeds are fast and volumes are heavy. There is need to create an east-west spine bikeway, but a safe one. Consider reducing speed limits.

Connectivity

Connectivity is an essential component of a successful Active Transportation Network as it is important to provide reliable connections between activity centers and provide alternative travel routes for various trip purposes.

Connect to Shoreline Boulevard/Ocean Drive Corridor – The bile lanes and trails along this corridor are wonderful facilities and can be made even more enjoyable. Getting to them from the surrounding areas is challenging due to few crossings and the provisions at those crossings, especially at Ennis Joslin Road, Louisiana Avenue and others. A nice connection has been made at Del Mar Boulevard – build on that.

Connect to TAMU-CC Main Campus – An 8-foot-wide sidewalk extends along the east side of Ennis Joslin Road from SPID to Ocean Drive and along the south side of Ocean Drive from Ennis Joslin Road to the TAMU-CC Main Campus. This wide sidewalk carries significant volume of pedestrians and bicyclists between campus and the nearby apartments. A 4-foot-wide shoulder bike lane is provided in both directions next to traffic traveling over 40 MPH, and a median area is provided and needs to be upgraded.

Connect to Del Mar College Heritage Campus – The campus is surrounded by residential neighborhoods, Staples Street on the east, Ayers Street on the west and Baldwin Boulevard on the north. These constrain access to the campus. Louisiana Avenue would make a good bike/ped gateway boulevard to the east side of campus.

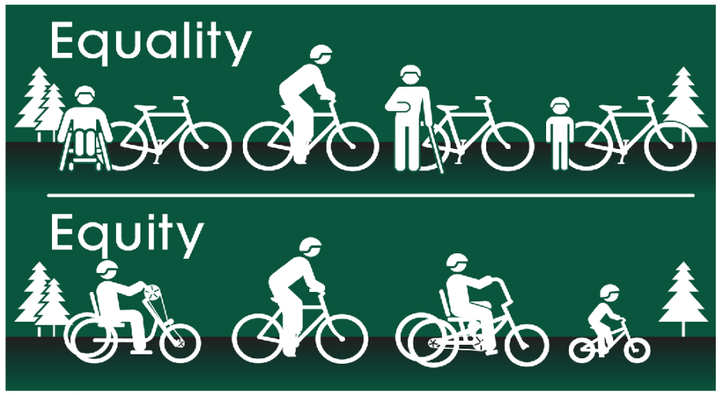
Missing Sidewalks – Many streets in Flour Bluff are built in a rural setting and have no sidewalks; many streets in Mustang Island also have not sidewalks, which limits non-motorized mobility and safety.

Equity and ADA Considerations

Equity in transportation involves meeting the needs of all community members by providing equitable levels of access to affordable and reliable transportation options based on the needs of the population being served, particularly populations that are traditionally underserved or disadvantaged. Equity differs from equality in that it considers each group's individual needs and provides the appropriate solutions. Exhibit 3-13 illustrates this difference using bike riding as an example. In an equal situation, everyone is given the same bike without considering their actual need. In an equitable situation, everyone is given different tools based on their need and are able to successfully travel by bike.

Without equity, certain communities may be left behind, exacerbating inequalities in health, mobility and opportunity. By prioritizing equity, cities can create transportation systems that promote social inclusion, improve public health and reduce environmental impacts, benefiting the entire community.

Exhibit 3-13: *Equality vs. Equity*



Source: FHWA

Advocacy for Environmental Justice

Specific efforts were made to involve and gain input from representatives of organizations that support disadvantaged groups and promote environmental justice. These organizations included:

Coastal Bend Center for Independent Living, a non-profit organization providing core services for the disabled to help them live independently. The Director also serves as the chair of the Corpus Christi Traffic Advisory Committee. Issues identified through conversation:

- Lack of accessibility, sidewalks and bike lanes throughout the region
- Bus stops seen as too far
- Need for more lighting especially at bus stops

Choice Living Community, operates a day activity center that provides vocational, social and life skills support for disabled persons. The Director also sits on the Corpus Christi People with Disabilities Committee. Issues identified through conversation included:

- A need to have more bike/ped events
- A desire to have protected bike lanes

Special Education Department at TAMU-CC, authored a 2023 study on accessibility for the disabled for parking, sidewalks, entrances, interiors, beaches and parks in Corpus Christi. Issues identified through conversation included:

- E-Bikes are seen as more reliable than buses
- No way to cross shoreline for parks
- No sidewalks to access the beach

City of Corpus Christi Homeless Services, provides placement services for the low-income and homeless population in Corpus Christi. Issues identified through conversation included:

- There is a lack of adequate sidewalks and bus access
- Bus stops need shade structures

Timon's Ministries, provides day services for the homeless in Flour Bluff. Issues identified through conversation included:

- Most homeless walk to their destination making it difficult to reach shelters, including Timon's Ministries
- There is no homeless shelter in Flour Bluff
- Homeless people are unable to cross the Oso Bridge
- Need for a shuttle service to downtown to reach social services and administration

Catholic Charities of Corpus Christi, operates a food bank, shelters, immigration services and support services for the low-income/disabled/homeless in Corpus Christi. Issues identified through conversation included:

- Homeless bicyclists need assistance keeping and maintaining their bikes (preventing them from being stolen, fixing flat tires, etc.)
- Often run out of day passes for transit

Sidewalks and Disadvantaged Populations

An inventory of pedestrian activity revealed limited available data. As such, input from stakeholders representing disadvantaged communities was used to understand sidewalk-dependent populations. These groups include the disabled and homeless, who rely more on ADA-compliant sidewalks and transit than cycling for daily mobility needs.

Exhibit 3-15 on page 3-8 shows the sidewalk inventory colorized to represent where there are concentrations of disabled persons and with the locations of Housing Authority and Homeless Shelter locations. A detailed analysis of these concentrations and their specific needed treatments is needed, specifically in Flour Bluff, Calallen/Annaville, Portland/Gregory and the Downtown and Central City areas of Corpus Christi. A zone-based approach, as used the by City of Corpus Christi in its Downtown Marina Arts District ADA Audit (see page 3-9), is recommended.

The sources used to analyze areas where there are concentrations of disadvantaged communities to identify priority areas for sidewalk improvements are listed below.

Mobility-Challenged Populations

Public engagement revealed that there is a perceived lack of mobility options for those with physical, but also non-ambulatory disabilities. The Corpus Christi MPO Program for Addressing Discrimination includes a dataset on persons with disabilities that was used to gain a general understanding of where these populations reside.

Corpus Christi Housing Authority

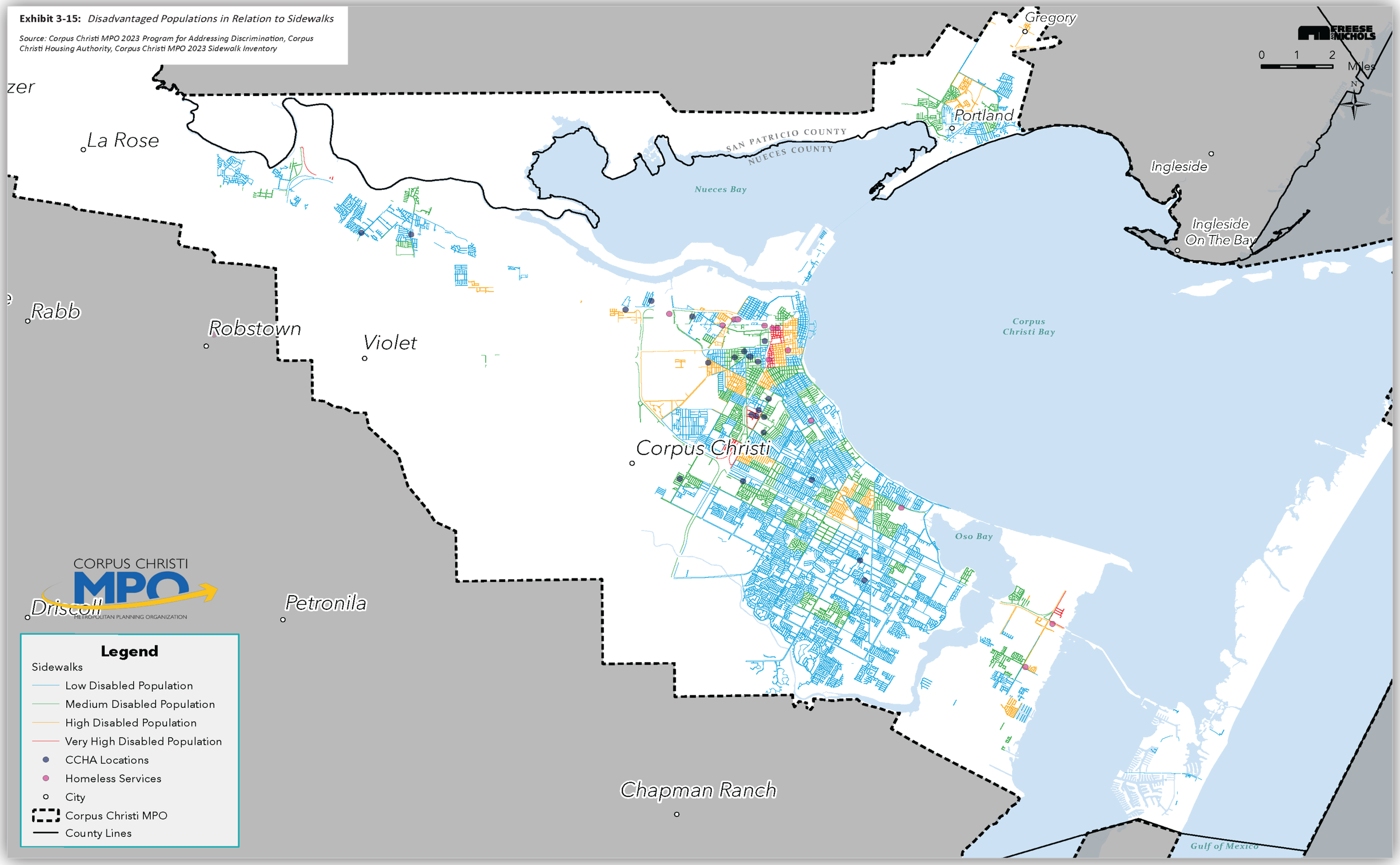
The Corpus Christi Housing Authority (CCHA) is a provider of affordable housing in the City of Corpus Christi, providing over 4,000 people with housing with an average rent of $115 per month. In addition to managing and developing low-income housing, CCHA provides resources for residents of Corpus Christi. The location of CCHA housing is one indicator of where disadvantaged populations are concentrated.

Homeless Services

The locations of various known social services for the homeless, including shelters and food banks, have been identified. At these locations, pedestrian infrastructure should be complete so that those who use walking as their

Exhibit 3-15: *Disadvantaged Populations in Relation to Sidewalks*

Source: Corpus Christi MPO 2023 Program for Addressing Discrimination, Corpus Christi Housing Authority, Corpus Christi MPO 2023 Sidewalk Inventory



primary mode of transportation can access the services safely and conveniently.

Downtown Marina Arts District ADA Audit

A good sidewalk network requires not only the presence of sidewalks but also that they be accessible and ADA-compliant. Elements of good sidewalk networks include good pavement conditions, sidewalk width of at least 6-10 feet, presence of ramps, ADA warning pads, crosswalks, continuous sidewalk connections, lighting, shade, benches and signage.

The Downtown Marina Arts District conducted a detailed ADA audit of the sidewalk network that addresses the accessibility requirements listed above. The audit was conducted between April and June 2023. Exhibit 3-16 reveals that the majority of assessed locations were in a need of sidewalk reconstruction or minor repairs and multiple other locations were lacking an ADA ramp.

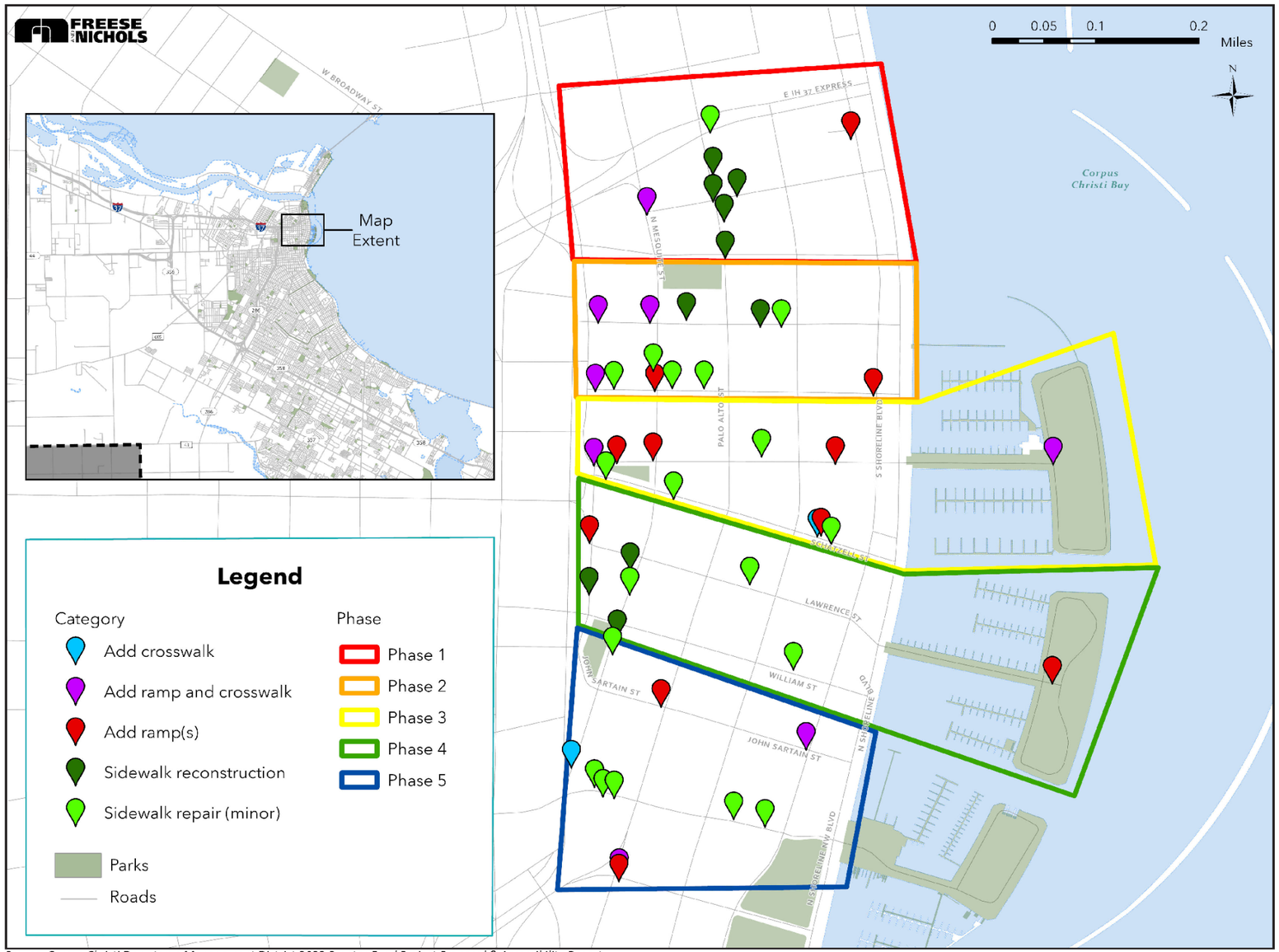
The recommendations from the ADA audit were incorporated into the City's Bond Program and this Active Transportation Plan has incorporated bike/ped-related Bond projects into the proposed network.

TAMU-CC Accessibility Study

A 2023 study (Community Survey Report: Status of Corpus Christi's Accessibility, Engagement and Inclusion) at Texas A&M Corpus Christi provided insight into the perception of accessibility in Corpus Christi. One key takeaway from the survey of 28 people is that beaches and parks were found among the least accessible areas.

Recommendations include providing wheelchair-accessible entrances, terrain and playground equipment and adding more accessible parking across the City. Generally, respondents felt that walking facilities are accessible but may be impeded by objects extending into the walkway.

Exhibit 3-16: *Downtown Marina Arts District ADA Audit*



Source: Corpus Christi Downtown Management District 2023 Scooter Fund Project Proposal & Accessibility Report

Bus Stop ADA Access Assessment

A 2022 ADA assessment of CCRTA bus stops, shown in Exhibit 3-18, identified stops that are non-ADA compliant. According to the U.S. Access Board, an ADA-compliant bus stop includes, but is not limited to, the following:

- A stable and firm surface
- Boarding and alighting areas that are:
  - At least 96 inches in length and 60 inches in width
  - Connected to a street, sidewalk or a pedestrian path by an accessible route
  - Do not have a slope steeper than 1:48.
- Bus signs that comply with specific:
  - Font case, style, proportions (line/character spacing, etc.)
  - Accessibility symbols and pictogram sizes and colors

If the bus stop features a bus shelter, the shelter needs to be at minimum 48 inches in length and 30 inches in width, and be connected to the boarding and alighting area by an accessible route.

Over 40% of the assessed stops were identified as non-ADA compliant for various reasons, including issues with the boarding area (71.3% of total non-compliant stops), issues with the shelter, or a lack of accessible route to/from the stop.

Exhibit 3-17: *Bus Stop ADA Compliance Assessment*

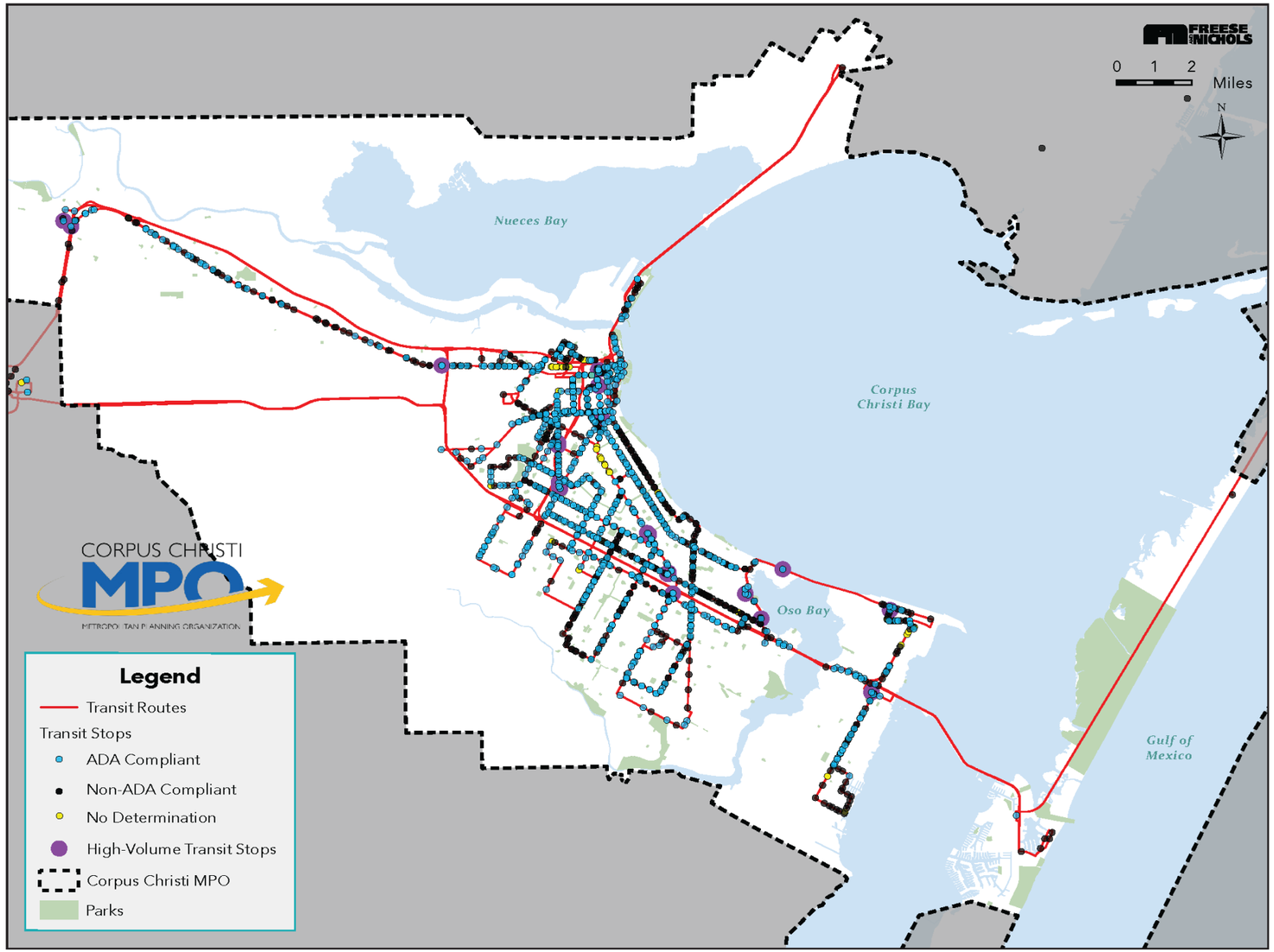
Non-Compliance Category	Count	Percent
ADA-Compliant Stops Total	**779**	**56.16%**
ADA-Non-Compliant Stops Total	**567**	**40.88%**
Boarding & Alighting Area Issues	404	29.13%
Shelter Issues	19	1.37%
Accessible Route Issues	57	4.11%
Multiple Issues	87	6.27%
Unknown Total	**41**	**2.96%**
Total	***1,387***	***100%***

Source: Bus Stop and Transfer Facility ADA Assessment, CCRTA Long Range System Plan, November 2022



Example of an inaccessible bus stop in Corpus Christi. The pad at the bus stop at Airline Road at Monette Drive does not have the required depth (96") to be ADA-compliant. (Source: Google Street View)

Exhibit 3-18: *CCRTA Bus Stop ADA Assessment Results*



Source: Bus Stop and Transfer Facility ADA Assessment, CCRTA Long Range System Plan, November 2022

IDENTIFIED OPPORTUNITIES

The development of a robust Active Transportation Network is enhanced by identifying and acting on existing and predicted opportunities in the MPO planning area. The following opportunities for bike and pedestrian improvements have been identified.

Harbor Bridge

The new Harbor Bridge is being constructed by TxDOT. The new bridge will replace the existing Harbor Bridge across the Corpus Christi Ship Channel, reconstruct connecting roadways, and increase the height of the crossing to allow for larger ships to access the port. This new crossing will provide opportunities to enhance connections across the new bridge to North Beach and Portland as well as improve connectivity in Downtown Corpus Christi. An observation platform at the middle of the bridge span will provide a new tourist attraction accessible only by the bridge walkway.



New Harbor Bridge SUP under construction.

Higher Education Institutions

Colleges are hubs of active transportation activity, with college students using bikes and walking as their primary form of transportation more than other populations. Texas A&M University - Corpus Christi and DelMar College present opportunities to promote active transportation and create connections between these campuses and the surrounding area.

Trestle Bridge

The City of Corpus Christi was recently awarded $13 million in funding to construct a hike and bike trail over the old railroad trestle across Oso Bay, allowing the trail to extend from Paul Jones Road/Oso Parkway to Flour Bluff Drive. This connection will greatly improve active transportation connectivity between Flour Bluff and Oso Bay and expand opportunities for Active Transportation Network development in Flour Bluff.



Washed out beams from the old railroad bridge crossing from Oso Bay to Flour Bluff, at the location of the new Trestle Bridge. *Source: Corpus Christi Parks and Recreation, Caller-Times Contributed*

Statewide Plans

TxDOT is in the process of developing its Statewide Bicycle Tourism Trail Network and Statewide Active Transportation Plan. This is an opportunity to connect the Corpus Christi MPO's Active Transportation Network to an even larger hike and bike network. The current alignment of the Texas Bicycle Tourism Trail enters the Corpus Christi area from the west along SH 44 and continues through Corpus Christi to Mustang Island, as illustrated by Exhibit 3-19 on page 3-12.

Current and Planned CIP, IMP and Bond Projects

Full listing and descriptions of all current and planned Capital Improvement Plan (CIP), Infrastructure Management Program (IMP) and bond projects can be found in Appendix F.

Several planned CIP, IMP, and bond projects involve bike, pedestrian and ADA considerations which extensively enhance active transportation infrastructure throughout the Corpus Christi MPO area.

Corpus Christi Projects

The purpose of the City of Corpus Christi CIP, IMP and bond projects is to improve the City's infrastructure and transportation network.

The CIP projects include improvements to bike mobility and ADA accessibility. These will be incorporated into the Active Transportation Network plan.

The IMP, also known as Rapid Pavement Program (RPP), focuses on street maintenance of aging infrastructure. The RPP rolls over every five years and sets up regular maintenance and rehabilitation of residential, local, and arterial streets to keep roadway pavement conditions at an acceptable level where rehabilitation is cost-effectively balanced against complete reconstruction. Sidewalks and ADA improvements may be included in residential street rebuild projects.

The proposed 2024 transportation bond projects are in the final stages of review by the City of Corpus Christi Parks Department and other entities. The bond will go before voters in November 2024. The projects will focus on street improvements and involve ADA-compliant improvements to sidewalks, and add sidepaths and trail segments.

Locations of all the CIP, IMP and Bond projects in Corpus Christi can be viewed in Exhibit 3-20 on page 3-13.

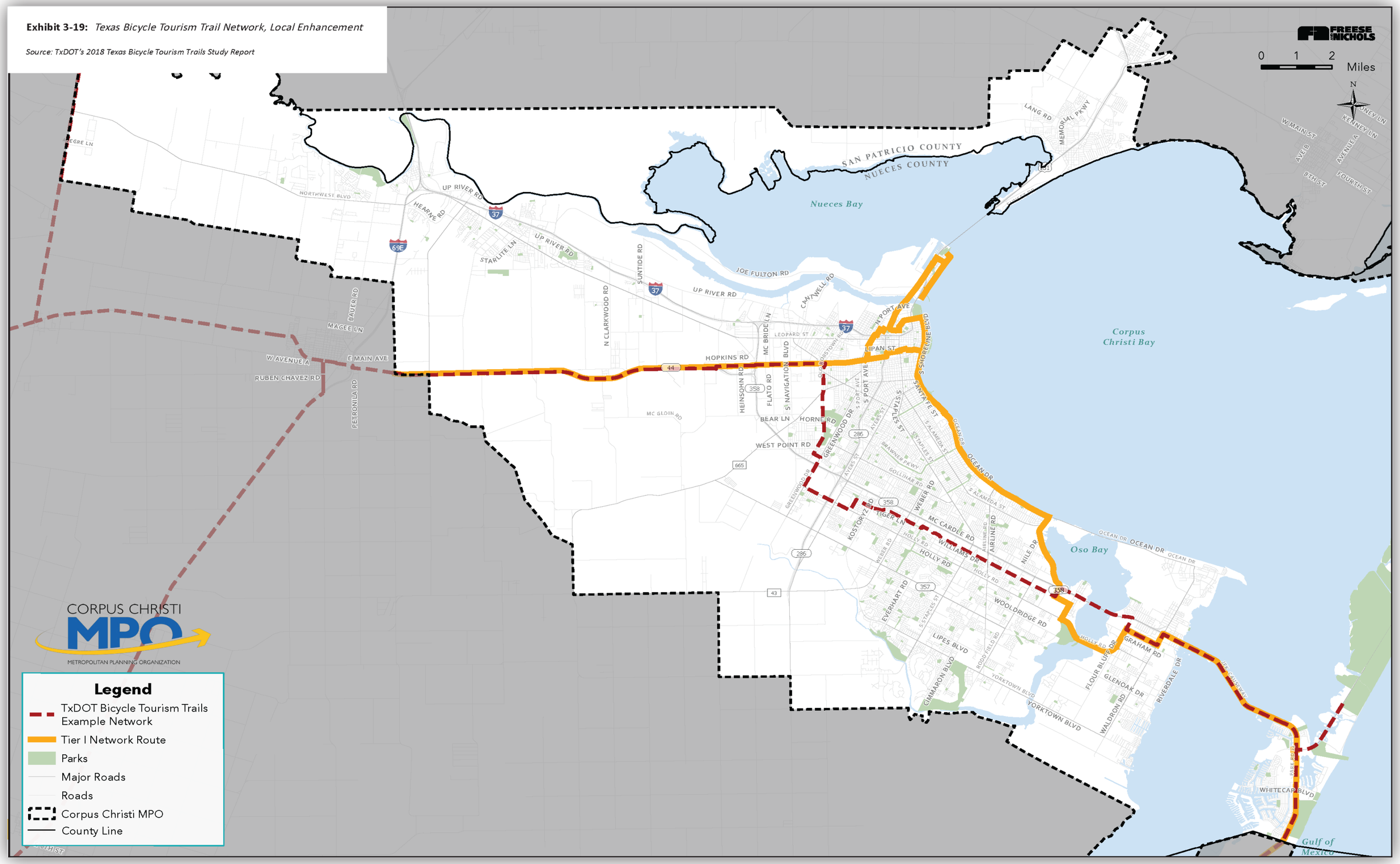
Portland Projects

The City of Portland's Capital Improvement Program for 2022-2026 lists several projects pertaining to bike, pedestrian and ADA improvements. The City of Portland has no known bond projects in place at the time of creation of this Active Transportation Plan.

Locations of all the CIP projects in Portland can also be viewed in Exhibit 3-20 on page 3-13.

Exhibit 3-19: *Texas Bicycle Tourism Trail Network, Local Enhancement*

Source: TxDOT's 2018 Texas Bicycle Tourism Trails Study Report



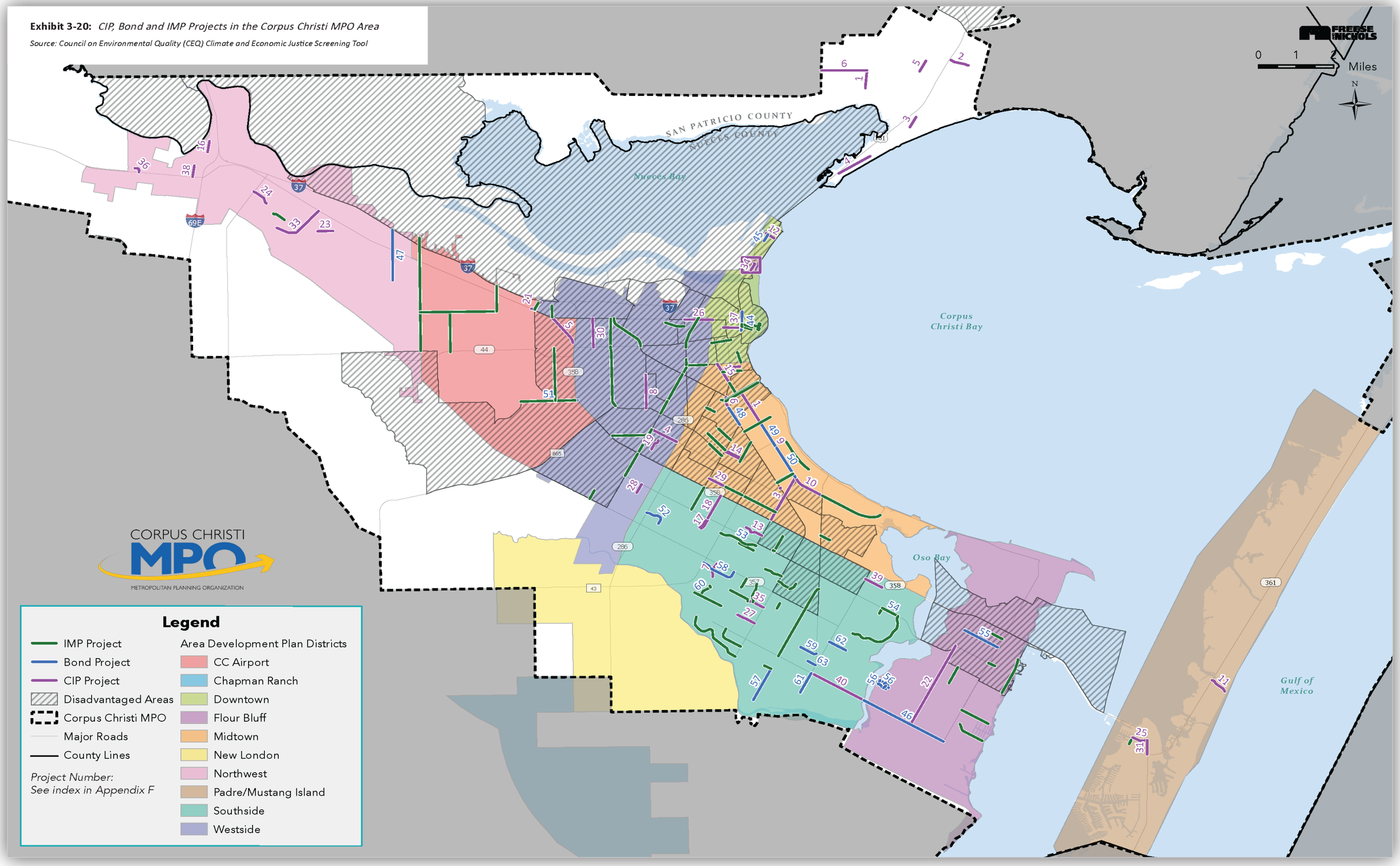
CORPUS CHRISTI MPO
METROPOLITAN PLANNING ORGANIZATION

Legend

- TxDOT Bicycle Tourism Trails Example Network
- Tier I Network Route
- Parks
- Major Roads
- Roads
- Corpus Christi MPO
- County Line

Exhibit 3-20: *CIP, Bond and IMP Projects in the Corpus Christi MPO Area*

Source: Council on Environmental Quality (CEQ) Climate and Economic Justice Screening Tool



Corpus Christi Area Development Plans

Many projects included in Area Development Plans (ADPs) focus on Active Transportation Network improvements. Projects that recommend the creation or design of a bike/ped facility were incorporated into the proposed Active Transportation Network.

Generally, street reconstruction projects should be considered as an opportunity to implement bicycle and pedestrian street design elements. The full listing of proposed projects from all ADPs, including street improvements, can be found in Appendix F.

Bayside ADP 2023

- Key policy recommendations support prioritizing repairs and upgrades of existing sidewalks, providing shade, and improving the walking and biking experience
- Recommendations include investing in bike/pedestrian improvements on Ocean Drive, Alameda Street, Airline Road, Ayers Street, Staples Road, Ennis Joslin Road, Gaines Street and around Brookdale Park

Exhibit 3-21: *Bayside ADP: Proposed Bike/Ped-Related Projects*

	Project ID	Project Type
SHORT-TERM	P3	Louisiana Parkway Trail Design & Construction
	P12	Gollihar/Cullen Ditch Multi-Use Trail
	P13	Koolside Park Sidewalk/Trail
	P15	Brawner Parkway Trail Design & Construction
	S9	Bike/Pedestrian Safety Improvements (Ocean Dr/Airline Rd Intersection)
	S10	Bike/Pedestrian Improvements to Brookdale Park
	S11	Santa Fe Street. Multi-Modal Design & Reconstruction (Ayers to Doddridge)
	S15	Robert Dr. Sidewalks for Bus stops (Alameda Street to Ocean Dr)
	S18	Alameda Street Reconstruction and Bike/Pedestrian Improvements (Everhart to Airline, including Avalon)
	S22	Ocean Dr. Bike & Pedestrian Infrastructure Plan
	N/A*	MPO Complete Streets, Active Transportation, & Micro-Mobility Plan
MID-TERM	S2	Ayers Street Intersection and Sidewalk Improvements (Port to Gollihar)
	S5	Staples Street./McArdle Intersection & Sidewalk Improvements (Airline Rd to Holmes)
LONG-TERM	P4	TAMU-CC Intercampus Boardwalk Project
	S2	Staples Bike Infrastructure (Brawner to Gollihar)
	S3	Carmel Parkway Trail Intersection Improvements
	S5	Bike Loop Improvement (Ennis Joslin to Alameda to Airline to Ocean)
	S8	Ocean Drive Bike Improvements (Ennis Joslin to TAMU-CC)

Westside ADP 2023

- Suggests the City follow Complete Streets and Vision Zero principles when designing future roadway improvements, including providing more signals and mid-block crossings on streets with long blocks, improving pedestrian crossings across Leopard Street and providing better school zone signs near Miller High School

Exhibit 3-22: *Westside ADP: Proposed Bike/Ped-Related Projects*

	Project ID	Project Type
SHORT-TERM	P4	Salinas Park Neighborhood Connections
	P13	Dr. Hector P. Garcia Hike and Bike Trail along Ditch
	S67	Lipan Street Sidewalk and Traffic Improvements

Flour Bluff ADP 2021

- Highlights the need for improvement in roadway conditions and enhanced connectivity to other transportation alternatives
- Recommends investing in sidewalk extension and bike mobility between Flour Bluff Drive and Waldron Road and sidewalk improvements along Glenoak Drive and Purdue Road

Exhibit 3-23: *Flour Bluff ADP: Proposed Bike/Ped-Related Projects*

	Project ID	Project Type
SHORT-TERM	P5	Oso Bay Trestle Bridge Hike & Bike Design
	P6	Oso Bay Hike & Bike Trail Phase 1
	P8	Laguna Shores Living Shoreline
	S6	Glenoak Drive Reconstruction + Bike Mobility (Flour Bluff Dr. to Waldron Rd.)
MID-TERM	P11	Laguna Madre / Dimmit Pier Trails Design
	P12	Oso Bay Trestle Bridge Construction
LONG-TERM	P14	Laguna Madre Living Shoreline (GLO Project)
	P15	Laguna Shores Hike & Bike Trail
	P16	Drainage Channel Hike & Bike Trail (Glenoak Dr. to Laguna Madre)
	P17	Drainage Channel Hike & Bike Trail (Parker Park to Laguna Madre)
	S29	Debra Ln. / Jamaica Street.- Street, Stormwater, & Pedestrian Improvements + Extension
	S30	Division Rd. Improvements + Bike Mobility

Northwest Boulevard Corridor Plan 2021

- Aims for the corridor to be safe and accessible for people of all ages and abilities, suggesting the need for traffic calming devices and ADA-compliant sidewalks and biking facilities along the boulevard and adjacent streets
- Recommends investing in bicycle and pedestrian facilities separated from vehicular traffic (e.g., sidepaths, buffered bike lanes, one-way cycle tracks and sharrows)

Exhibit 3-24: *NW Corridor Boulevard Plan: Proposed Bike/Ped-Related Projects*

	Strategy	Actions
2 YEARS	Coordinate with ISD to manage traffic demand	Organize a walking school bus program and other activities to encourage walking and biking to school
3 YEARS	Build active infrastructure along roadways	Install buffered bike lanes along recommended roadways
		Install shared-lane markings and signage along recommended roadways
5 YEARS		Construct sidepaths as recommended along Northwest Boulevard
	Improve intersections for safety and mobility	Incorporate traffic-calming, street lighting and pedestrian facilities into designs for prominent intersections

Padre/Mustang Island ADP 2021

- Created to accomplish the goals and objectives in the MPO's 2016 Strategic Plan for Mobility
- Recommends creating and incorporating ADA accessibility designs to sidewalk network and bicycle connections to Flour Bluff to enhance pedestrian and bicycle connectivity

Exhibit 3-25: *Padre/Mustang Island ADP: Proposed Bike/Ped-Related Projects*

	Project ID	Project Type
SHORT-TERM	S9	Island Mobility Plan for Pedestrian, Bicycle, Golf Cart and Other Alternative Transportation
	S10	Pedestrian and Bike Safety Improvements (North Padre Sea Wall Area)
MID-TERM	S27	PR22 Pedestrian and Access Management Improvements (TxDOT)
	S29	Mobility Plan Implementation Phase I
LONG-TERM	P17	Bike Path from Balli Park to Padre Island National Seashore
	S31	Mobility Plan Implementation Phase II

Southside ADP 2020

» The vision theme includes improving transportation conditions including pedestrian, cyclist, vehicle, and public transportation connectivity and safety

» Recommends investing in separated and shaded sidewalks, walking paths, bike lanes along stormwater drainage channels, and hike and bike trails in the following locations: Crossgate, Schanen (Phases III and IV) and Oso Creek (Phases I and II)

Exhibit 3-26: *Southside ADP: Proposed Bike/Ped-Related Projects*

	Project ID	Project Type
SHORT-TERM	P6	Crossgate Trail
	P7	Schanen Hike & Bike Trail Phase III (underway)
	P8	Oso Creek Trail - Planning
	S3	Pedestrian Connectivity - Extended Sidewalk
MID-TERM	P9	Schanen Hike and Bike Trail Phase IV
	P10	Drainage Channel Trail Development Program Phase I
	P11	Oso Creek Trail - Phase I
	S22	Ayers Street Sidewalk
LONG-TERM	P13	Oso Bay Railroad Trestle - Hike and Bike Trail
	P15	Drainage Channel Trail Development Program Phase II
	P16	Oso Creek Trail Phase II

London ADP 2020

» Vision theme includes promoting sustainable growth and Oso Creek and Oso Bay as a community amenity

» As a mid- and long-term initiative, the plan recommends investing in the continuous hike and bike trails along Oso Creek and Oso Bay, including marked pedestrian crosswalks and bicycle paths at trail gateways

Exhibit 3-27: *London ADP: Proposed Bike/Ped-Related Projects*

	Project ID	Project Type
MID-TERM	P3	Oso Creek Trail Phase I
	P4	Oso Creek Trail Phase II
LONG-TERM	P5	Oso Creek Channel Trail Development III
	P6	Drainage Channel Trail Development Phase II

Downtown ADP 2018

» The plan aims to make Corpus Christi a top-tier 21st century waterfront city in Texas, with vibrant, safe, walkable and interconnected districts

» Proposes a pedestrian and bicycle network routed through Washington-Coles along Lake Street connecting west to Hillcrest Park, east to the waterfront and south to Uptown

Exhibit 3-28: *Downtown ADP: Proposed Bike/Ped-Related Projects*

Project ID	Project Type
G7a	Bike/ped improvements—Antelope from Staples to Broadway; Peoples from Broadway to Shoreline (3,920 LF)
G7b	Mesquite Street bike boulevard (Cooper's Alley to I-37—3,330 LF)
G8a	Waterfront bike/ped improvements — Art Museum to Art Center (6,930 LF)
G8b	Bike/ped improvements—waterfront between Art Museum and ferry dock/Ortiz Center (1,500 LF)
G8c	Bike boulevard—Ortiz Center to I-37 on Mesquite (3,700 LF)
G9a	Cycle track & transitional bike boulevard—Hillcrest Park to Mesquite via Winnebago, Sam Rankin, N Sam Rankin, Resaca (11,000 LF)
G9b	Bike Boulevard - Port Avenue from Mesquite, W. Broadway, Lexington, Minton, Kennedy, Koepke, Van Loan, Noakes to Nueces Bay Boulevard (7,730 LF)
G10a	Cycle track—Winnebago, Staples, Comanche, Alameda
G10b	Cycle track, bike boulevard, Blucher Park path—Comanche from Culbertson, Blucher Park, Cooper's Alley
G11a	South Chaparral and Coleman bike boulevards (4,920 LF); Park Avenue cycle track (930 LF)
G11b	Buford and 3rd Street Cycle tracks (3,850 LF); 6th Street Bike boulevard to Morgan (1,000 LF)
G12	Recreation Trail—Aquarium to Dolphin Park along existing Beachwalk to New Harbor Bridge; along Timon and Surf-side median (8,000 LF)
S4	Ped improvements—Leopard Street at Broadway: Stop signs, crosswalks
S5	Pedestrian improvements—Accessible ramps from Upper to Lower Broadway
S8	Phase 1: Brewster from Tancahua to Chaparral; sidewalks/shared ped/vehicle street
S11	Street/ped improvements—Shoreline Boulevard
S12	Street/ped improvements—Coopers Alley–Shoreline Boulevard to Broadway
S13	Street/ped improvements—Lawrence Street–Shoreline Boulevard to Broadway
S14	Street/ped improvements—Hill-crest-Kennedy Avenue., Peabody Avenue., Hill-crest-Kennedy Avenue., Peabody Avenue., Van Loan Avenue., Hulbirt Street., Minton Street., Nueces Street., John Street.

TIRZ #3 Traffic and Planning Analysis

» The plan's purpose is to "reinvent downtown Corpus Christi and the greater TIRZ #3 areas into a walkable and connected neighborhood through key investments"

» Proposes pedestrian and bicycle network improvements on Chaparral Street, Brewster Street, Shoreline Boulevard, Coopers Alley, Mesquite Street, and a new bike/ped bridge on Twig Street

Exhibit 3-29: *TIRZ #3: Proposed Bike/Ped-Related Projects*

	Project ID	Project Type
SHORT-TERM	S1	Chaparral Street - Pedestrian Improvements
	S2	Brewster Street - Phase 1 improvements - sidewalks/shared pedestrian/vehicle Street
	S3	Shoreline Boulevard - Ped safety improvements, crosswalks and signage at IH-37, Twigg, Kinney, Park, Furman and Lawrence
	S17	Coopers Alley - Sidewalk from Shoreline to the Sea Wall, crosswalks, sidewalk to public restroom and two ramps
	S19	Agnes Street - Feasibility Study of street configuration and reconstruction, appropriate bike facility for corridor, pedestrian improvements and landscaping
MID-TERM	M4	Brewster Street - Phase 2: Sidewalk/Shared Ped/Vehicle Street
	M13	Twigg Street Bridge - Pedestrian and bicycle bridge over IH-37
	M17	Mesquite Street - Two-Way Conversion; Resurfacing; Lighting; Bike Boulevard; and Streetscape Improvements
	M21	Sea Wall Ped Improvements and Flood Protection - Flood prevention and pedestrian access

Candidates for a Road Diet

A road diet involves re-striping a roadway to reduce the number of vehicle travel lanes to dedicate more of the right-of-way to other uses such as bike lanes or on-street parking (see Exhibit 3-32). This form of roadway reconfiguration is relatively low-cost compared to other types of road reconstruction projects and presents an opportunity to enhance the Active Transportation Network in the Corpus Christi MPO.

Exhibit 3-30 lists, and Exhibit 3-31 illustrates, the candidates for a road diet. Roadways for which road diets are appropriate have relatively low traffic volumes and either 4 or 5 lanes. In the Corpus Christi MPO area, potential candidates for road diets were either:

- 4-lane roads with less than 15,000 daily traffic volumes
- 5-lane roads with less than 20,000 daily traffic volumes
- Identified as good road diet projects in the City of Corpus Christi Roadway Safety Action Plan

The following are benefits of a road diets:

- A roadway that more effectively serves all users via the addition of bike lanes, transit lanes/stops, or sidewalks
- Safety increases due to lowered vehicle speeds and volumes
- Fewer lanes to cross for pedestrians and vehicles on side streets
- Traffic calming

Some of these streets in Exhibit 3-31 were also included as recommendations for potential road diet in Mobility CC.

Exhibit 3-30: *List of Road Diet Candidates*

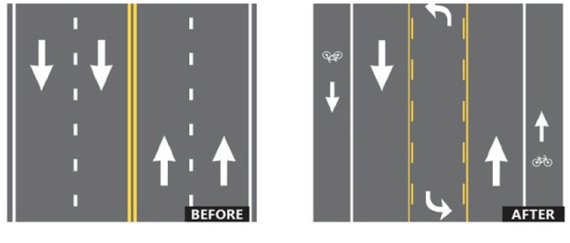
Roadway	Current Daily Traffic Volume (vehicles/day)	Current Number of Lanes	Proposed Number of Lanes
1. **Ayers Street** Between Saratoga Boulevard and Holly Road	4,693 - 10,000	5	3
2. **Louisiana Avenue** Between Swantner Street and Ocean Drive	6,684	4 Divided	3
3. **Brawner Parkway** Between Ramsey Street and S. Alameda Street	3,933	4 Divided	3
4. **Airline Road** Between Ocean Drive and S. Alameda Street	7,647	4-5 Undivided	3
5. **Ennis Joslin Road** Between Ocean Drive and Holly Road	19,695	4 Divided	3
6. **Ocean Drive** Between Sand Dollar Boulevard and Naval Air Station	2,229	4 Undivided	3
7. **Ayers Street** Between S. Staples Street and Baldwin Boulevard	6,482	4 Undivided	3
8. **Ayers Street** Between Baldwin Boulevard and Horne Road	13,423	5	3
9. **Leopard Street** Between N. Staples Street and Upper Broadway	3,142	4 Undivided	3

Source: TxDOT Traffic Count Database System (TCDS)

Exhibit 3-31: *Road Diet Candidates in the City of Corpus Christi*



Exhibit 3-32: *Example of a Road Diet Before and After Re-striping*





4. ACTIVE TRANSPORTATION NETWORK

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4. ACTIVE TRANSPORTATION NETWORK DEVELOPMENT

STREET DESIGN FOR ACTIVE TRANSPORTATION

This Active Transportation Plan focuses on two principles from FHWA's Safe System Approach: Safer Roads and Safer Speeds. Safer Roads is designing roadway environments to mitigate human mistakes and account for injury tolerances, encourage safer behaviors, and to facilitate safe travel by the most vulnerable users. Safer Speeds is defining speeds for all roadway environments using thoughtful, equitable, context appropriate design, appropriate speed limit setting, targeted education, outreach campaigns, and enforcement.

The American Heart Association has stated that "We all want and deserve to live in safe, healthy communities. Complete Streets policies make communities and neighborhoods more livable by ensuring all people can get safely to where they need to go – work, school, the library, grocery stores, or parks. They also help people feel more connected to their neighbors, which improves quality of life."

Land Use Context

This section extracts information from the 7th edition of the Policy on Geometric Design of Highways and Streets (the Policy) developed by the American Association of State Highway and Transportation Officials (AASHTO). Please refer to the Policy document for more detailed information on land use context in street designs.

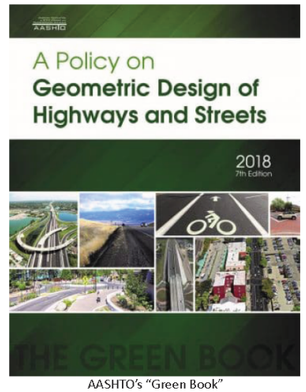
Street designs vary based on locational contexts. The Policy categorizes them into five contexts, as illustrated in Exhibit 4-01.

Development density, land uses, and building setbacks are the main determinants of these contexts. By reviewing the character of an area, cities can understand the community needs in relation to mode choices. It is important to consider both the existing and future contexts when designing streets and other transportation elements, so that predicted transportation needs can be accommodated.

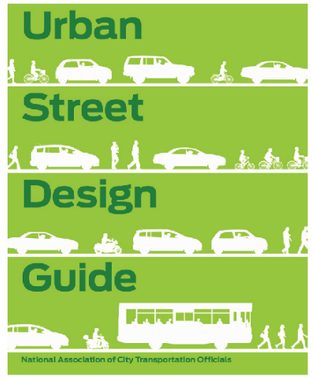
Land Use Context in Active Transportation

The level of density and types of land uses are closely related to implementing active transportation in cities. In areas with higher density and more diverse land uses, such as a mix of commercial, residential, and institutional land uses within a small area, residents are more likely to use active transportation modes to satisfy their daily needs, which are generally located closer to one another. Such areas present higher active transportation demand and require municipalities to create street conditions that are safe and welcoming for all residents and support their commuting needs.

The AASHTO Policy states that urban contexts have more active pedestrian and cyclist activities than rural contexts. This is consistent with the National Association of City Transportation Officials (NACTO) Urban Street Design Guide which states that urban contexts have higher development density and diverse land use types, which creates more favorable environments for pedestrians and cyclists. Sidewalks and other pedestrian amenities are important in facilitating active transportation, especially in urban contexts. Pedestrian bridges and plazas are also commonly found in such locations. Urban core contexts should have a sidewalk network that is nearly continuously connected. Sidewalk networks in urban and suburban contexts should be well-developed. In addition to sidewalks, bike lanes should also be present in urban contexts to allow cyclists to travel safely. Despite relatively lower pedestrian and cyclist activities in rural contexts, sidewalks and other pedestrian or cyclist amenities are still essential components in street design.

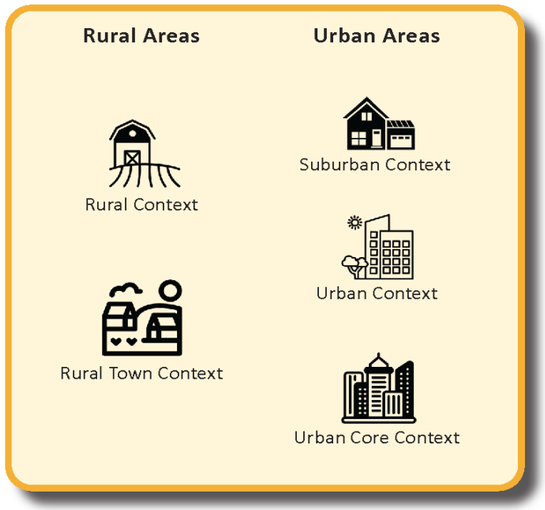


AASHTO's "Green Book"



NACTO's Urban Street Design Guide

Exhibit 4-01: *Context Classifications for Geometric Design*



Pedestrian Elements

This section extracts information from the Complete Streets Program Guide, unless specified otherwise. The full Program Guide can be found in Appendix A.

Walking is the most basic mode of transportation, yet pedestrians are often ignored in roadway design. Certain areas generate high pedestrian activity, such as downtowns, residential, commercial and entertainment areas and schools. Yet even in areas of low pedestrian activity, such as along commercial strip-developed arterials, pedestrian needs and safety must be addressed, as drivers usually do not expect pedestrians.

As speeds increase, drivers are less attentive to what is happening on the side of the road. Reaction time is increased and the pedestrian has a higher chance of dying or becoming severely injured in case of a crash.

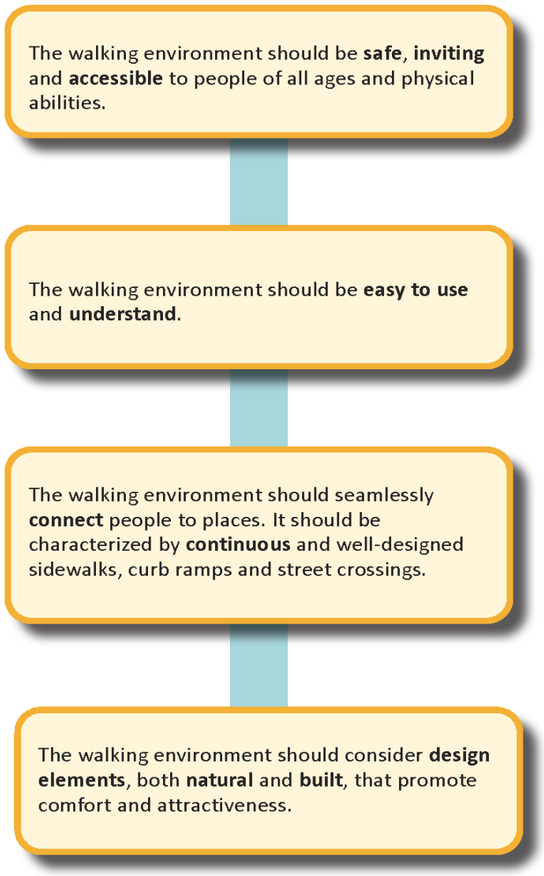
Most pedestrian crashes occur when a person crosses the road and the most common crash type is a conflict between a crossing pedestrian and a turning vehicle at an intersection. But designing for pedestrians should not focus primarily on avoiding crashes; the goal of roadway and intersection design should be to create an environment that is conducive to walking, where people can walk along and cross the road, where the roadside becomes a place where people want to be. The two most effective methods to achieve these goals are to minimize the footprint dedicated to motor vehicle traffic and to slow down the speed of moving traffic. This approach allows the designer to use many features that enhance the walking environment, such as trees, curb extensions and street furniture, which in turn slow traffic: a virtuous cycle.

Accessibility

Nowhere is the concept of universal access more important than in the design of the pedestrian environment. While perhaps not intuitively obvious at first glance, this is the realm of streets with the greatest variation in user capabilities and where attention to design detail is essential to effectively balance user needs. This is also the realm where signs and street furniture are located and where transitions are made between modes (e.g., driver or passenger to pedestrian via parking, bus stop/train station, or bike rack). The pedestrian environment includes sidewalks, curb ramps, crosswalks, bus stops, signs and street furniture.

The design principles listed in Exhibit 4-02 should be incorporated into every pedestrian improvement.

Exhibit 4-02: *Principles of Universal Pedestrian Access*



Elements of Pedestrian Design

To provide a seamless path of travel throughout the community that is accessible to all, designers should consider five important elements: sidewalks/sidepaths, curb ramps, crosswalks, signals and bus stops.

Sidewalks/Sidepaths

Sidewalks and sidepaths should provide a comfortable space for pedestrians between the roadway and adjacent land uses. Sidewalks and sidepaths along city streets are the most important component of pedestrian mobility. They provide access to destinations and critical connections between modes of travel, including transit and bicycles. General provisions for sidewalks and sidepaths include pathway width, slope, space for street furniture, utilities, trees and landscaping and building ingress/egress.

Sidewalks and sidepaths include four distinct zones as illustrated in Exhibit 4-03: the frontage zone, the pedestrian and bicycling zone, the furniture zone and the curb zone.

Frontage Zone

The frontage zone is the portion of the sidewalk located immediately adjacent to buildings and provides shy distance from buildings, walls, fences, or property lines. It includes space for building-related features such as entryways and accessible ramps. It can include landscaping as well as awnings, signs, news racks, benches and outdoor café seating. In single-family residential neighborhoods, landscaping typically occupies the frontage zone.

Pedestrian and Bicycling Zone

The pedestrian and bicycling zone, situated between the frontage zone and the furniture zone, is the area dedicated to walking and bicycling and should be kept clear of all fixtures and obstructions. Within the pedestrian and bicycling zone, the Pedestrian Access Route (PAR) is the path that provides continuous connections from the public right-of-way to building and property entry points, parking areas and public transportation. This pathway is required to comply with ADA guidelines and is intended to be a seamless pathway for persons with disabilities.

According to FHWA, sidewalks require a minimum width of 5.0 feet if set back from the curb or 6.0 feet if at the curb face. Any width less than this does not meet the minimum requirements for people with disabilities. Walking is a social activity. For any two people to walk together, 5.0 feet of space is the bare minimum. In some areas, such as near schools, sporting complexes, some parks, and many shopping districts, the minimum width for a sidewalk is 8.0 feet. Thus, any existing 4.0-foot-wide sidewalk (permitted as an AASHTO minimum) often forces pedestrians into the roadway. The desirable width for a sidewalk is often much greater. Some shopping districts require 12, 20, 30, and even 40 feet of width to handle the volumes of pedestrian traffic they encounter.

Designers must pay close attention to minimums, and only use variances below these levels for short sections. All transitions (e.g., from street to ramp or ramp to landing) must be flush and free of changes in level. The engineer should determine the pedestrian zone width to accommodate the projected volume of users. In no case will this zone be less than the width of the PAR.

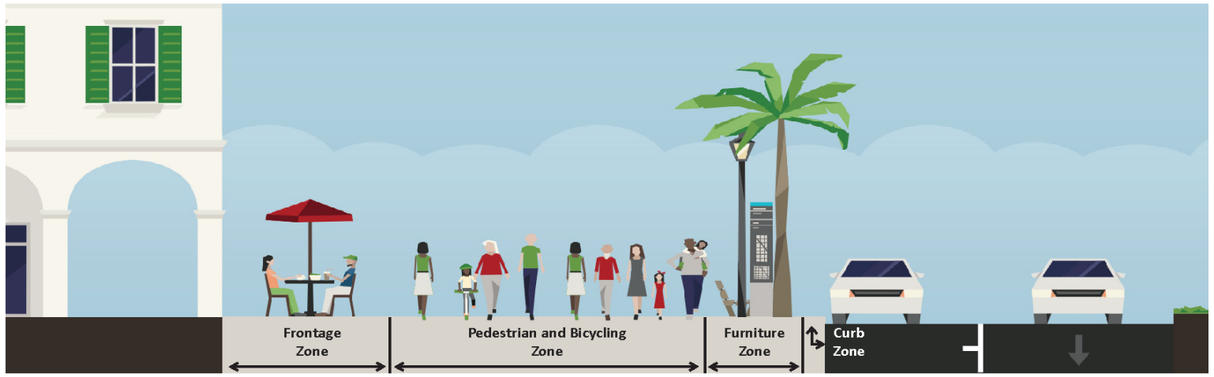
Furniture Zone

The furniture zone is located between the curb line and the pedestrian zone. The furniture zone should contain all fixtures, such as street trees, bus stops and shelters, parking meters, utility poles and boxes, lamp posts, signs, bike racks, news racks, benches, scooter corrals, waste receptacles, drinking fountains and other street furniture to keep the pedestrian zone free of obstructions.

Curb Zone

The curb zone serves primarily to prevent water and cars from encroaching on the sidewalk. It defines the areas of pedestrian and automobile activity in the right-of-way. It is the area people using assistive devices must traverse to get from the street to the sidewalk, so its design is critical to accessibility.

Exhibit 4-03: *Sidewalk Zones*

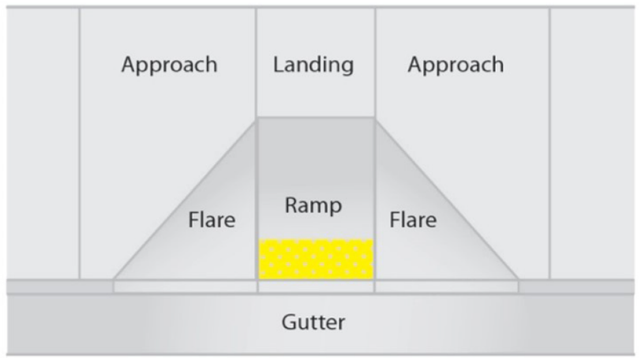


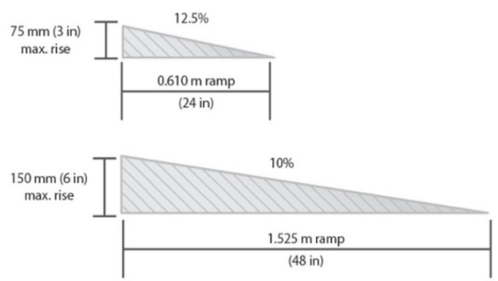
Curb Ramps

Proper curb ramp design is essential to enable pedestrians using assistive mobility devices (e.g., scooters, walkers and crutches) to transition between the street and the sidewalk. These design guidelines provide a basic overview of curb ramp design. The ADA requires installation of curb ramps in new sidewalks and whenever an alteration is made to an existing sidewalk or street. Landings and ramps should be the full width of the sidewalk/ sidepath.

Roadway resurfacing is considered an alteration and triggers the requirement for curb ramp installations or retrofits to current standards. Curb ramps are typically installed at intersections, mid-block crossings (including trail connections), accessible on-street parking and passenger loading zones and bus stops.

Exhibit 4-04: *Curb Ramp Components and Alternate Slopes*





Crosswalks

Crossing a street should be easy, safe, convenient and comfortable. While pedestrian behavior and intersection or crossing design affect the street crossing experience, motorist behavior (whether and how motorists stop for pedestrians) is the most significant factor in pedestrian safety.

A number of tools exist to improve pedestrian safety and to make crossing streets easier. Effective traffic management can address concerns about traffic speed and volume. A motorist driving more slowly has more time to see, react and stop for a pedestrian. The number of pedestrians also influences motorists; in general, motorists are more aware of pedestrians when there is more pedestrian activity. Most tools to address crossing challenges are engineering treatments, but enforcement, education and planning are also important. Engineering treatments include raised crosswalks and crossing islands, as shown in Exhibit 4-05.

Exhibit 4-05: *Examples of Engineering Treatments at Crosswalks*



Crossing island. (Credit: Ryan Snyder)



Raised crosswalk. (Credit: Ryan Snyder)

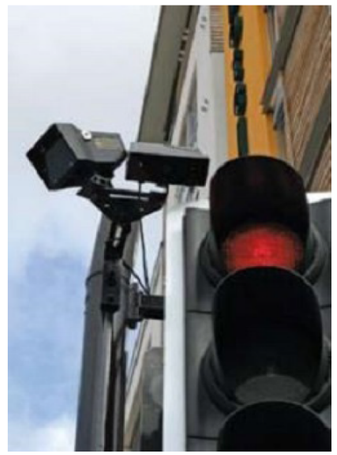
Signals

Signalized street crossings require special consideration of people with disabilities.

Crossing Times

In planning for people with disabilities, slower speeds must be considered. This is critical in setting the timing of the walk phase of signalized intersections. Federal ADA requirements specify that transportation agencies use an assumed walking speed of 3.5 feet/second for signal timing, with a minimum walk interval of 7 seconds. In situations where a large number of older adults or persons with disabilities cross, special pedestrian detection devices may be needed, such as the Pedestrian User Friendly Intelligence Intersection (PUFFIN) that is depicted in Exhibit 4-06.

Exhibit 4-06: *Automated Pedestrian Sensor Used for a PUFFIN Signal*



(Source: FHWA)

Bus Stops

Public transit is an important part of many pedestrians' daily travel and should be planned and designed as part of the street system. It should interface seamlessly with walking, bicycling, car, taxi, or paratransit networks whenever possible.

The essential streetscape elements for transit include signs, shelters and benches.

Flag signs indicate where people are to wait and board a transit vehicle. The signs should clearly identify the transit operator, route number and schedule. Maps showing the transit lines servicing that stop, local destinations and additional transfer transit lines should also be provided. Flag signs should be located toward the front of the stop.

Benches should be provided at transit stops with headways longer than 5 minutes.

Shelters provide comfort and security for passengers by keeping them out of the rain, sun, heat, and wind. Shelters vary in size and design; standard shelters are 3 to 7 feet wide and 6 to 16 feet long. They include covered seating and sign panels that can be used for transit information. Shelters should:

- Be provided at transit stops with headways longer than 10 minutes.
- Have electrical connections to power lighting and/or real-time transit information, or accommodate solar power.
- Be located in a sidewalk's furniture zone so they don't conflict with the pedestrian zone. Shelters may be placed in the sidewalk's frontage zone provided that they do not block building entrances or the pedestrian zone.

Transit Stops should also provide other amenities to make waiting for the next bus comfortable. These amenities could include:

- Trash/recycling receptacles should be provided and maintained at most stops.
- Depending on service frequency and the number of passengers boarding and alighting, electronic "next bus" readouts can be used to inform passengers when to expect the next bus. Cell phone applications can also be used.
- High volume bus stops and stations should include space for vendors to sell goods and services.



Example of a sheltered bus stop with a bench and highly visible flag signs. (Source: CCRTA)

Bicycle Elements

As a general rule, designated bicycle facilities (e.g., bike lanes and cycle tracks) should be considered for all major streets (avenues and boulevards), as these roads generally offer the greatest level of directness and connectivity in the network and are typically where destinations are located. There are occasions when it is infeasible or impractical to provide bikeways on a busy street, or the street does not serve the mobility and access needs of bicyclists.

Well-designed bicycle facilities guide cyclists to ride in a manner that generally conforms to the vehicle code: in the same direction as traffic and usually in a position 3 to 4 feet from the right edge of the traveled way or parked cars to avoid debris, drainage grates and other potential hazards. Cyclists should be able to proceed through intersections in a direct, predictable and safe manner.

Exhibit 4-07: *Bicycle Experience Continuum*



Design Elements

This section has been adapted from NACTO's Urban Bikeway Design Guide, the prevailing guidance on bikeway design. Please refer to the Design Guide for more detailed information on bikeway design elements.

Signing and Marking

Colored Bike Facilities

Colored pavement within a bicycle lane increases the visibility of the facility, identifies potential areas of conflict and reinforces priority to bicyclists in conflict areas and in areas with pressure for illegal parking. Colored pavement can be utilized either as a corridor treatment along the length of a bike lane or cycle track, or as a spot treatment, such as a bike box, crossing markings, or intersection crossing marking.



Example of a colored bike lane.

Bicycle Parking

Bike racks along sidewalks should support the bicycle adequately and make it easy to attach a lock to the frame of the bike and the rack. Refer to the Association of Pedestrian and Bicycle Professionals (APBP) Bike Parking Guidelines for additional information.

Intersection Treatments

Most conflicts between roadway users occur at intersections, where travelers cross each other's path. Good intersection design indicates to those approaching the intersection what they must do and who has to yield. Conflicts for pedestrians and bicyclists are exacerbated due to their greater vulnerability, lesser size and reduced visibility to others.

Exhibit 4-08 on page 4-5 describes NACTO's Bikeway Design Guide tools that are design considerations in intersection geometry to improve safety, accessibility and mobility for all users.

Exhibit 4-08: *Bikeway-Appropriate Intersection Treatments*



Bike Box

A designated area at the head of a traffic lane at a signalized intersection that provides bicyclists with a safe and visible way to get ahead of queuing traffic during the red signal phase.



Two-Stage Turn Queue Box

A designated area for cyclists to queue while waiting to turn.



Combined Bike Lane/Turn Lane

Places a suggested bike lane within the inside portion of a dedicated motor vehicle turn lane. Shared lane markings or conventional bicycle stencils with a dashed line can delineate the space for bicyclists and motorists within the shared lane or indicate the intended path for through bicyclists.



Through Bike Lane

A bike lane that continues through an approach to an intersection with vehicular turn lanes.

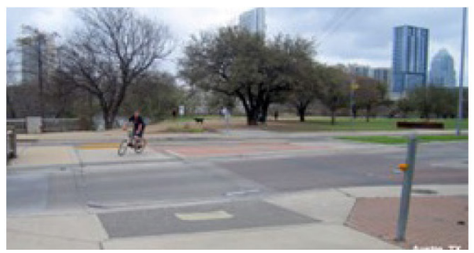
Cycle Track Intersection Approach

The approach to an intersection from a cycle track. Should be designed to reduce turn conflicts for bicyclists and/or to provide connections to intersecting bicycle facility types.



Intersection Crossing Markings

Markings that indicate the intended path of cyclists through an intersection.



Median Refuge Island

Protected spaces placed in the center of the street to facilitate bicycle and pedestrian crossings.

Source: NACTO Bikeway Design Guide

Bikeway Typologies

There are some general principles that should guide the selection of bikeway types. For instance, as traffic volumes and speeds increase, greater separation of the bikeway from motor vehicle traffic is desirable. Other factors to consider are users, adjacent land uses, available right-of-way and costs.

Within the Corpus Christi MPO, several of the bikeway typologies already exist. Exhibit 4-09 to Exhibit 4-17 on page 4-7 describe those typologies and also additional typologies that currently do not exist in the MPO planning area but can be provided to accommodate cyclists of different comfort levels and in different contexts:

On-Street

- Bike Route
- Bike Lane/Shoulder Bike Lane
- Buffered Bike Lane
- Protected Bike Lane
- Separated Bike Lane/Cycle Track
- Shared Parking Lane and Bike Lane
- Shared Bike Lane and Bus Lane

Off-Street

- Sidepath
- Hike and Bike Trail

Exhibit 4-09: *Bike Lane*



Ocean Drive, Corpus Christi, TX (Source: FNI)

- Designates an exclusive area for cyclists through pavement marking and signage
- Visually reminds motorists of cyclists' right to the street
- Increases cyclists' comfort and confidence on busy streets
- Relatively easy to implement and maintain
- Does not provide physical protection for cyclists

Exhibit 4-10: *Buffered Bike Lane*



Doddridge Street, Corpus Christi, TX (Source: FNI)

- Buffer between car traffic and bike traffic via two painted white lines, with or without diagonal cross hatching
- Allows cyclists more room without appearing as a car travel/parking lane
- Does not provide physical protection for cyclists

Exhibit 4-11: *Protected Bike Lane*



Doddridge Street, Corpus Christi, TX (Source: Google Street View, FNI)

- Provides physical separation from car traffic via bollards, planters, raised curb, or parked cars
- Prevents double-parking unlike conventional bike lanes
- Requires special maintenance

Exhibit 4-12: *Separated Bike Lane/Cycle Track*



Alameda Street, Corpus Christi, TX (Source: FNI)

- More attractive to wider range of bicyclists at all levels and ages
- Lower stress level than bike lanes due to the physical separation from traffic
- Vertically separated from the street pavement

Exhibit 4-13: *Sidepath*



Brawner Parkway, Corpus Christi, TX (Source: FNI)

- Serves multiple types of users – cyclists, pedestrians, inline skaters, wheelchair users, joggers, and other non-motorized users
- Adjacent and parallel to a street
- Accommodates two-way traffic on one side of the street

Exhibit 4-14: *Hike and Bike Trail*



Holly Road Park Trail, Corpus Christi, TX (Source: FNI)

- Path serving multiple types of users, particularly pedestrians, cyclists and joggers
- Completely separated from traffic (off-street)
- Usually passes through a greenway, park or an open space

Exhibit 4-15: *Shared Parking Lane and Bike Lane*



Mescalero Road, Roswell, NM (Source: FNI)

- Uses edge lines to provide curbside space for bikers and on-street parking
- Appropriate on streets with low volumes and on-street parking needs

Exhibit 4-16: *Bike Route*



Liptonshire Drive, Corpus Christi, TX (Source: Google Street View, FNI)

- Provides basic bicycle access on roads where no space for a designated bicycle facility is available
- Helps to maintain connectivity between destinations and streets with designated bicycle facilities
- "Share the Road" signage recommended to remind motorists of cyclists' right to the street

Exhibit 4-17: *Shared Bus Lane and Bike Lane*



Walnut Street, Philadelphia, PA (Source: NACTO)

- Provides basic bicycle access on transit routes if no space is available for designated bikeways
- Accommodates both modes (bicycle and transit) at low speeds
- Is not a high-comfort bike facility

MICRO-MOBILITY

The following information has been extracted from the Corpus Christi MPO 2023 Micro-Mobility Plan and Ordinance. To view the full document, refer to Appendix C.

Micro-Mobility Defined

The Federal Highway Administration (FHWA) defines micro-mobility as:

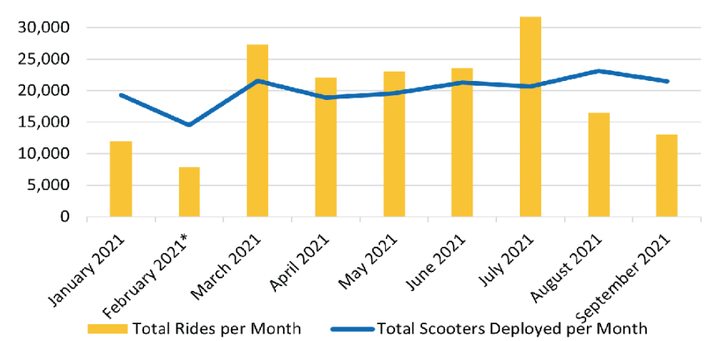
> *"Any small, low-speed, human or electric-powered transportation device, including bicycles, scooters, electric-assist bicycles (e-bikes), electric scooters (e-scooters) and other small, lightweight, wheeled conveyances."*

Micro-mobility is one part of a complete active transportation system that is especially helpful for first- and last-mile trips. Micro-mobility ridership is growing rapidly, especially on college campuses and in cities with a large population of young adults. While bicycles have been a reliable mode of transportation, electric micro-mobility vehicles (such as e-bikes and e-scooters) and shared micro-mobility systems have led to an increase in micro-mobility ridership.

» What is shared micro-mobility?

Shared micro-mobility entails various forms of micro-mobility that are shared between more than one person. This is often done either through a public bike or scooter-share system, like MetroBike in Austin, or a private company like Lime. Shared micro-mobility allows the user to forgo costs associated with owning, maintaining and storing a micro-mobility vehicle and instead pay only for operating the vehicle. Shared micro-mobility often requires the use of a smartphone app.

Exhibit 4-18: *e-Scooter Ridership and Deployment in Corpus Christi*



* Scooters were removed for over a week due to the winter event in February

Currently, there is one shared e-scooter system in the Corpus Christi MPO Planning Area within the City of Corpus Christi. Lime provides around 800 scooters and operates under a license agreement administered by the City of Corpus Christi in accordance with its ordinances.

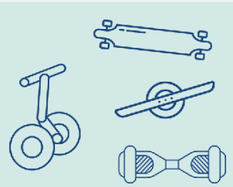
Exhibit 4-18 shows the monthly e-scooter ridership and deployment in Corpus Christi in 2021. Ridership generally increased during the spring and summer months and decreased during the fall and winter. The average number of scooters deployed each day in FY 2021 ranged between 728 in November 2020 and 518 in February 2021.

Overview of Existing Technologies

The discussion around micro-mobility is complicated by the ever-changing scope of what micro-mobility is, and new emerging vehicles and technologies. To properly discuss micro-mobility, it is important to explicitly define each different mode and some important terms. The classification of micro-mobility vehicles is a necessary first step:

- **Pedal Bike** - A pedal bike (or "traditional" bike) is a form of Non-Motorized Transportation (NMT) on which a rider sits on a seat, pushes two pedals with his feet and steers using a handlebar.
- **Electric-assist Bike** – Electric-assist bikes (e-bikes) are motorized versions of pedal bikes. These have a similar look but allow the user to travel faster and for longer distances due to the assistance of the motor. e-Bikes can be individually owned or accessed via shared mobility.
- **Kick Scooter** - A kick scooter (or push scooter) is a two-wheeled, manual, single-rider vehicle that is operated by kicking the ground as one stands on a deck. It is a form of non-motorized travel (NMT) and is steered using a handlebar.
- **Electric Scooter** - An electric scooter (e-scooter) is a motorized version of a kick scooter. Modern e-scooters can travel around 15 miles before requiring recharging and are typically recharged once a day.
- **Other small, lightweight, wheeled conveyances** – Other, less used micro-mobility vehicles include skateboards, Onewheels, hoverboards, segways and electric unicycles. These vehicles are usually less than 50 lbs and individually owned.

Exhibit 4-19: *Types of Micro-Mobility Vehicles*

Vehicle	Other - Skateboard, e-Skateboard, Onewheel, Hoverboard, Segway	Kick scooter	e-Scooter	Pedal bike	e-Bike		
					Class 1	Class 2	Class 3
Defining Features	Small, lightweight, single-user	Deck for standing	Motor, deck for standing, optional seat	User is seated	Pedal assist	Throttle assist	High-speed pedal assist
Typical Speed	Typically 20 mph or less	10 mph	15-20 mph	15 mph	20 mph or less	20 mph or less	28 mph or less
Weight	<50 lbs	Typically <15 lbs	Typically <50 lbs	Typically <50 lbs	Typically <100 lbs	Typically <100 lbs	Typically <100 lbs
							

Micro-Mobility Benefits

First- and Last-Mile Connections

One of the most significant benefits of micro-mobility is its role in facilitating first- and last-mile connections to and from transit services. Micro-mobility vehicles can increase the service area of a bus route by expanding the 1/4 mile walking catchment area to over a mile using micro-mobility vehicles. This can make transit a more attractive choice for the public and increases transit accessibility.

Alternative Mode Choice

Micro-mobility provides an easy and convenient option for transportation supplementing automobiles, transit and walking. This allows people to travel by car less, which has many benefits for the community:

- Relieves pressure on the road system, helping to alleviate congestion
- Decreases noise pollution
- Provides more transport options for disadvantaged communities
- Contributes to the "safety in numbers" effect wherein the presence of other pedestrians creates a safer street for all

Stewardship

Research shows that micro-mobility vehicles reduce carbon emissions and decrease reliance on fossil fuels[1]. The adoption of micro-mobility options reduces the use of personal automobiles on short distance trips and assists in first- and last-mile travel, allowing for increased use of public transportation.

National Renewable Energy Laboratory (NREL) reported that high adoption of shared micro-mobility can save 2.3 billion gasoline-equivalent gallons per year nationwide and that increasing access to transit is micro-mobility's largest contribution to reducing energy consumption in cities[2].

1 Rusul L. Abduljabbar, Sohani Liyanage and Hussein Dia "The role of micro-mobility in shaping sustainable cities: A systematic literature review" (2021) https://www.sciencedirect.com/science/article/abs/pii/S1361920921000389?via%3Dihub
2 NREL, "Data-Informed Analysis Reveals Energy Impacts of Shared Micromobility" (2021) https://www.nrel.gov/news/program/2021/data-informed-analysis-reveals-energy-impacts-of-shared-micromobility.html

Areas of Concern

Safety

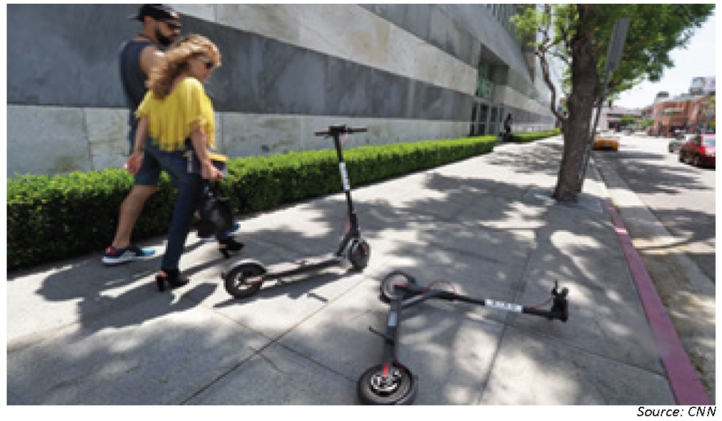
Micro-mobility users are considered "vulnerable road users" by the FHWA due to the lack of protection of an enclosed vehicle. Interactions between micro-mobility and users of more established modes like drivers and pedestrians can be dangerous[3]. Misuse while operating the vehicles, as well as the improper placement of the vehicles after use, are of concern.

In its first 100 million e-scooter rides, Lime reported nine fatalities of riders. In the first 50 million rides on Bird scooters, there were five reported fatalities. Existing EMS and hospital visit data estimates that injuries due to e-scooter crashes occur at a rate of 87-251 emergency room visits per million trips and 29-62 hospital admissions per million trips. Comparatively, bicycles are safer, with 110-180 emergency room visits per million trips and 5-10 hospital admissions per million trips[4].

To mitigate safety issues, communities can employ several tactics, such as guidelines for proper use, requiring safe features on micro-mobility vehicles, geofencing and prioritizing regular road maintenance.

Tension Between Stakeholders

Users of micro-mobility depend on bicycle and pedestrian paths and sidewalks for safe travel. Two major infrastructure challenges face micro-mobility users: parking and operation in high-traffic corridors. Municipalities can create designated parking areas for bikes and dockless micro-mobility vehicles (corrals) to lower the likelihood that these vehicles clutter the public right-of-way and create tension between varying stakeholders.



Source: CNN

3 Hong Yang a, Qingyu Ma a, Zhenyu Wang a, Qing Cai b, Kun Xie c and Di Yang "Safety of micro-mobility: Analysis of E-Scooter crashes by mining news reports" (2020) https://doi.org/10.1016/j.aap.2020.105608
4 International Transport Forum "Safe Micromobility" (2020) https://www.itf-oecd.org/safe-micromobility

Equity

While micro-mobility can help counter equity issues caused by cars and increase connectivity for disadvantaged populations, it can also create its own equity issues. When prices are not regulated by the municipality, prices of shared micro-mobility will continue to increase - average e-scooter and e-bike trip costs doubled from 2018 ($3.50) to 2021 (around $7)[5].

Additionally, some people may be physically unable to ride traditional scooters or bikes and may require adaptive devices. These can include seated scooters, segways with handles, powered cycles that attach to wheelchairs, or others.

The cost of purchasing a bicycle, while still relatively inexpensive compared to a car, has increased significantly over the last several years. Discounted fare structures, equitable distribution of micro-mobility devices and connection to public transportation can help advance transportation equity via micro-mobility.

Promotion and Regulation of Shared Micro-Mobility Providers

New and established companies are eager to employ their vehicles on to the streets. Cities should anticipate this and have policies in place to ensure a proactive response when considering adoptions of micro-mobility services. See Appendix C for more information on the promotion and regulation of shared micro-mobility.



Shared micro-mobility provider in Austin, Texas. (Source: FNI)

5 NACTO, "Shared Micromobility Snapshot" (2022) https://nacto.org/wp-content/uploads/2022/12/2020-2021_shared_micro_snapshot_Dec7_2022.pdf

COMPLETE STREETS

The following information has been extracted from the National Complete Streets Coalition (NCSC) and Corpus Christi MPO's Complete Streets Program Guide. To view the full document, refer to Appendix A.

Background

The Complete Streets concept evolved from a recognition that traditional transportation planning, heavily focused on automobiles, often neglected the needs of pedestrians, bicyclists, and transit users. This shift gained momentum in the late 20th and early 21st centuries, with the first Complete Streets policies adopted by nine jurisdictions nationwide in 2000. As the movement expanded, it emphasized creating streets that are safe and accessible for all users, regardless of age, ability, or mode of transportation. This approach aligns with broader efforts to create more livable, equitable, and resilient communities. By 2020, over 1,300 cities and towns, 93 counties, 1 tribe, 78 regions, and 36 states and territories had adopted Complete Streets policies. Agencies supporting Complete Streets include, but are not limited to:

- American Association of Retired Persons
- American Heart Association
- U.S. Department of Transportation
- FHWA
- Institute of Transportation Engineers
- American Planning Association
- Smart Growth America

Complete Streets Defined

According to the NCSC, Complete Streets is a process and approach that enables safe access to streets for all users. Complete Streets aims to fix **incomplete streets** that have an outdated design that can be dangerous or deadly for users without a personal vehicle.

A benefit of Complete Streets is that it responds to the needs and context of the community and can change shape accordingly. Based on the context of a community, Complete Streets will look different each time and can include a combination of the following transportation design elements:

- Sidewalks
- Bike lanes (or paved shoulders)
- Special bus lanes
- Comfortable and accessible public transportation stops,
- Frequent and safe crosswalks
- Median islands
- Accessible pedestrian signals
- Curb extensions
- Narrower travel lanes
- Roundabouts

"Complete Streets are streets for everyone. Complete Streets is an approach to planning, designing, building, operating and maintaining streets that enables safe access for all people who need to use them, including pedestrians, bicyclists, motorists and transit riders of all ages and abilities."

Source: NCSC, Smart Growth America





Complete Streets Policy

Adopting a Complete Streets policy is crucial in planning for Complete Streets. The policy will specify how a community will plan, design and maintain its Streets. The NCSC created a Complete Streets Policy Framework outlining 10 elements of best practices in creating and implementing a Complete Streets policy. An ideal Complete Streets policy includes the following:

1. Establishes commitment and vision
2. Prioritizes under-invested and underserved communities
3. Applies to all projects and phases
4. Allows only clear exceptions
5. Mandates coordination
6. Adopts excellent design guidance
7. Requires proactive land-use planning
8. Measures progress
9. Sets criteria for choosing projects
10. Creates a plan for implementation



Source: NCSC, Smart Growth America

Planning Policies for Implementation

Policy is just a first step in the process of creating a Complete Streets design that later results in a Complete Streets network. A policy that does not get implemented has no impact on the community. NCSC developed a set of steps to help guide communities in putting their policy into practice:

1. Change procedures and processes
2. Review and revise design guidance
3. Train agency staff and community members
4. Establish new performance measures
5. Begin transforming the project selection process
6. Create a committee to oversee implementation
7. Create an inclusive community engagement plan

Street Design

It is impossible to prioritize street design that encourages both speed and safety. Roadway design is ever present on the streets and has a stronger influence on driver behavior than signage present only every few blocks or miles. Just as roadway design can contribute to pedestrian and bicyclist injuries and deaths, it can contribute to their prevention.

Speed is the main factor in a majority of pedestrian and bicyclist deaths. Higher speed has translated into higher number of pedestrian and bicyclist injuries and deaths on the roads. Taller, heavier and more powerful vehicles have exacerbated the issue.

Complete Streets approach works under the belief that aside from limited access roads like interstates and freeways, it is impossible to prioritize street design that encourages both speed and safety. The approach thus emphasizes the use of design to alter driver behavior to lower their speed.

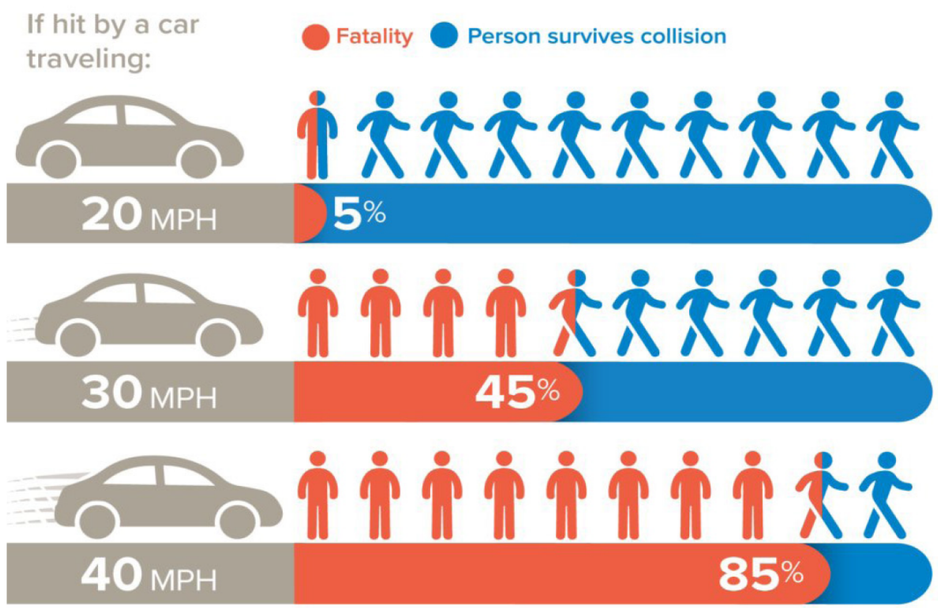
Roadway design that encourages speeding is typical of arterial design in the United States, prioritizing speed over safety. Elements include:

- Wide and straight travel lanes
- Connecting streets without crosswalks or curb ramps
- Wide corners at turning lanes
- Right turn "slip" lanes
- Long distances between intersections/crosswalks
- Sidewalks as an afterthought or more of an edge treatment

Complete Streets approach prioritizes safety over speed. Through design, drivers receive multiple visual clues to slow down that affect their behavior, such as:

- Narrower travel lanes
- Landscaping and trees
- On-street parking lanes
- High-visibility crosswalks
- Curb extensions
- Eliminating right turn "slip" lanes in favor of right angle turns
- Decreasing distances between intersections/crosswalks
- Adding signalized crosswalk in the middle of long blocks
- Treating pedestrian and bicyclist safety as a number one priority

Exhibit 4-20: *Pedestrian Fatalities by Vehicle Speed*



National Traffic Safety Board (2017) Reducing Speeding-Related Crashes Involving Passenger Vehicles. Available from: https://www.ntsb.gov/safety/safety-studies/Documents/SS1701.pdf

Source: NCSC, Smart Growth America

ACTIVE TRANSPORTATION NETWORK DEVELOPMENT

Several factors were considered in the development of the Active Transportation Network. These included expansion of existing facilities, fulfillment of local area plans, and other identified needs to create a regional network and to propose active transportation projects.

The Bike/Ped Network

A bike/ped network is a seamless interconnected system of hike and bike trails, SUPs and bikeways. The purpose and quality of the network depends on the assumptions, goals and decisions made during the planning process. Networks should be thoughtfully planned to provide necessary and desired connections and access. The most successful bike/ped networks enable people of all ages and abilities to safely and conveniently get where they want to go.

Network Principles

Effective bike/ped networks lead to more people bicycling by creating active transportation facilities that are efficient, seamless and easy to use. Seven key principles for network design, shown in Exhibit 4-21, are described in the Bikeway Selection Guide published by FHWA in 2019. Of these seven principles, three have particular importance in guiding bike/ped facility selection:

Safety: Bike/ped facility designs should be selected to reduce the frequency and severity of crashes and minimize conflicts between users.

Comfort: Bike/ped facilities should be selected to minimize stress, anxiety and safety concerns for the target design user. Comfort and safety are closely related.

Connectivity: Trips within a bicycle network should be direct and convenient and offer access to all destinations served by the roadway network. Transitions between active transportation facilities should be seamless and clear.

Exhibit 4-21: *Seven Principles of Bike/Ped Network Design*



Source: FHWA 2019 Bicycle Selection Guide

Network Formulation

The Active Transportation Network development process considered the following steps:

- Expanding upon what works – extend existing trails, add more SUPs along roadways, trails, protected bikeways
- Enhancing what exists – transitions, compliance
- Adding local connections – parks, schools, local Area Development Plans
- Creating a core network – key attractions, destinations
- Accommodating multiple user groups - local trips as well as longer-distance travel

The proposed Active Transportation Network is shown in Exhibit 4-22 on page 4-13.

Functional Areas

The network has been subdivided into 10 functional areas developed based on the existing ADPs and special areas of interest. The functional areas are:

- SEA/New Harbor Bridge/North Beach (NHB)
- Shoreline Boulevard/Ocean Drive/Alameda Street (SLB)
- Ennis Joslin/Holly Bridge (EJR)
- Flour Bluff (FBL)
- Padre/Mustang Island (PMI)
- Midtown (MDT)
- Southside (SSD)
- East-West Connection/Texas Bicycle Network (EWC)
- Calallen/Annaville (CAL)
- Portland/Gregory (PGR)

Priority Network

The Priority Active Transportation Network connects through high profile areas and to significant attractions in Corpus Christi including the following:

- USS Lexington and Texas State Aquarium
- North Beach beach front trail
- New Harbor Bridge Trail
- Science, Arts and Entertainment district
- Shoreline Boulevard scenic promenade and two-way cycle track
- Ocean Drive shoulder bike lanes along the scenic roadway corridor
- Ennis Joslin Road SUP and bike lanes though high-density residential areas
- Holly Road Trail and Holly Road Trestle Bridge
- Flour Bluff Road SUP and SUP network in Flour Bluff
- Bike-on-Bus connection to Mustang Island

The following tiers list the priorities for implementation of the network:

Tier I

Tier I is a priority network of trails, SUPs and bike lanes that provide connectivity to the high profile destinations and locations in the MPO region. The elements of the Tier I network should be continuously advanced for funding and implementation of the enhanced and completed high quality network.

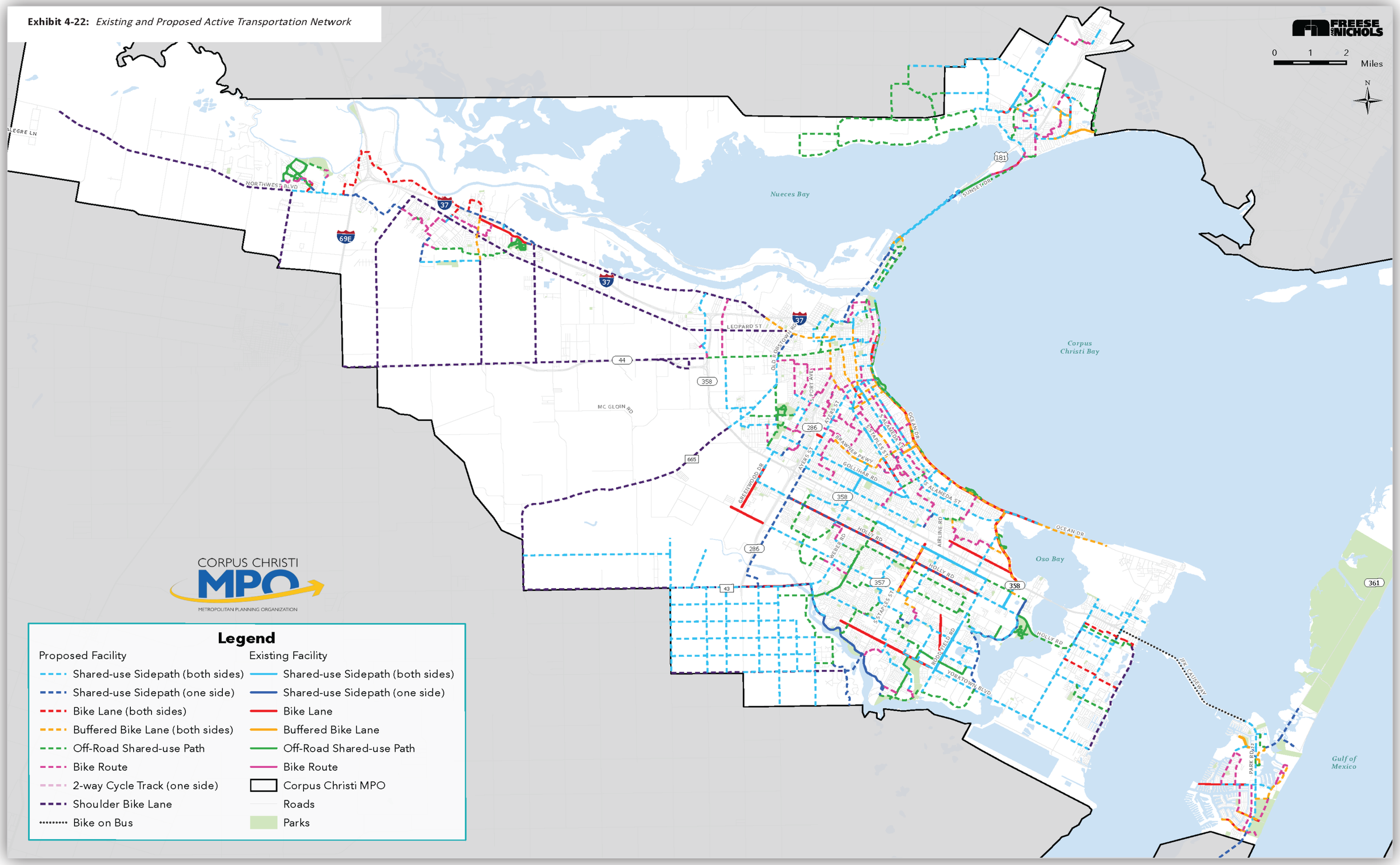
Tier II

The second tier of projects would be completed in conjunction with ongoing CIP projects. The elements of the Tier II network may advance short segments of the larger network and should be brought to a logical terminus while awaiting completion of the network.

Tier III

The third tier of projects include the remaining trails, bike lanes and bike routes that connect to the various neighborhoods, schools and parks that are not in the priority network nor in a current CIP. The network elements in Tier III would be implemented as opportunities arise in conjunction with development and as special funding is available, such as Safe Routes to Schools and Parks under the Transportation Alternatives program.

Exhibit 4-22: *Existing and Proposed Active Transportation Network*



CORPUS CHRISTI MPO
METROPOLITAN PLANNING ORGANIZATION

Legend

Proposed Facility	Existing Facility
Shared-use Sidepath (both sides)	Shared-use Sidepath (both sides)
Shared-use Sidepath (one side)	Shared-use Sidepath (one side)
Bike Lane (both sides)	Bike Lane
Buffered Bike Lane (both sides)	Buffered Bike Lane
Off-Road Shared-use Path	Off-Road Shared-use Path
Bike Route	Bike Route
2-way Cycle Track (one side)	Corpus Christi MPO
Shoulder Bike Lane	Roads
Bike on Bus	Parks

SEA/New Harbor Bridge/North Beach

The new Harbor Bridge will provide new mobility opportunities for bicyclists and pedestrians in Corpus Christi. This new crossing will increase the span height across Nueces Bay, thus allowing larger ships to port access. The bridge will also include a scenic overlook, providing additional tourism opportunities and destinations by cyclists and pedestrians.

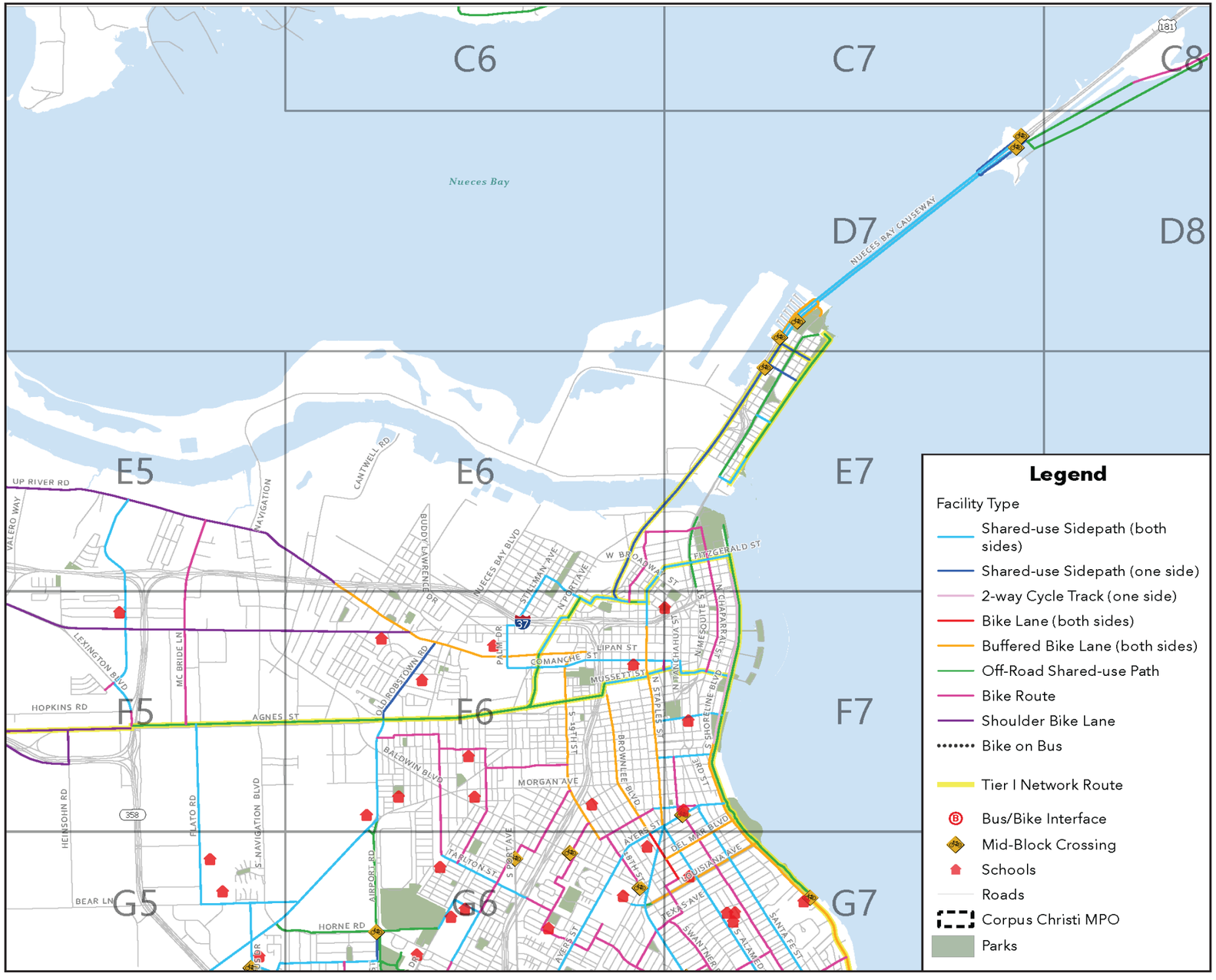
The bridge will have an SUP along the east side of the street, extending from a trailhead on Lake Street on the south to a pedestrian crossing of the northbound service road near Gulfspray Avenue on the north. An SUP is recommended along Gulfspray Avenue that would connect to the public beach at Gulfspray Park as well as the existing 1.5-mile-long beachside trail that runs from Dolphin Park and public bathhouse on the north to the USS Lexington and Texas State Aquarium on the south. A 1.5-mile-long SUP is proposed to run along the wide median between Timon Boulevard and Surfside Boulevard that would complete the trail loop between those destinations. Access to and from the shoulder lanes on the Causeway Bridge to Portland would be via the vehicular ramps just north of Beach Avenue.

East-west connection across the Hillcrest/Washington/Coles and the Sports/Entertainment/Arts (SEA) area north of I-37 would extend from Stillman Avenue along Winnebago Street to Lake Street to Broadway to Beldon Street to connect to the SUP along Shoreline Boulevard. East-west conveyance south of I-37 would be provided by the newly constructed Leopard Street crossing of the Crosstown Expressway.

Bridge crossings over I-37 would be provided by the Harbor Bridge project at Stillman Avenue and at Staples Street. Those crossings would provide connection to the newly improved Leopard Street and to Comanche Street, which provide grade-separated crossings of the Crosstown Expressway. At Staples Street, SUPs are provided along each side of that bridge. A bike/ped bridge at Stillman Street connects via Palm Street to Leopard and Camanche Street.

An abandoned railroad corridor crosses under the I-37 grade separation near Port Avenue, allowing for bicyclists and pedestrians to have room adjacent to Port Avenue at the crossing under I-37. Some businesses have acquired and built upon the abandoned railroad corridor north of Lipan Street, so a SUP would need to extend along the east side of Port Avenue between Lipan Street and the I-37 service roads. The SUP along Port Avenue would then continue southward toward the east-west rail-to-trail corridor along the north side of Agnes Street.

Exhibit 4-23: *SEA/New Harbor Bridge/North Beach Functional Area*



Proposed Improvements for SEA/New Harbor Bridge/North Beach

Much of the noted bicycle and pedestrian facilities in this area will be constructed as part of the New Harbor Bridge (NHB) project. An SUP is provided along Lake Street, between Sam Rankin Avenue and the trailhead parking near Winnebago Street, for access onto the SUP along the new Harbor Bridge. Several projects are proposed to complement the newly completed network.

NHB 1 - New Harbor Bridge South End Connection to Shoreline Boulevard SUP

- NHB 1.1 - Lake Avenue SUP/Trail, Sam Rankin Street through Proposed Washington Park to N. Alameda Street
- NHB 1.2- Lake Avenue SUP, N. Alameda Street to N. Staples Street
- NHB 1.3 - N. Staples Street SUP on both sides, I-37 WB Service Road to W. Broadway Street
- NHB 1.4 - N. Staples Street extension SUP on both sides, W. Broadway Street to N. Broadway Street
- NHB 1.5 - Fitzgerald Street SUP on both sides, N. Broadway Street to Shoreline Boulevard

Exhibit 4-24: *NHB 1 - New Harbor Bridge South End Connection to Shoreline Boulevard SUP*

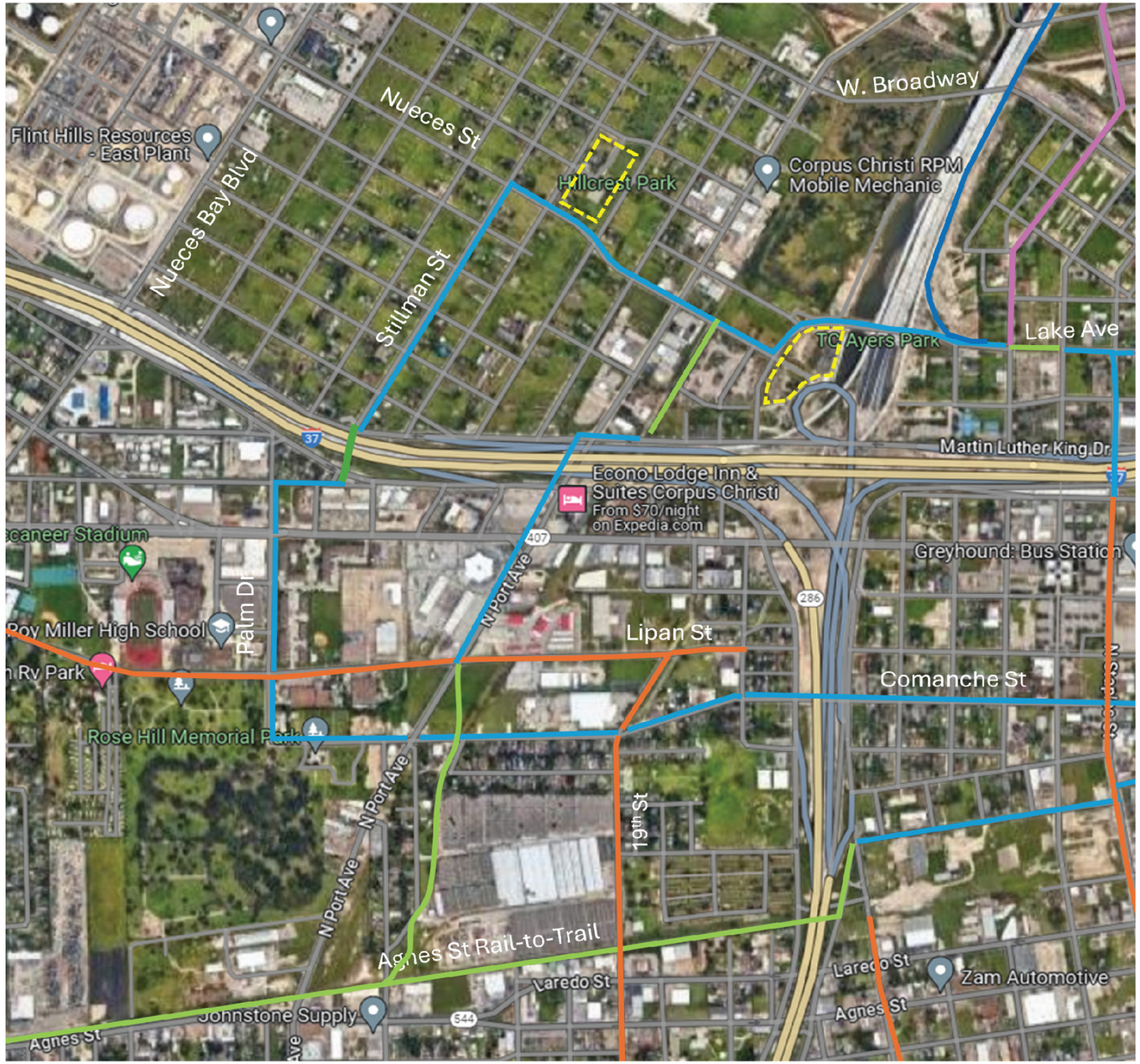


NHB 2 New Harbor Bridge South End Connection to Agnes Street Rail-to-Trail SUP

An existing bike/ped bridge has been built to span I-37 at Stillman Street, with extensive ramps to get from street level to bridge level at each end just beyond the service roads.

- NHB 2.1 – W. Broadway Street SUP, Stillman Street to Port Avenue
- NHB 2.2 – Nueces/Winnebego SUP, Lake Avenue to Nueces Bay Boulevard
- NHB 2.3 – Stillman Street SUP, W. Broadway to I-37 WBSR
- NHB 2.4 – Antelope/Palm Drive SUP, I-37 EBSR to Comanche Street
- NHB 2.5 – Comanche SUP, Palm Drive to Staples Street
- NHB 2.6 – Port Avenue Road Diet/SUP, I-37 WBSR to Agnes Street
- NHB 2.7 – Nueces Bay Boulevard SUP, Nueces to Agnes Street
- NHB 2.8 – Rail-to-Trail, W. Broadway to I-37 WBSR

Exhibit 4-25: *NHB 2 - New Harbor Bridge South End Connection to Agnes Street Rail-to-Trail SUP*



NHB 3 - New Harbor Bridge North End Connection to Waterfront, Lex, Aquarium

The SUP across the new Harbor Bridge terminates at a signal-protected pedestrian crossing of the northbound service road of US 281 between Surfboard Avenue and Gulfspray Avenue. The TxDOT project extends a 10-foot SUP along the northbound service road between Surfboard Avenue and Beach Avenue. An existing 10-foot-wide concrete beachfront path extends along the length of the eastern shore of North Beach from Dolphin Park on the north to the USS Lexington on the south. Wide sidewalks extend between the USS Lexington and the Texas State Aquarium.

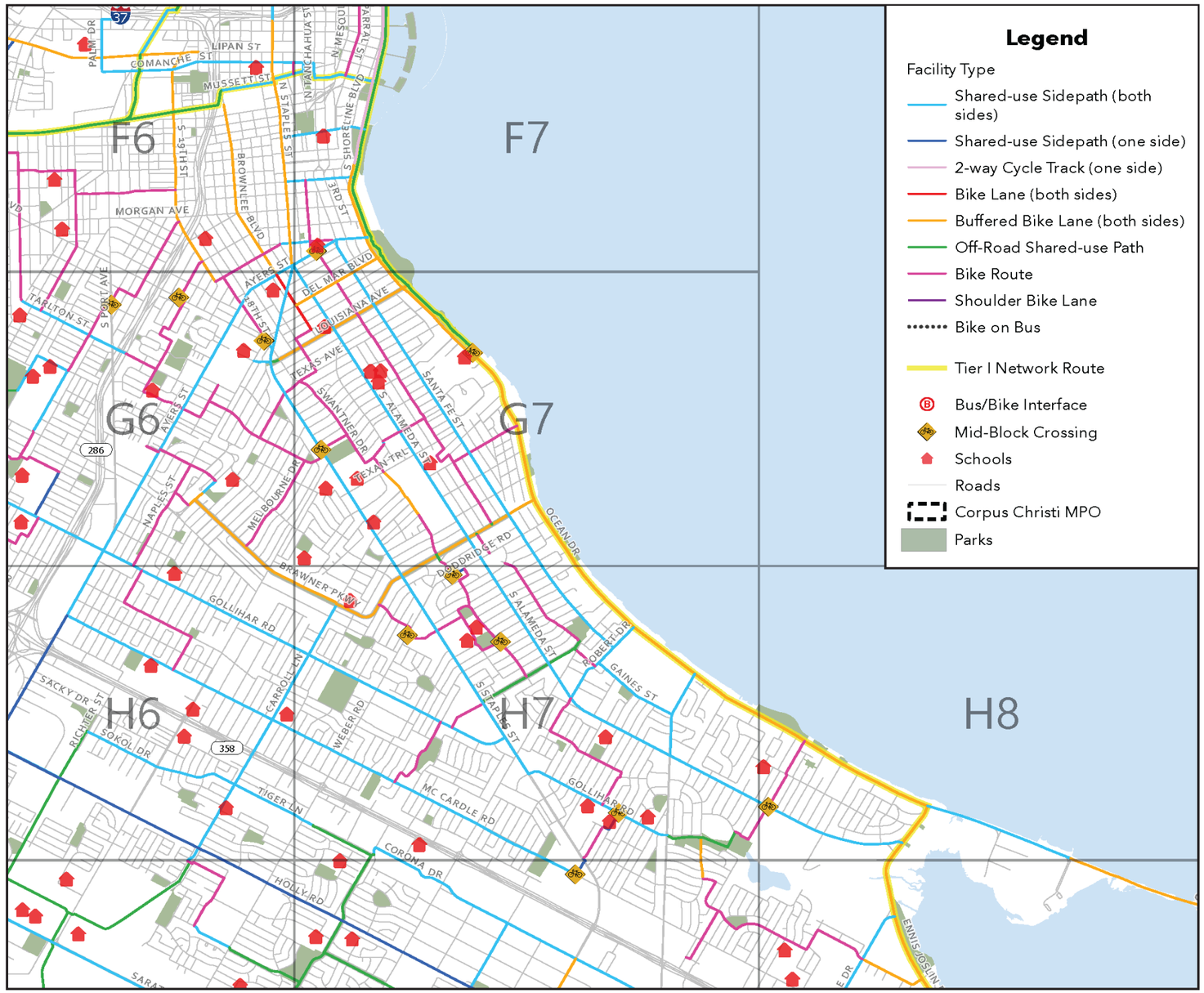
- NHB 3.1 – Beach Avenue SUP, US 281 NBSR to Beachfront Path (proposed in City of Corpus Christi 2024 Bond program)
- NHB 3.2 – Gulfspray Avenue SUP, US 281 NBSR to Gulfspray Park (proposed in City of Corpus Christi 2024 Bond program)
- NHB 3.3 – Median SUP, Dolphin Park to Pearl Avenue
- NHB 3.4 – Breaker Avenue SUP, Median SUP to Beachfront Path
- NHB 3.5 – Golf Place SUP, Median SUP to Beachfront Path

Exhibit 4-26: *NHB 3 - New Harbor Bridge North End Connection to Waterfront, Lex, Aquarium*



Shoreline Boulevard/Ocean Drive

Exhibit 4-27: *Shoreline Boulevard/Ocean Drive Functional Area*



The existing bicycle and pedestrian provisions along Shoreline Boulevard and along Ocean Drive attract large volumes of pedestrians, bicyclists and micro-mobility users. Proposed east-west connections would be used by area residents to access the Ocean Drive bike/ped corridor and include:

- Lake/Broadway/Belden
- Musset Street/Blucher Street/Blucher Park/Coopers Alley
- Park Avenue
- Furman Avenue
- Ayers Street
- Del Mar Boulevard
- Louisiana Avenue
- Doddridge Street

Proposed Improvements to Shoreline Boulevard/Ocean Drive

SLB 1 - Shoreline Boulevard Reconfiguration Completion

In the 1990s, the City of Corpus Christi undertook a reconfiguration of Shoreline Boulevard to move the 80-foot-wide median between northbound and southbound Shoreline Boulevard up against the seawall SUP, pushing the northbound lanes to the west up against the southbound lanes. That reconfiguration extended between Furman Avenue on the south and Lomax Street on the north (about 3,600 linear feet) and amassed over 5 acres of park and open space near the seawall and provided nearly 200 off-street parking spaces. Coopers Alley passes through the space between Shoreline Boulevard and the seawall SUP to provide access to the Coopers Alley L-Head. Part of the former northbound lanes are utilized to provide access to the Arts Center of Corpus Christi.

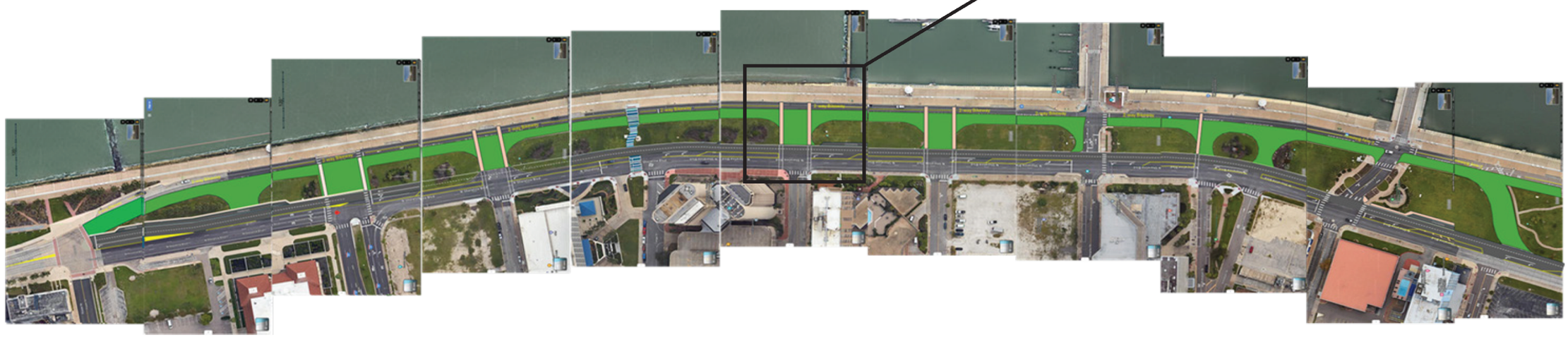
The proposed reconfiguration project, between Lomax Street and Power Street, would consist of the following elements:

- SLB 1.1 – Widen SB Shoreline Boulevard pavement to provide 5 lanes. As space allows, provide a parking lane on each side
- SLB 1.2 – Modify existing traffic signals and pavement markings to accommodate two-way traffic in the 5-lane roadway
- SLB 1.3 – Shift the northbound Shoreline Boulevard traffic onto the new 5-lane roadway
- SLB 1.4 - Abandon the former 3-lane northbound roadway and adapt for use as a two-way bikeway
- SLB 1.5 – Remove unneeded roadway pavement, add off-street parking and landscape as appropriate
- SLB 1.6 – Re-stripe the two-way Shoreline Boulevard between Furman Avenue and Coopers Alley to eliminate the shoulder bikeway and restripe to provide dedicated left turn lanes at cross streets



Taylor Street at Shoreline Boulevard concept illustration.

Exhibit 4-28: *SLB 1 - Shoreline Boulevard Reconfiguration*



SLB 2 – Shoreline Boulevard/Ocean Drive Shoulder Bike Lanes Enhancement

The existing realigned Shoreline Boulevard begins at Furman Avenue. An approximately 8-foot-wide shoulder bike lane is designated in each direction along the entire length of Shoreline Boulevard/Ocean Drive. While this bikeway is good, there is much room for improvement. At some intersections, the shoulder lane is narrowed to introduce a left turn lane or entirely repurposed as a right turn lane. To continue a high level of bicyclist accommodation to the south of Furman Avenue, enhancements to the bike lanes to create more of a protected bikeway are proposed and include the following:

- SLB 2.1 – Within the 8-foot-wide shoulder bike lanes, add a second 4-inch-wide stripe to create a 2-foot buffer for the remaining 6-foot bike lanes, between Furman Avenue and Ennis Joslin Road, with special treatments at key locations.
- SLB 2.2 – Install flexible bollards within the 2-foot buffer at approximately 20 feet on center along the buffered bike lanes between Furman Avenue and Ennis Joslin Road. Leave 200-foot long gaps in bollards at locations that need parking for home maintenance vehicles.
- SLB 2.3 – Widen sidewalks along Ocean Drive. There are segments of sidewalk along the west side of Ocean Drive that are only about 3 feet wide. Widen sidewalks along the west side of Ocean Drive to a minimum of 5 feet wide and preferably 8 feet wide.



Example of a protected bike lane (Source: FNI)

SLB 3 – Establish bike lane continuity though the intersections along Shoreline Boulevard and Ocean Drive

Several intersections along the Shoreline/Ocean Drive corridor present challenges for bicycling and pedestrian conveyance and crossings. These intersections are proposed for treatments to improve non-motorized mobility and safety. Recently installed intersection improvements include the new Pedestrian Hybrid Beacon at Shoreline Boulevard at Del Mar. Additional proposed improvements include the following:

- SLB 3.1 – Shoreline Boulevard at Furman Avenue as depicted in Exhibit 4-29 – A new traffic signal for interrupting continuous flow to accommodate bicycle and pedestrian connectivity at this junction of two-way separated bikeway to the north, buffered one-way bike lanes to the south and bike lanes with SUPs to the west along Furman Avenue.
- SLB 3.2 – Shoreline Boulevard at Louisiana Avenue – Convert this complex directional intersection into a standard roundabout with pedestrian crossings and bike lane conveyance through the roundabout.
- SLB 3.3 – Ocean Drive at Doddridge Street – Eliminate the southbound right turn lane and continue the buffered bike lane to the intersection.
- SLB 3.4 – Ocean Drive at Robert Drive – Narrow the southbound through lanes to maintain a minimum 4-foot-wide bike lane up to the intersection.
- SLB 3.5 – Ocean Drive at Airline Road - Narrow the southbound through lanes to maintain a minimum 4-foot-wide bike lane up to the intersection, positioned between the through lane and the right turn lane. Narrow the northbound lanes to maintain a minimum 4-foot-wide bike lane through the intersection.



Example of a protected bike lane (Source: FNI)

Exhibit 4-29: *SLB 3 - Proposed Improvements on Shoreline Boulevard at Furman Avenue*



SLB 4 – Agnes Street Rail-to-Trail Connector to Shoreline Boulevard

A direct connection between the Agnes Street Rail-to-Trail and the bicycle and pedestrian facilities and bayfront along Shoreline Boulevard would be provided through a series of connecting facilities, as shown in Exhibit 4-30 and listed here:

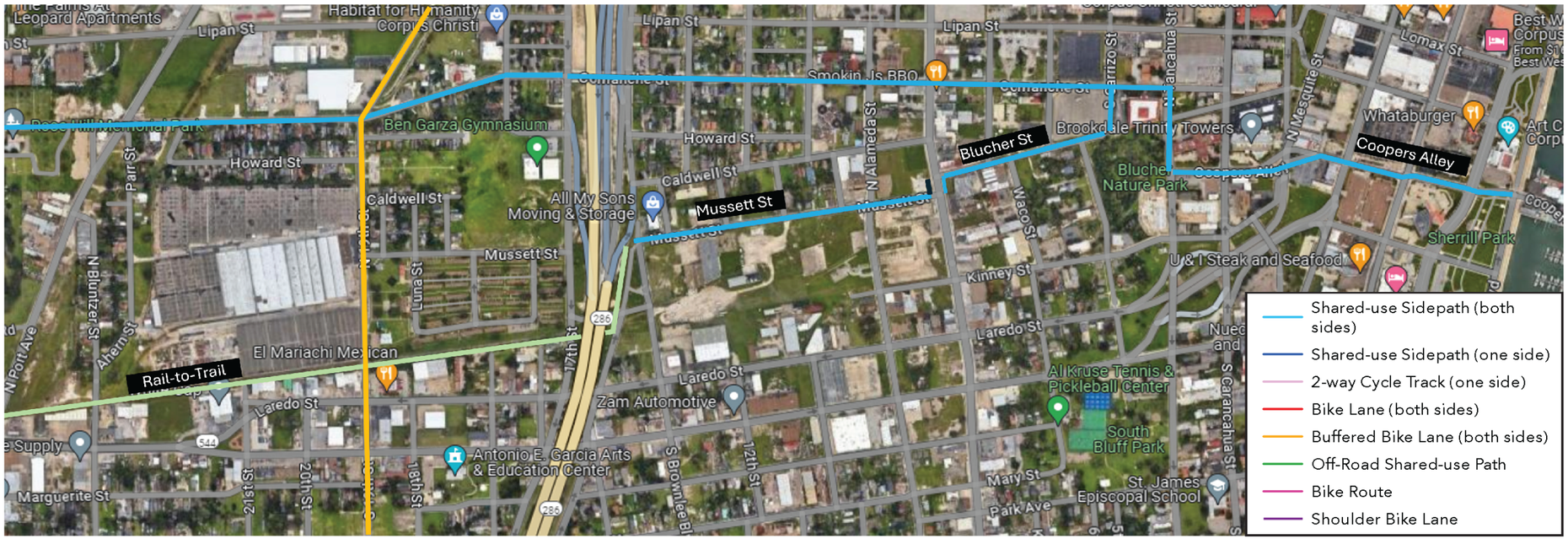
- SLB 4.1 – Rail-to-Trail SUP from near Port Avenue to SH 286 Crosstown Expressway service roads crossing and using a remnant of the northbound service road to tie-in to Musset Street
- SLB 4.2 – SUP along one side of Mussett Street to Staples Street, chevron pavement markings
- SLB 4.3 – Offset crossing of Staples Street at Musset/Blucher, enhanced bus stop and crossing
- SLB 4.4 – Shared street along Bluchers Street to Carrizo Street, chevron pavement markings. Tie into Blucher Nature Park
- SLB 4.5 – An SUP along edges of La Retama Central Library to Coopers Alley, enhanced crossing at Tancahua Street
- SLB 4.6 – Bike lanes along Coopers Alley from Blucher Nature Park to Mesquite Street (TX 544), enhanced crossing at Mesquite Street
- SLB 4.7 – Bike lanes along Coopers Alley from Mesquite Street (TX 544) to Shoreline Boulevard

<u>SLB 4.8 – Comanche Street</u>

As part of the new Harbor Bridge project, Comanche Street has a new bridge across the Crosstown Expressway, provided with SUPs along both sides of the bridge. The bridge for Lipan Street across the Crosstown Expressway was removed and the ramping to and from the Crosstown is now via Comanche Street. Proposed improvements to Comanche Street include the following:

- SLB 4.8.1 - SUP along both sides of Comanche Street from Crosstown Expressway to Carancahua Street.
- SLB 4.8.2 - SUP along both sides of Comanche Street from Crosstown Expressway to Lipan Street

Exhibit 4-30: *SLB 4 - East-West Connector between Agnes Road Rail-to-Trail and Shoreline Boulevard/Ocean Drive*



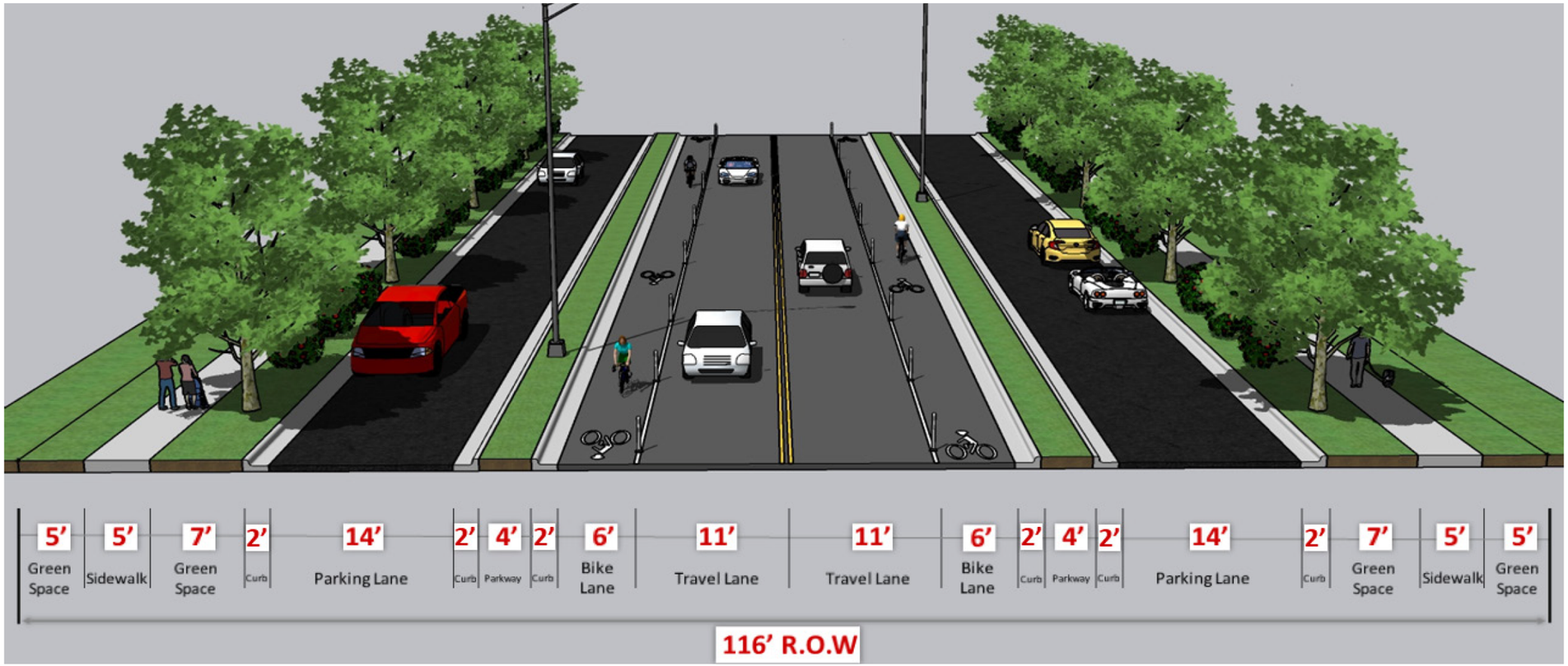
SLB 5 – Del Mar Boulevard Connection to Ocean Drive

Del Mar Boulevard extends westward from Ocean Drive on its eastern end to Staples Street on its western end. The street configuration is unique in that it is a wide 2-lane street with parallel one-way street segments in between cross streets that provide protected parallel parking for adjacent residents. The street provides sidewalks along the tree-lined parallel parking lanes. The wide 2-lane street segment tends to experience speeding and also sees parking along the curbsides during special events at Cole Park. A pedestrian hybrid beacon was recently installed on Ocean Drive at Del Mar Boulevard to facilitate bicycle and pedestrian crossing of Ocean Drive.

Additional proposed improvements include the following:

- SLB 5.1 - Del Mar Boulevard is proposed to be strengthened as a multimodal, Complete Street with traffic calming treatments. The proposed enhancement to the typical section is shown in Exhibit 4-31. The treatment would add a 12-inch-wide bike lane stripe with bollards to reduce the through lanes to 11 feet and create a buffered 5-foot-wide bike lane in each direction.
- SLB 5.2 – A roundabout controlled intersection would be installed at South Alameda Street for traffic calming in both directions and to facilitate pedestrian crossings.

Exhibit 4-31: *SLB 5 - Proposed Multimodal and Traffic Calming Treatment on Del Mar Boulevard*



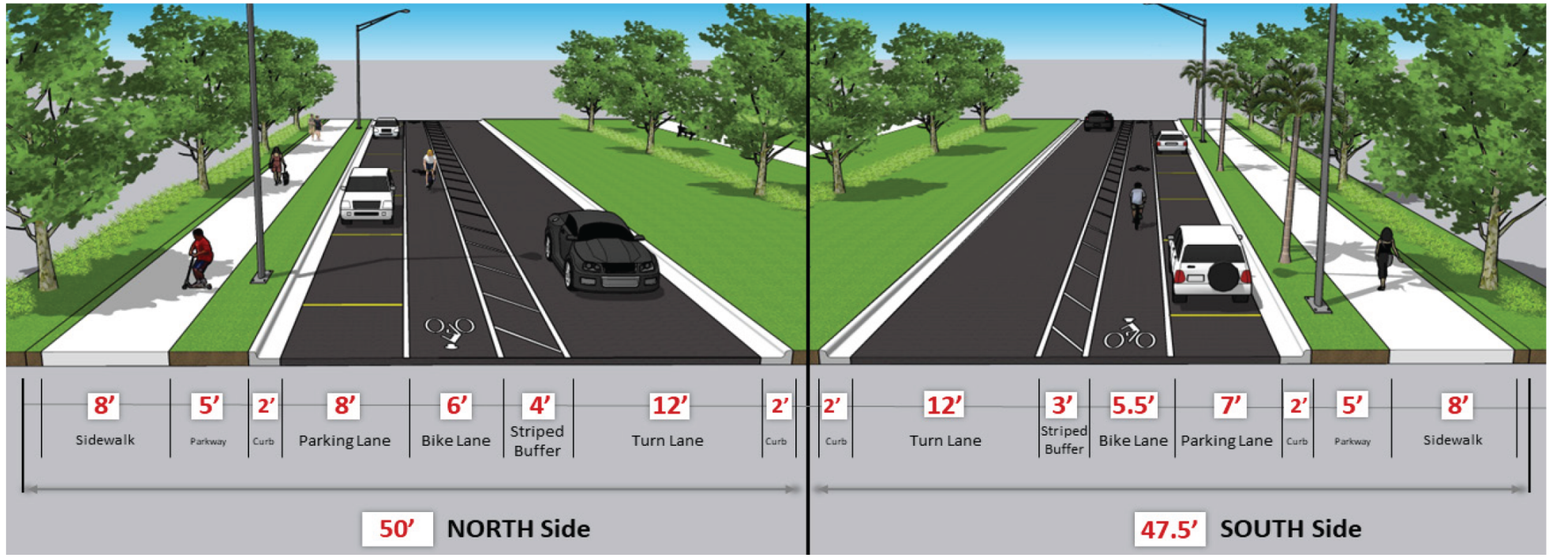
SLB 6 – Louisiana Avenue Connection to Ocean Drive

The existing 4-lane divided roadway with parking carries about 9,000 vehicles per day, total both directions, with a speed limit of 30 mph. A planned pavement overlay project by the City of Corpus Christi (programmed for 2026) provides the opportunity to restripe the pavement to introduce a buffered bike lane. Proposed improvements include the following:

- SLB 6.1 – Reduce the two 11-foot-wide travel lanes (each way) to one 12-foot travel lane plus a buffered bike lane, retaining the existing parking
- SLB 6.2 – Improve the existing sidewalks, enhancing as needed to a minimum width of 5 feet and preferably 8 feet.
- SLB 6.3 – Hike and bike trail (SUP) within center median landscaped drainage area

Related: SLB 3.2 – Ocean Drive at Louisiana Avenue – Convert this complex directional intersection into a standard roundabout with pedestrian crossings and bike lane conveyance through the roundabout. Alternatively, reconfigure the signalized intersection to provide interruption of the northbound free flowing traffic to allow access to and from the shoulder bike lane and trail along the east side of Ocean Drive.

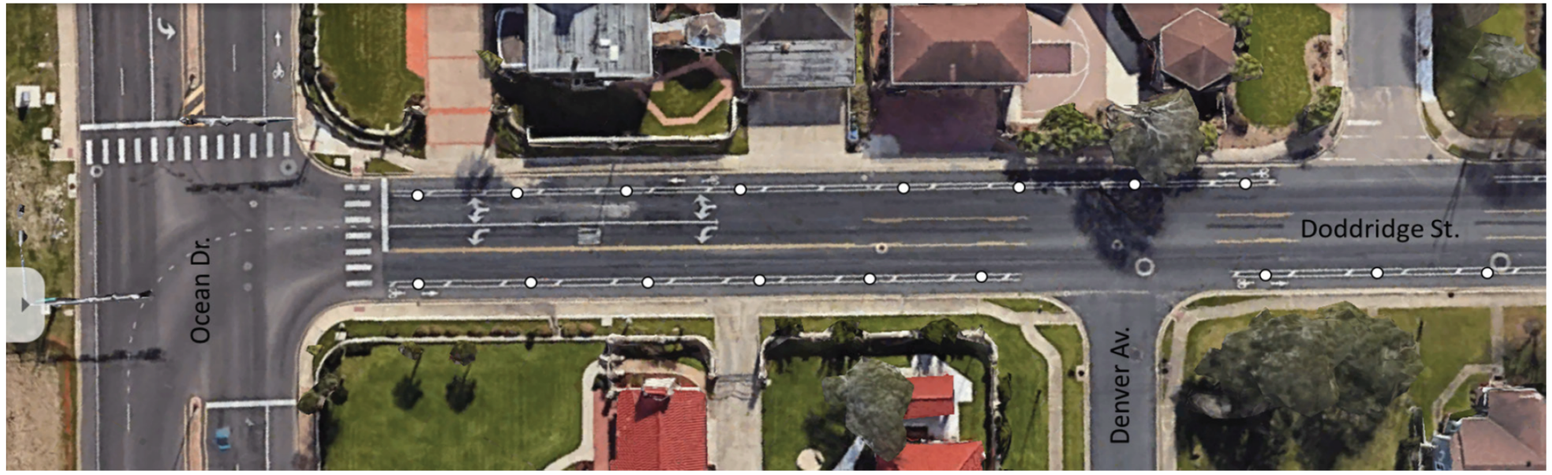
Exhibit 4-32: *SLB 6 - Louisiana Avenue Connection to Ocean Drive*



SLB 7 – Doddridge Street Buffered Bike Lanes to Protected Bike Lanes

Enhance the existing buffered bike lanes along Doddridge Street, between Alameda Road and Ocean Drive, by adding bollards in the buffer area, at approximately 40 feet on center, to create a protected bike lane and a better feeling of separation from moving traffic (see Exhibit 4-33). Leave up to 200-foot-long gaps between bollards at key locations such as side streets and driveways.

Exhibit 4-33: *SLB 7 - Doddridge Street Buffered Bike Lanes Concept*



Proposed Improvements to Alameda Street

When Alameda Street was reconstructed between the Staples/Ayers intersection and Louisiana Avenue, a road diet project was implemented to convert the former 4-lane roadway to two lanes with a center turn lane which also provided 10-foot-wide SUPs on both sides of the street between Cole Street, just south of the Staples/Ayers intersection and Southern Street, just north of Louisiana Street. The SUP was provided with green colored pavement to denote the bicyclist half of the SUP and was signed for one-way bicycling in the direction of the adjacent traffic flow.

The City of Corpus Christi is currently in design of the reconstruction of Alameda Street between Louisiana Avenue and Doddridge Street. The design is proposed to consist of a 5-lane roadway with a protected bike lane and sidewalks in each direction. The typical section is planned to continue to Airline Road.

SLB 8 – Modify the Alameda SUP Intersection Treatments

Bicyclists have complained about the transition of the bicycle half of the Alameda SUP ending in advance of the 5-foot-wide sidewalk ramp at the cross street intersections. Modify the SUP intersection treatments and provide a minimum 8-foot-wide ramp at the crosswalks to remove the bottleneck. Where the SUP shifts to be at the back of curb to avoid obstacles, flexible bollards would be installed to enhance the feeling of bicyclist protection from traffic in the adjacent lane.



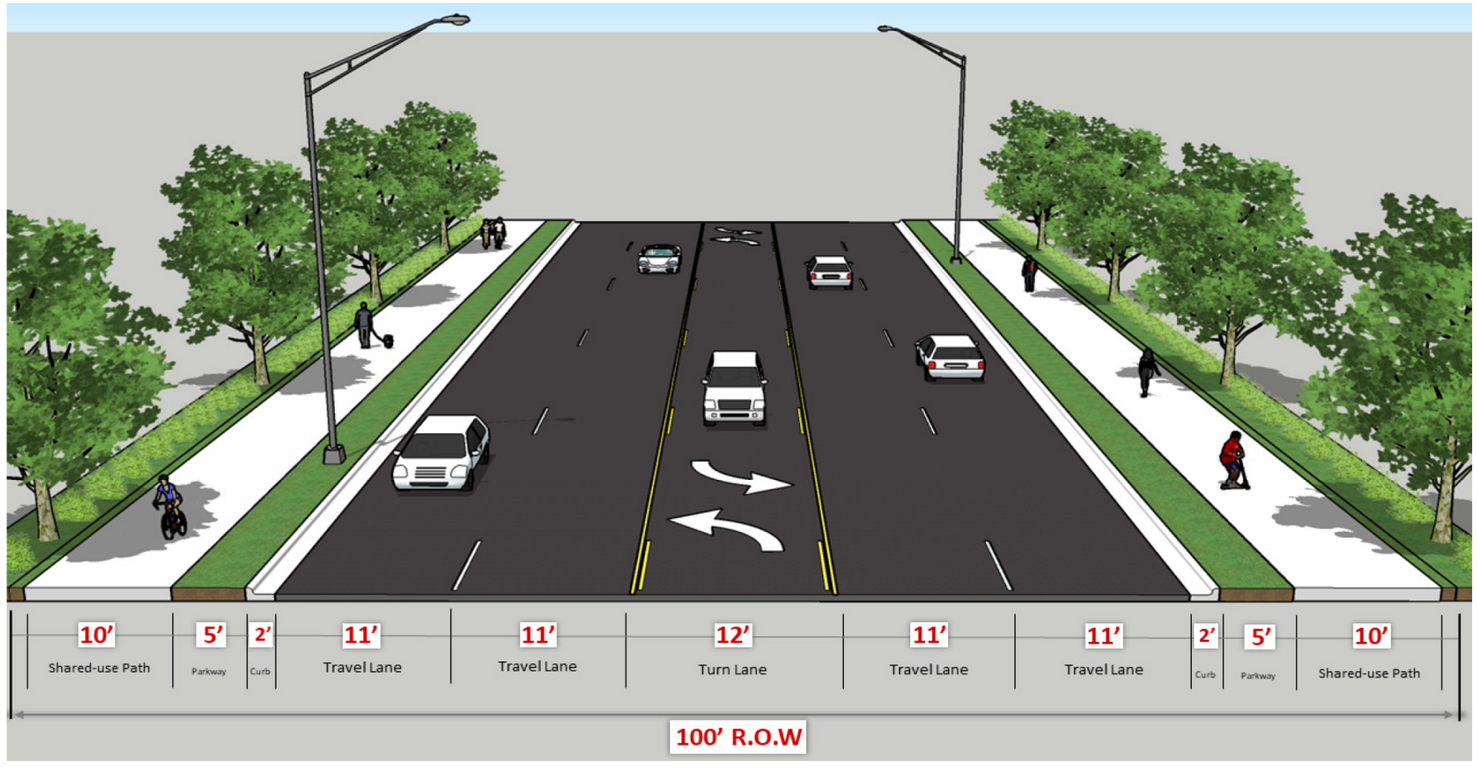
Alameda Street with one-way cycle track in Corpus Christi. (*Source: FNI*)

Project SLB 9 - Alameda SUP, Louisiana Avenue to Airline Road

The street right-of-way along Alameda Street is 100 feet in width southeast of Louisiana Avenue compared to just 80 feet of right-of-way northwest of Louisiana Avenue. This right-of-way allows for enhanced bicycle and pedestrian accommodations while providing the needed 5-lane roadway. One concept for the treatment is shown on Exhibit 4-34. The improved roadway would consist of a 5-lane roadway with a protected bike lane and sidewalks in each direction. The separated bike lanes would transition to the SUP with green one-way bicycle segmentation at Louisiana Avenue.

- SLB 9.1 - The City of Corpus Christi is currently in design of the reconstruction of Alameda Street between Louisiana Avenue and Doddridge Street and they chose to provide SUPs on both sides of Almeda Street in this segment
- SLB 9.2 – The typical section would continue along Alameda Street between Doddridge Street and Airline Road
- SLB 9.3 – Southeast of Airline Road to Ennis Joslin Road, the typical section would reduce to a 3-lane roadway with SUPs on both sides

Exhibit 4-34: *SLB 9 - Proposed SUPs on Alameda Street, Louisiana Avenue to Airline Road*



Project SLB 10 – Local Street Bike Route Network Surrounding Alameda Street

Some bicyclists have indicated a preference for riding on lower volume, lower speed local streets in their residential area to get to nearby destinations. While bicyclists could use any local street to get to the bikeway network along the minor arterial network, one particular set of local streets makes up an extensive network of local and neighborhood collector streets that offer signalized crossings of the arterials. This network of local and collector streets is supplemented by trail connectors and street crossing safety enhancements to enlarge and interconnect the network of bike routes.

Ocean Drive/Ennis Joslin/Holly Bridge

Completing the Statewide Bicycle Touring network through Corpus Christi, the network would extend along Ocean Drive to Ennis Joslin Road, along Ennis Joslin Road between Ocean Drive and Holly Road, and then along the Holly Road Trail and the programmed Trestle Bridge to Flour Bluff Drive, ending at the RTA Bus Transfer location near Waldron Road at South Padre Island Drive (SPID).

Ennis Joslin Road north of SPID has a significant amount of multifamily residential development that caters to the housing needs of the TAMU-CC campus. This segment of roadway currently has an 8-foot SUP along the east side and sidewalks along the west side and a narrow (3-foot-wide) bike lane.

On Ocean Drive east of Ennis Joslin, narrow (3- to 4-foot wide) shoulder bike lanes are provided adjacent to travel lanes with a posted speed limit of 45 mph. An 8- to 10-foot-wide SUP is provided at the back of curb on the south side of Ocean Drive, from Ennis Joslin to the first driveway to the TAMU-CC campus at Island Boulevard, with a 1,500-foot-long, 8-foot-wide barrier separated segment at the crossing of a bay inlet that constrains two-way passage of bicyclists and pedestrians.

Ennis Joslin Road south of Williams Drive to Holly Road has 10-foot-wide SUPs on both sides, but only 4-foot-wide sidewalks on both sides between SPID and Williams Drive.

Proposed Improvements to Ocean Drive/Ennis Joslin/Holly Bridge

EJR 1 - Ocean Drive at Ennis Joslin Road

Enhance the connectivity of the proposed buffered bike lanes along Ocean Drive to the proposed enhanced bike lanes along Ennis Joslin Road:

- EJR 1.1 An enhanced channelization of the intersection of the two roadways is proposed as illustrated in Exhibit 4-36.
- EJR 1.2 Add RRFB or PHB at the ped/bike crosswalks across the two high-speed uninterrupted right turn lanes

Exhibit 4-35: *Ocean Drive/Ennis Joslin Road/Holly Bridge Functional Area*

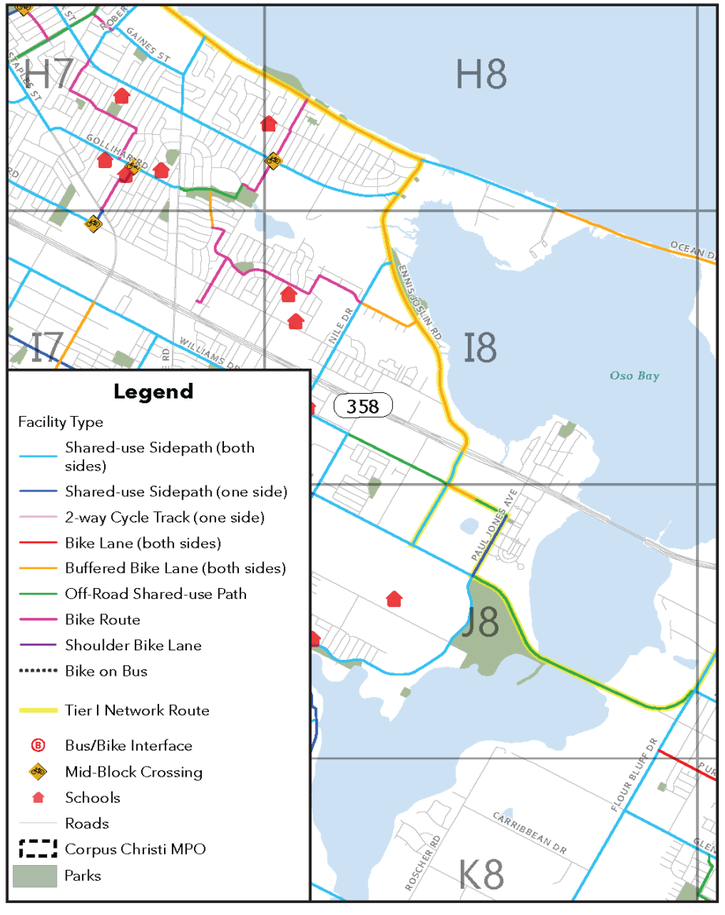
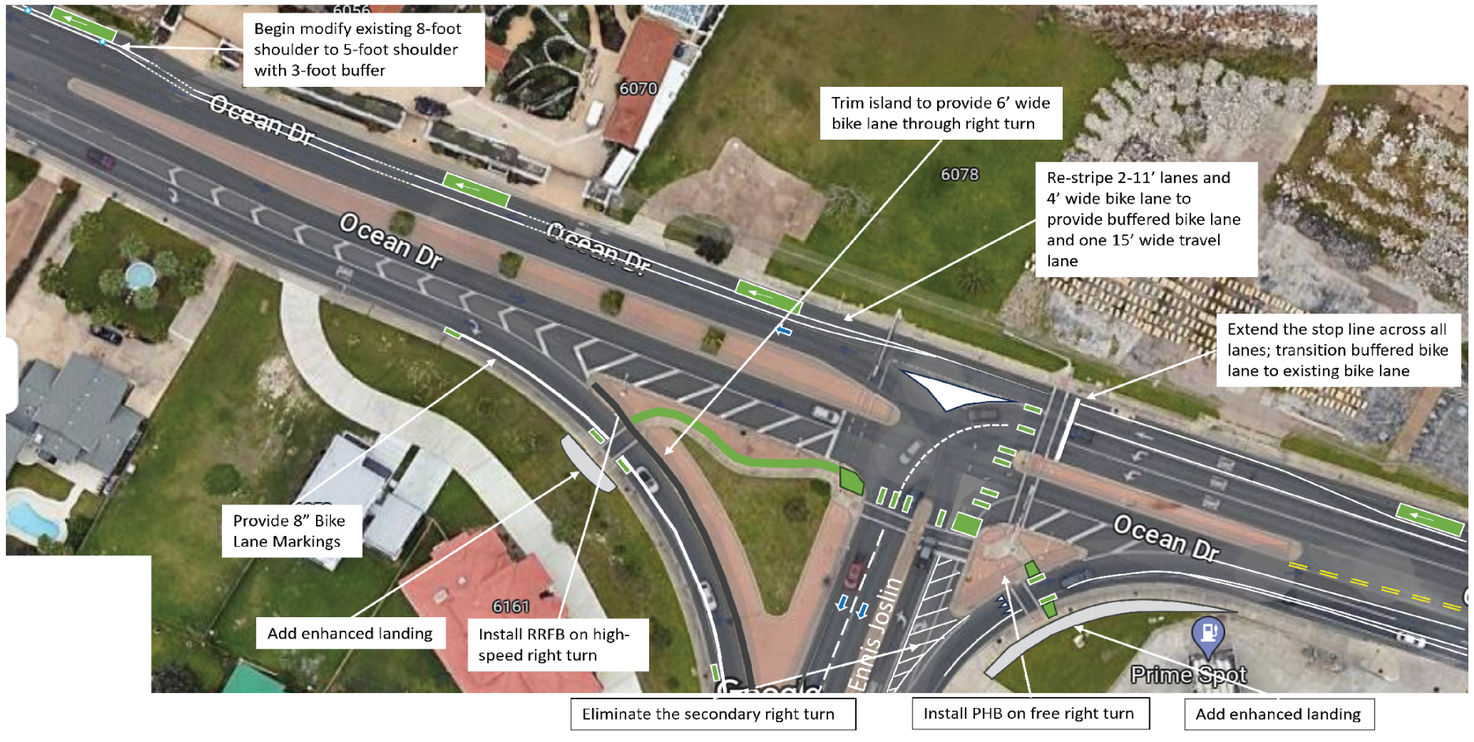


Exhibit 4-36: *EJR 1 - Enhanced Channelization of Ocean Drive at Ennis Joslin Road*



EJR 2 - Conversion of Ennis Joslin Road to a High Quality Multimodal Corridor, Ocean Drive to SPID

Ennis Joslin Road is in a strategic location within the roadway grid to allow for enhanced accommodation of bicycle and pedestrian mobility while also providing for transit service and a moderate capacity and acceptable level of service for general traffic. Ennis Joslin Road is lined with apartment complexes, many of which focus on housing for students of Texas A&M University – Corpus Christi.

- EJR 2.1. The proposed conversion concept for the roadway is to reallocate the outside lane to the provision of a buffered bike lane. The remaining one lane would be increased in width from its current 10 feet to 12 feet in width.
  - The two southbound lanes extending from Ocean Drive would force off one lane to go onto Alameda Road, leaving one southbound through lane from Alameda Road to just before SPID
  - At intersecting streets and driveways, the buffered bike lane striping would be dashed for a length of about 150 feet to allow right turning vehicles to move into the right lane to execute their turn
  - At bus stops, the buffered bike lane striping would be dashed for a length of about 150 feet to allow buses to move out of the through lane into the curbside to service passengers

Exhibit 4-37: *EJR 2 - Ennis Joslin Road at South Alameda Street*



Exhibit 4-38: *EJR 2 - Intersection Concepts on Ennis Joslin Road*







EJR 3 - Ennis Joslin Road from SPID interchange to Williams Drive

The SPID interchange presents an opportunity to improve operations for motorized traffic as well as bicyclists and pedestrians traversing along Ennis Joslin Road.

» EJR 3.1 Ennis Joslin Road north of SPID Interchange

- The long right turn lane would be converted to a second general purpose lane with the existing narrow bike lane. To add the third lane, transition the two lanes with a buffered bike lane at the center median. At a distance of about 200 feet in advance of the SPID westbound service road, transition to two through lanes and one right turn lane that would be a shared lane with bicyclists, in which bicyclists would be allowed to proceed straight through the intersection. An enhanced sidewalk would allow less advanced bicyclists to not use the shared right turn lane to get through the intersection.

» EJR 3.2 Ennis Joslin Road at SPID Interchange

- Two lanes would be provided in each direction between service roads, providing for one dedicated left-turn lane and one through and left-turn lane in each direction
- The southbound double left turn onto the eastbound service road of SPID would be channelized with lane markings into the leftmost two lanes of the service road to facilitate their entry to the on ramp to SPID. The service road U-turn would be converted from a free-flow to yield condition.
- The eastbound service road would be channelized to provide one through and left turn lane and one through and right turn lane

» EJR 3.3 Ennis Joslin Road south of SPID Interchange

- 10-foot-wide SUPs would be installed on both sides of Ennis Joslin Road southward to tie to the existing SUPs that begin just south of Williams Drive, between SPID and Williams Drive
- The traffic volumes on Ennis Joslin Road are currently well below the capacity of the existing 5-lane roadway. Just south of SPID, there is currently one southbound lane that operates adequately. The remaining southbound pavement would be restriped to provide one through vehicular lane and a buffered bike lane in each direction.
- Northbound Ennis Joslin Road would also be restriped to provide one through lane and a buffered bike lane. At the approach to SPID, the pavement would be restriped to provide two through lanes and one right turn lane, with the buffered bike lane crossing the right turn lane to the right of the through lanes.

Exhibit 4-39: *EJR 3.1 - Ennis Joslin Road North of SPID Interchange*

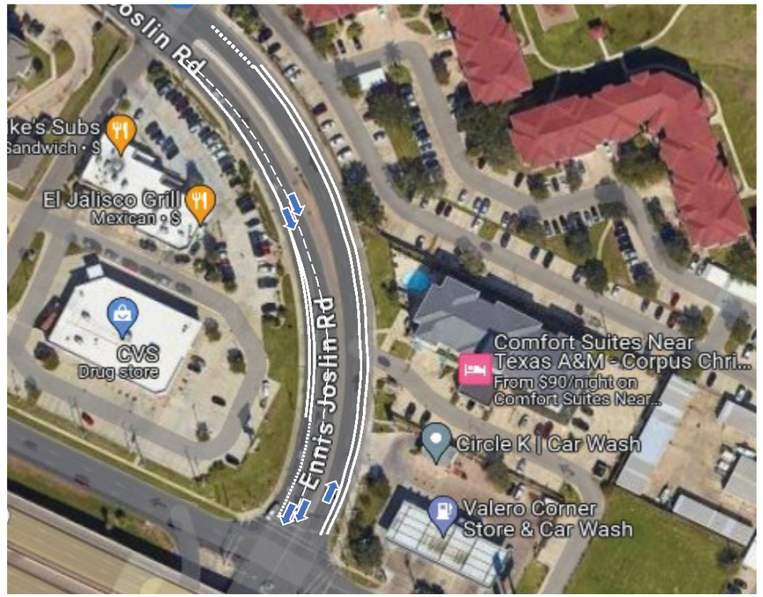
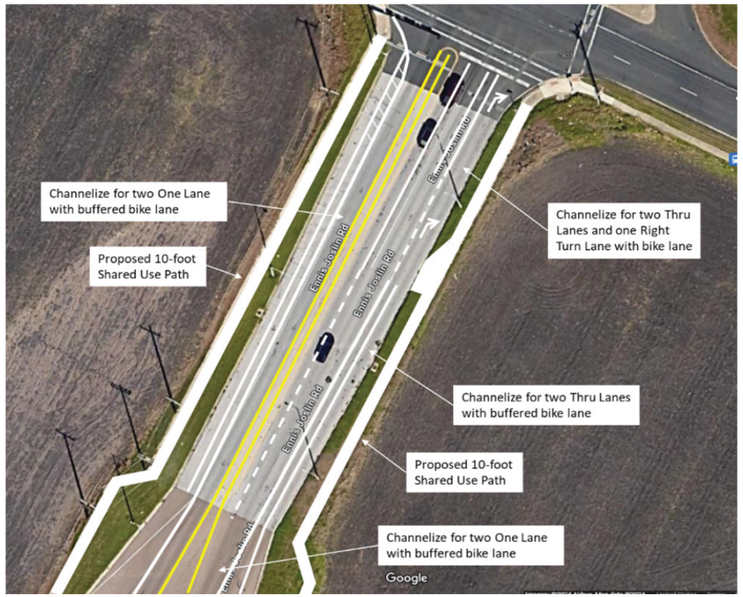


Exhibit 4-40: *EJR 3.2 - Ennis Joslin Road at SPID Interchange*



Exhibit 4-41: *EJR 3.3 - Ennis Joslin Road South of SPID Interchange*



EJR 4 - Connection from Ennis Joslin Road to Holly Road Trail

An existing 10-foot-wide SUP is provided along both sides of Ennis Joslin Road south of Williams Drive to Holly Road. An existing 10-foot-wide SUP extends along the Paul Jones Drive frontage of the City's softball complex and extends southward to Holly Road, with connection to the existing hike and bike trail east of Paul Jones Avenue. North Oso Parkway aligns with Paul Jones at Holly Road and has an 8-foot-wide SUP along its eastern edge, though a short connecting segment is needed. A 2024 Bond project would add sidewalks along Holly Road between Rodd Field Road and Paul Jones Road; the project would be amended to increase the sidewalks to SUP.

» EJR 4.1 - Williams Drive Extension SUP/Trail
  - The City of Corpus Christi Thoroughfare Plan includes an extension of Williams Drive from Rodd Field Road to Ennis Joslin Road. A current City project is in design to extend Williams Drive east of Rodd Field Road to Lexington Road. In conjunction with or in advance of that extension, a 10-foot-wide SUP or trail would extend the SUP along both sides of Williams Drive west of Rodd Field Road to tie to the SUP along both sides of Ennis Joslin Road.

» EJR 4.2 - Williams Drive Connection to Paul Jones Drive Trail
  - Bike lanes would be marked along Williams Drive east of Ennis Joslin Road. A connecting trail will be provided from the end of the existing Williams Drive pavement to connect to the 10-foot-wide SUP along Paul Jones Avenue.

EJR 5 - Holly Road Trail and Bridge

The existing 10-foot Hike and Bike trail through Holly Road Park provides access to a large nature area and park, with a terminus near the banks of Oso Bay at Osprey Outlook where the piers of a former railroad track still remain. The City of Corpus Christi recently was awarded funding to put a hike and bike trail deck atop the railroad trestle foundations, allowing the trail to extend from Paul Jones Road/ Oso Parkway to Flour Bluff Drive.

» EJR 5.1. Railroad Trestle Connection to Flout Bluff Drive SUP
  - Some of all of the 10-foot-wide trail will be installed with the trestle bridge project. A traffic signal will be needed to connect to the SUP.

Exhibit 4-42: *EJR 4 - Connection from Ennis Joslin Road to Holly Road Trail*



Exhibit 4-43: *EJR 5 - Connection from Ennis Joslin Road to Holly Road Trail*



Flour Bluff

A 12-foot-wide SUP currently extends from Don Patricio Road to north of Graham Road. The RTA currently runs bus service from a sheltered stop on Waldron Road near Graham Road to a sheltered stop on Mustang Island, which currently serves to connect Flour Bluff and Mustang Island for pedestrians and bicyclists as a way to traverse the causeway bridge.

Proposed Improvements to Flour Bluff

FLB 1 – Graham Road SUP

A 10-foot-wide SUP would run along the north side of Graham Road and tie to the RTA bus stop on Waldron Road adjacent to Parker Park and a City Police Station. This roadway is included in the proposed Bond 2024 set of projects, but with sidewalks and not an SUP, so the bond project scope would need to be modified.

FLB 2 – Flour Bluff Drive, Yorktown Boulevard to Don Patricio Road, Graham Road to north of SPID

- FLB 2.1 - A 10-foot-wide SUP would extend south from Don Patricio Road to Yorktown to complete the circuit of SUPs on either side of the Oso Bay.
- FLB 2.2 - The existing SUP along Flour Bluff Road would be extended northward from its terminus north of Graham Road to north of SPID at Sunbird Street, widening existing sidewalks.

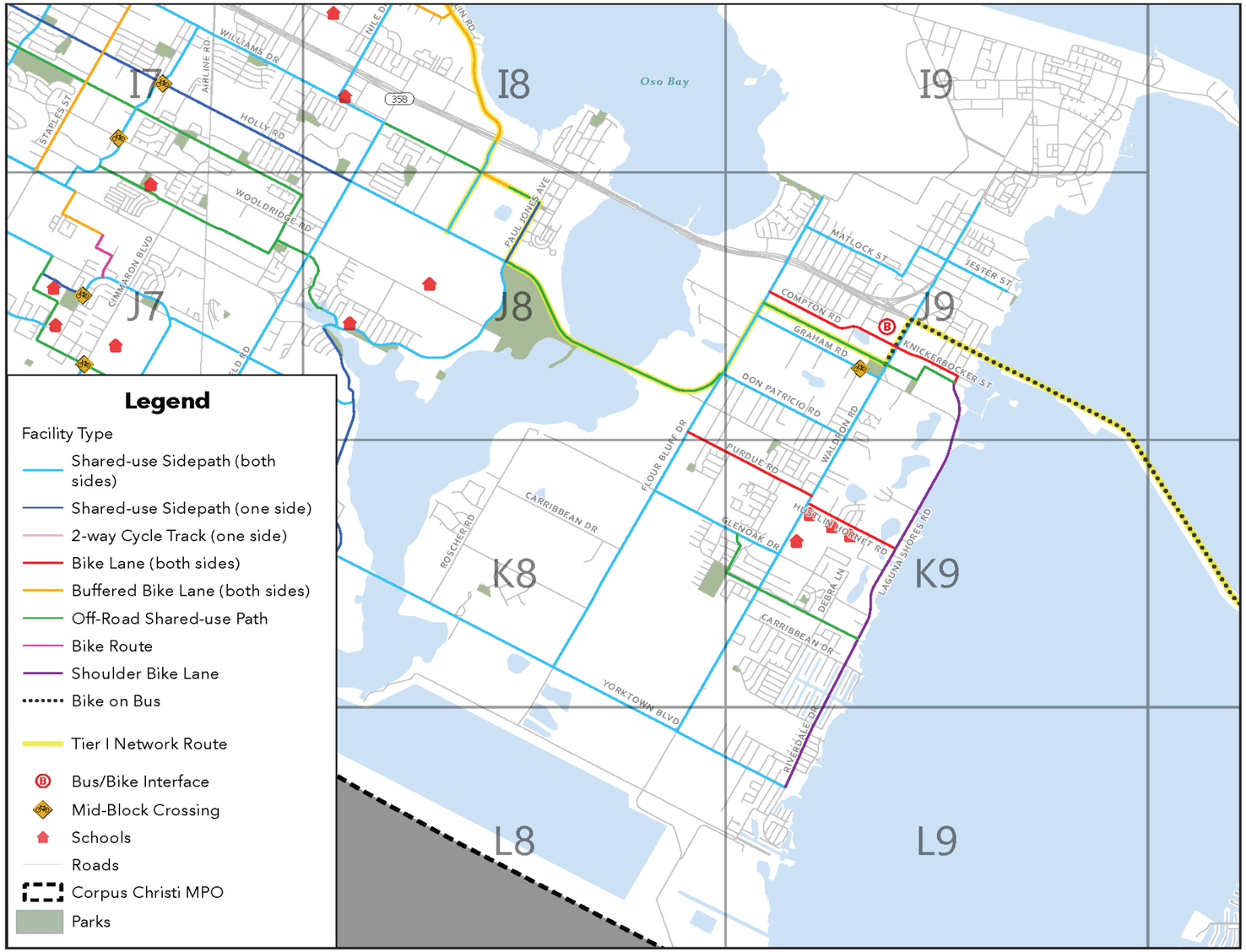
FLB 3 – Yorktown Boulevard SUP to Laguna Shores Road

The City of Corpus Christi is currently designing improvements to Yorktown Boulevard east of Rodd Field Road toward Flour Bluff, to include SUPs along one or both sides of the roadway. The 2024 Bond Program of projects includes the design of improvements to Yorktown Boulevard from the Oso Bay Bridge to Waldron Road to include sidewalks, which would need to be increased to SUPs. Extend the SUP along Yorktown Boulevard to a terminus at Laguna Shores Road.

FLB 4 – Waldron Road SUP, Yorktown Boulevard to NAS Drive

A 10-foot-wide SUP would run along both sides of Waldron Road and crossing under SPID to connect high school, park and residential destinations and tie to the SUPs within the NAS. In addition to the signalized intersections, controlled street crossings would be added strategically as needed to support access to and from the SUP.

Exhibit 4-44: *Flour Bluff Functional Area*



FLB 5 – Laguna Shores Road Shoulder Bikeway

The recently reconstructed Laguna Shores Road provides 3- to 4-foot-wide striped shoulders. While narrower than desired for use as a shoulder bike lane, the corridor is a scenic conveyance and serves to create the opportunities for loop routes in Flour Bluff for recreational bicycling. The existing roadway pavement has 12-foot-wide travel lanes which would be narrowed to 11-foot-wide by adding a second white edge line to denote the slightly buffered shoulder bike lanes. The 40 mph speed limit would be reduced to 30 mph.

FLB 6 – Knickerbocker Street/Compton Road Bike Lanes, Laguna Shores Road to Flour Bluff Drive

Existing striped parking lanes along Knickerbocker Street would be jointly utilized for bicycling between Laguna Shores Road and Waldron Road, the wide 2-lane Compton Road west of Waldron Road to 1st National Drive would have a bike lane striped and the narrow 2-lane roadway between 1st National Drive and Flour Bluff Drive would be widened to add a 4-foot-wide shoulder bike lane.

FLB 7 – Don Patricio Road SUP, Flour Bluff Drive to Waldron Road

A new 10-foot-wide SUP along the north side of Don Patricio Road would connect the proposed SUP along Waldron Road to the existing SUP along Flour Bluff Drive and the trail connector to the Holly Road Trestle Bridge.

FLB 8 – Purdue Road Bike Lane, Flour Bluff Road to Waldron Road

Existing striped parking lanes along Purdue Road would be jointly utilized for bicycling between Flour Bluff Drive and Waldron Road.

FLB 9 – Hustlin' Hornet Drive Bike Lanes

Existing striped parking lanes and striped shoulder along Hustlin' Hornet Drive would be jointly utilized for bicycling between Waldron Road and Laguna Shores Road. The crossover between Hustlin' Hornet Drive and Purdue Road bike lanes would utilize SUPs along both sides of Waldron Road.

FLB 10 – Glenoak Drive SUP, Flour Bluff Road to Waldron Road

A new 10-foot-wide SUP along the north side of Glenoak Drive would connect the proposed SUP along Waldron Road to the proposed SUP along Flour Bluff Drive. See Exhibit 4-45 for rendering of the Glenoak Drive from the Flour Bluff ADP.

FLB 11 - Trail along Ditch North of Graham Road

A new 10-foot trail would connect the existing 10-foot-wide SUP along Flour Bluff Drive to the proposed SUPs along Waldron Road. At Waldron Road, the ditch would be adjacent to Parker Park, a Police Station and an CCRTA bus stop.

FLB 12 - JFK Causeway Crossing via Bike-on-Bus

The CCRTA Route #4 carries bicyclists and pedestrians between Flour Bluff Road and Padre/Mustang Island. This would be the interim connection until the JFK Bridge can be enhanced to add a SUP along its edge.

Exhibit 4-45: *FLB 10 - Glenoak Drive SUP Rendering from the Flour Bluff ADP*



Bike on Bus Connection between Flour Bluff and Padre/ Mustang Island

There are no bicycle or pedestrian accommodations on the JFK Causeway, which is currently the only way to get between the Flour Bluff area and Padre/Mustang Island. To create a connection for the Active Transportation Network across the JFK Causeway, a bike-on-bus accommodation is designated using the existing Route #65 bus service provided by the CCRTA. RTA buses are equipped with front-mounted bike carriers that can hold two bicycles. The Flour Bluff Transfer Point is on the north side of Compton Road west of Waldron Road.

Exhibit 4-46: *Bicycle Network Connection to CCRTA Transfer Point in Flour Bluff*

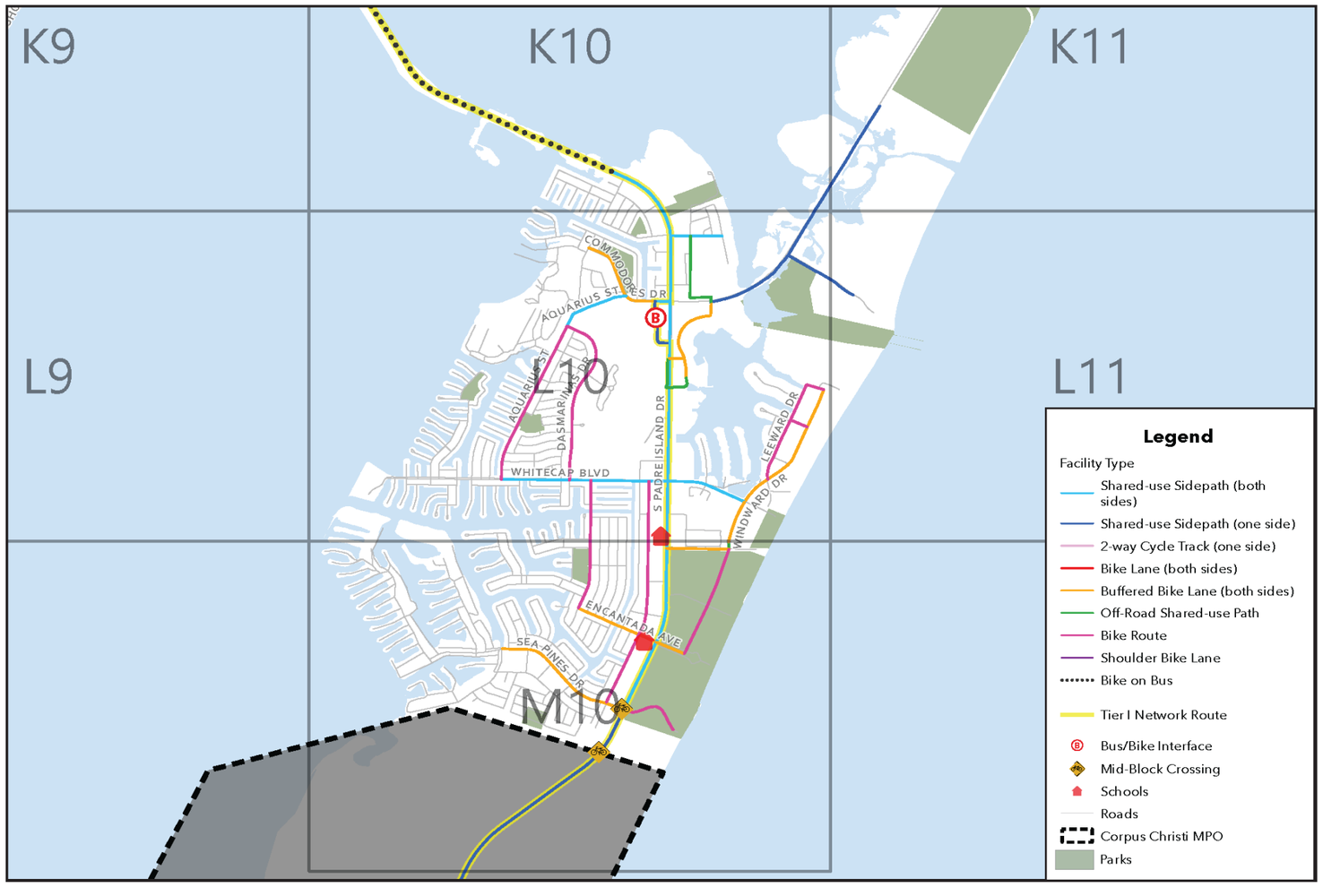


Padre/Mustang Island

The City of Corpus Christi is developing a plan for bicycle and pedestrian facilities on Padre/Mustang Island. The current version of the plan for facilities is depicted in Exhibit 4-47. One existing 3,000 LF of buffered bike lane is provided along Commodores Drive just west of Park Road 22, between Aquarius Street and Compass Street. The RTA bus stop that serves the route between Mustang Island and Flour Bluff is located on Compass Street just south of Commodores Drive.

Existing bike lanes are striped along the length of Encantada Avenue west of Park Road 22 (PR 22) and along Padre Balli Park Road east of PR 22, though no safe crossing of PR 22 is provided to connect the two segments. Bike lanes are also striped on Sea Pines Drive west of PR 22 and on most of Whitecap Boulevard west of PR 22. TxDOT recently reconstructed the bridge on Park Road 22 over the inlet, about midway between Commodores and Whitecap, that left space for a trail undercrossing between the two sides of PR 22. Significant elements of the proposed network include the following.

Exhibit 4-47: *Padre/Mustang Island Functional Area*



Proposed Improvements to Padre/Mustang Island

PMI 1 – Park Road 22 SUP

A 10-foot-wide SUP/hike and bike trail would be added to the PR 22 corridor, from Verdmar Drive to Sea Pines Drive/Access Road 6. The trail would be positioned at least 10 feet off the edge of the pavement along the high speed roadway. The trail would include an undercrossing of PR 22 at the bay inlet.

PMI 2 – Whitecap Boulevard SUP

A 10-foot-wide SUP along the length of one or both sides of Whitecap Boulevard on both sides of PR 22 is proposed.

- PMI 2.1 Whitecap Boulevard SUP west of PR 22 – The SUP would widen the existing 4-foot-wide sidewalk, where provided, to supplement or perhaps replace the existing bike lanes.
- PMI 2.2 Whitecap Boulevard SUP east of PR 22 – The existing 8-foot-wide brick paver SUP would be enhanced as needed. The intersection at Whitecap Boulevard at Windward Drive would be enhanced to provide better crossing provisions for pedestrians and bicyclists, potentially considering a roundabout for traffic control of the intersection.

PMI 3 – Sea Pines Drive/Access Road 6

- PMI 3.1 – The existing bike lanes along Sea Pines Drive would be enhanced to be buffered bike lanes by a lane diet or road diet of the 4-lane divided Sea Pines Drive.
- PMI 3.2 – Bike lanes along Access Road 6 would be provided by widening the narrow 2-lane roadway.

PMI 4 - Elliff Road and Windward/Leeward Drives

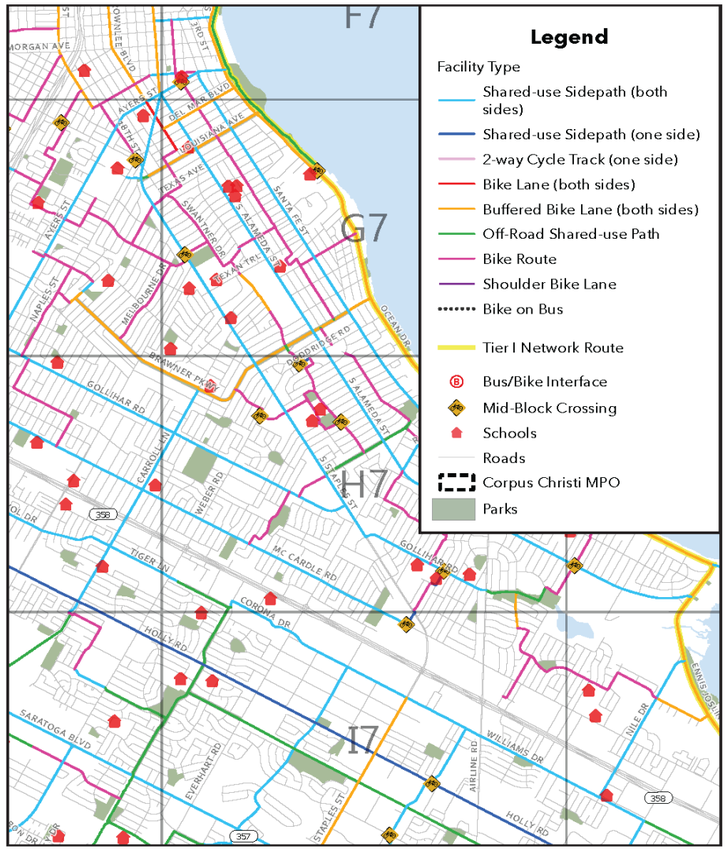
A 2-mile-long north-south bikeway east of PR 22 would be created by designating Elliff Road as a bike route, providing a connecting SUP to Windward Drive, enhancing the existing bike lanes along Windward Drive to add buffer space between the bike lanes and travel lanes, and designating shared parking and bike lanes in both directions along Leeward Drive.

Midtown

This area of Corpus Christi north of SPID and east of the Crosstown Highway comprises fully developed residential neighborhoods with sidewalks on both sides of streets, as well as established local businesses and some areas in transition. Within the last several years, street improvement projects have incorporated SUPs along one or both sides of several collector and minor arterial roadways including:

- Gollihar Road between Staples Street and Kostoryz Road (10-foot-wide with 5 feet of green colored concrete to denote bicycle passage portion of SUP).
- Carroll Lane between McArdle Road and Houston Street just south of Brawner Parkway (10-foot-wide with 5 feet of green colored concrete to denote bicycle passage portion of SUP).

Exhibit 4-48: *Midtown - East Functional Area*



Proposed Improvements to Midtown - East

MDT 1 - Brawner Parkway

The existing two-way pair of roadways carries a total of about 9,000 vehicles per day, total both directions, with a posted speed limit of 30 mph. The pair of roadways runs parallel to each side of a large drainage channel for a distance of over 2 miles through a fully developed residential area of mostly single-family homes. Each roadway provides a narrow travel lane (9 to 10 feet) in each direction next to a 6-foot-wide parking lane.

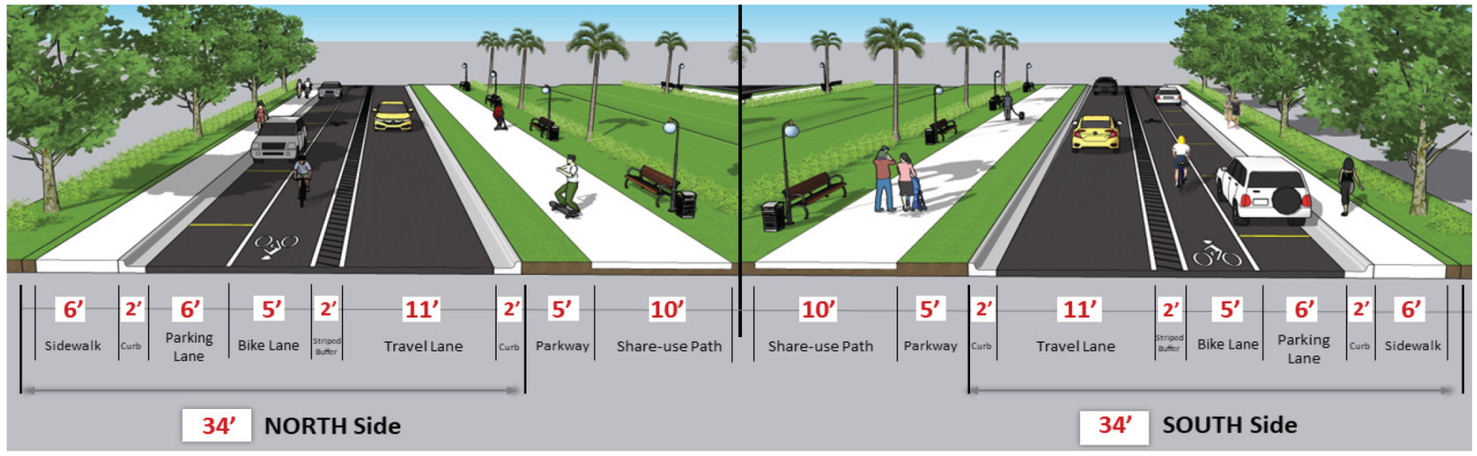
A 2,500-foot-long section of SUP/hike and bike trail has been installed along the north side top bank of the drainage ditch between Kostoryz Road and Carrol Lane and is popularly used. Segments of Brawner Parkway are programmed for pavement improvements while the entire length of the roadway could use an overlay.

- MDT 1.1 - Convert Brawner Parkway from a pair of two-way streets to a one-way couplet of streets on either side of the drainage ditch. Assess local circulation needs for additional crossover streets between the two sides of the drainage channel.
- MDT 1.2 - Right size the one-way couplet to provide one travel lane (each side) and a buffered bike lane with curbside parking.
- MDT 1.3 - Provide SUPs within center landscaped drainage area, along both sides if feasible.
- MDT 1.4 - Improve the intersection of Brawner Parkway at South Staples Street (see Exhibit 4-49)
  - Converting Brawner Parkway to a pair of one-way streets will reduce the number of conflict points at the intersection at Staples Street. The simplified intersection will then facilitate the traffic control of the intersection with a traffic signal.

Exhibit 4-50: *MDT 1.4 - Intersection Concept of Brawner Parkway at South Staples Street*



Exhibit 4-49: *Concept for Complete Street along Brawner Parkway Including Conversion to a One-Way Couplet*



MDT 2 – Carmel Parkway

Similar to Brawner Parkway, the existing two-way pair of roadways comprising Carmel Parkway carries a total of about 5,000 vehicles per day, total both directions, with a posted speed limit of 30 mph. The pair of roadways runs parallel to each side of a large drainage channel for a distance of one-half mile, between Staples Street and Alameda Street, through a fully developed residential area of mostly single-family homes and some multifamily and with commercial development at the two arterial intersections. Each roadway provides a narrow travel lane (9 to 10 feet) in each direction next to a 6-foot-wide parking lane. Segments of Carmel Parkway are programmed for pavement improvements while the entire length of the roadway could use an overlay. The signalized intersection at Staples Street is made complex by the pair of two-way streets of Brawner Parkway.

- MDT 2.1 - Convert Carmel Parkway from a pair of two-way streets to a one-way couplet of streets on either side of the drainage ditch. Assess local circulation needs for additional crossover streets between the two sides of the drainage channel at San Fernando Place.
- MDT 2.2 - Right size the one-way couplet to provide one travel lane (each side) and a buffered bike lane with curbside parking, improve sidewalks as needed
- MDT 2.3 - Provide SUPs within center landscaped drainage area, along both sides if feasible.
- MDT 2.4 – Realign westbound Carmel Parkway to come to a single point at the intersection with Staples Street.
- MDT 2.4 – Realign with eastbound Carmel Parkway to come to a single point at the intersection with Alameda Street and add traffic control at the intersection and a turnaround.

MDT 3 - Carroll Lane Bikeway

A 10-foot-wide SUP is provided along both sides of Carroll Lane between McArdle Road and Houston Street just south of Brawner Parkway (10-foot-wide with 5 feet of green colored concrete to denote bicycle passage portion of SUP). Expansion of the SUP provisions along Carroll Lane would create a multimodal corridor connecting residential, school, park and commercial destinations using one of the less intense crossings of SPID.

- MDT 3.1 – Extend the SUP along both sides of Carroll Lane from Houston Street to Brawner Parkway.
- MDT 3.2 – Extend the SUP along both sides of Carroll Lane from Brawner Parkway to Staples Street, tie to the 8-foot SUP on the west side of Staples Street. Designate Dabney Street as a bike route between Staples Street and Fort Worth Street.
- MDT 3.3 – Extend the SUP along both sides of Carroll Lane from McArdle Street to and through the SPID underpass. There are houses that front onto Carroll Lane between McArdle and SPID that have their own driveways and will likely be sensitive to converting the parking lane to provide the needed width for the SUP on both sides of Carroll Lane.
- MDT 3.4 – Add 10-foot-wide SUP along both sides of Carroll Lane from SPID to Tiger Lane.
- MDT 3.5 – Add 10-foot-wide SUP along both sides of Carroll Lane from Tiger Lane to Holly Road, connecting to the trail along Carroll Ditch that leads to Mary Carroll High School.

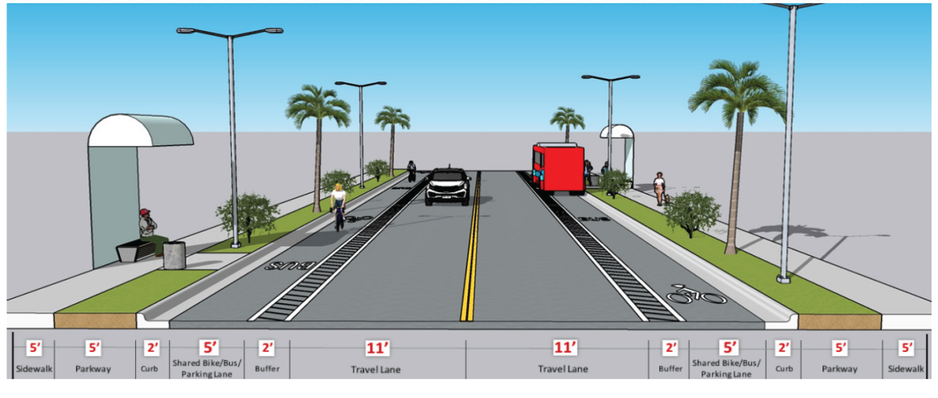
MDT 4 - Brownlee Boulevard

Brownlee Boulevard, from Louisiana Avenue to Mussett Street is a 2-lane and at times a 4-lane roadway with signalized crossings of Staples Street, Ayers Street, Morgan Avenue and Agnes Street. Brownlee Boulevard carries about 5,0000 vehicles per day with a posted speed limit of 30 mph and accommodates a bus route. At its northern terminus, Brownlee Boulevard connects to the Agnes Road Rail-to-Trail project (see SLB 4 – Agnes Street Rail-to-Trail Connector to Shoreline Boulevard on page 4-21).

The concept for this treatment would be to add bike lanes on the 2-lane street segments, and on the 4-lane segments, between Staples Street and Laredo Street, to convert the four 10-foot-wide lanes to two 12-foot-wide lanes and an 8-foot-wide buffered bike lane (5-foot-wide bike lane with 3-foot-wide striped buffer). The RTA buses servicing the corridor would drive in the 12-foot-wide travel lane with other motorized traffic until needing to serve passengers at the bus stop. Buses would move in and out of the buffered bike lane as needed for prevailing traffic conditions, yielding to bicyclists in the buffered bike lane.

Notably, parking was observed in the outside 10-foot-wide travel lane of the 4-lane segments. Conversion to the buffered bike lane would enhance the safety for conveyance of traffic along Brownlee Boulevard and pose a minor inconvenience for bicyclists to leave the bike lane to pass the parked car.

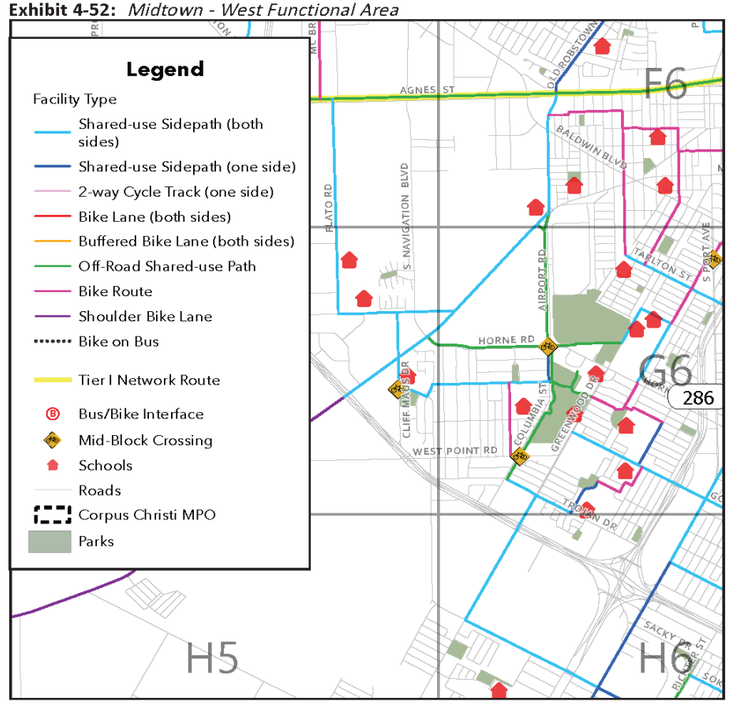
Exhibit 4-51: *Brownlee Boulevard Conversion from Four Lanes to Two Lanes with Buffered Bike Lanes*



Proposed Improvements to Midtown - West

This area of Corpus Christi north of SPID and west of the Crosstown Highway comprises fully developed residential neighborhoods with sidewalks on both sides of streets, as well as local businesses and some areas in transition.

Exhibit 4-52: *Midtown - West Functional Area*



Southside

The southern area of Corpus Christi, south of SPID and east of Crosstown Highway is a sector that has seen relatively high growth in residential and commercial development over the last two decades compared to the rest of the City. This area has been developed with an extensive system of drainage ditches, which were proposed for an extensive trail network along the edges of the ditch right-of-way in the previous MPO Plan. Several segments of the system have already been developed, including:

- Schanen Hike and Bike Trail, from Yorktown Boulevard to Killarmet Drive
- Carroll Trail, from Carroll Lane at Holly Road to Kostoryz near the new Mary Carroll HS
- Ditch side trail from Slough Road to Rodd Field Road SUP and continuing (with a 1,300 LF gap) westward to just west of Morteza Drive to a bridge crossing over the ditch and connection to Yorktown Boulevard across from Bill Witt City Park. A project in the proposed 2024 Bond Program would complete the gap in the trail at Rodd Field Road and enhance the crossings of Rodd Field Road and Yorktown Boulevard.

A 10-foot-wide SUP is provided along both sides of Williams Drive/Corona Drive between Rodd Field Road and Flynn Parkway, a length of about 3.5 miles.

Proposed Improvements to Southside

SSD 1 – Expansion of the Schanen Hike and Bike Trail beyond Killarmet Drive

A trail network of over 5 miles extending to Oso Bay, with ditch extension northward to a crossing of Holly Road and connection to the SUP along Tiger Lane/Corona Drive/Williams Drive.

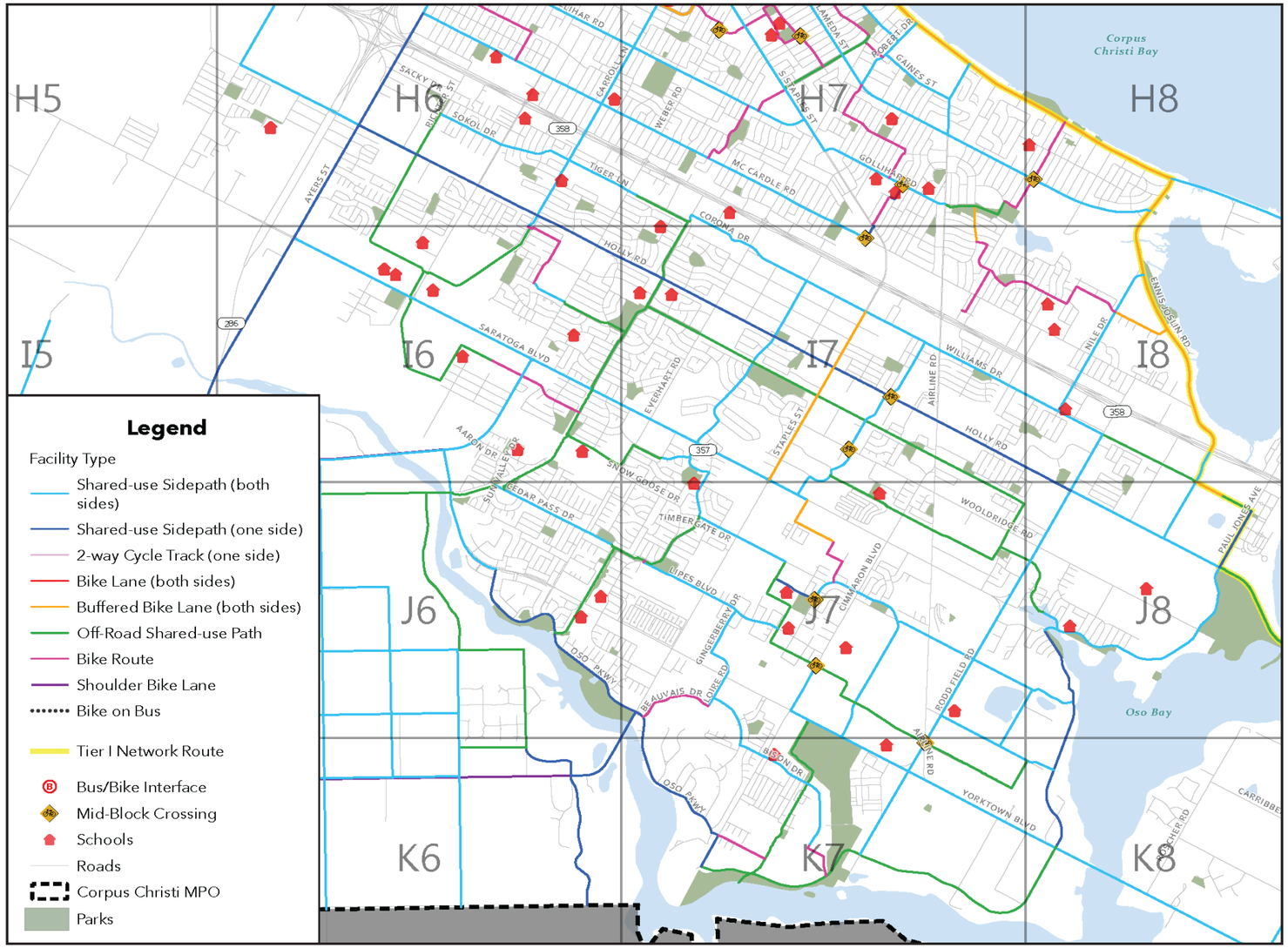
SSD 2 – Expansion of the (ditch) trail from Morteza Drive to Timbergate Drive

Extending from the current connection to Billy Witt Park, continue the hike and bike trail westward to a terminus at Timbergate Drive.

SSD 3 – Timbergate Drive Bike Lane/Parking Lane

Connecting between the two major hike and bike tails ending at Spanish Wood Drive and Hunt Drive, the existing parking lane would be co-designated as a shared use bike lane.

Exhibit 4-53: *Southside Functional Area*



East-West Connection/Texas Bicycle Network

Many bicyclists in Corpus Christi enjoy long rides on roadways with stretches of uninterrupted riding, often riding 20 miles or more on an outing. Local bicycle groups have indicated that Upriver Road is a route that they ride often due to its uninterrupted flow, relatively low volume and 35 mph speed limit, despite the roadway being industrial in nature and having less than 3 feet of shoulder. Leopard Road (SH 407) is a 5-lane roadway that has a 3- to 6-foot-wide shoulder and 35 mph speed limit along the majority of its length from west of Callicoatte Road to Upriver Road.

The Texas Bicycle Tourism Study has proposed an example statewide network of bicycle touring routes, building upon a collection of localized plans. The example network indicates statewide connectivity to enter the Corpus Christi MPO area using shoulder bikeways along SH 44 from a nexus in Robstown. SH 44 from Robstown is mostly a limited access highway with service roads that have 6- to 8-foot-wide shoulders. There are several enhancements that are needed to add to the safety and attractiveness of these routes.

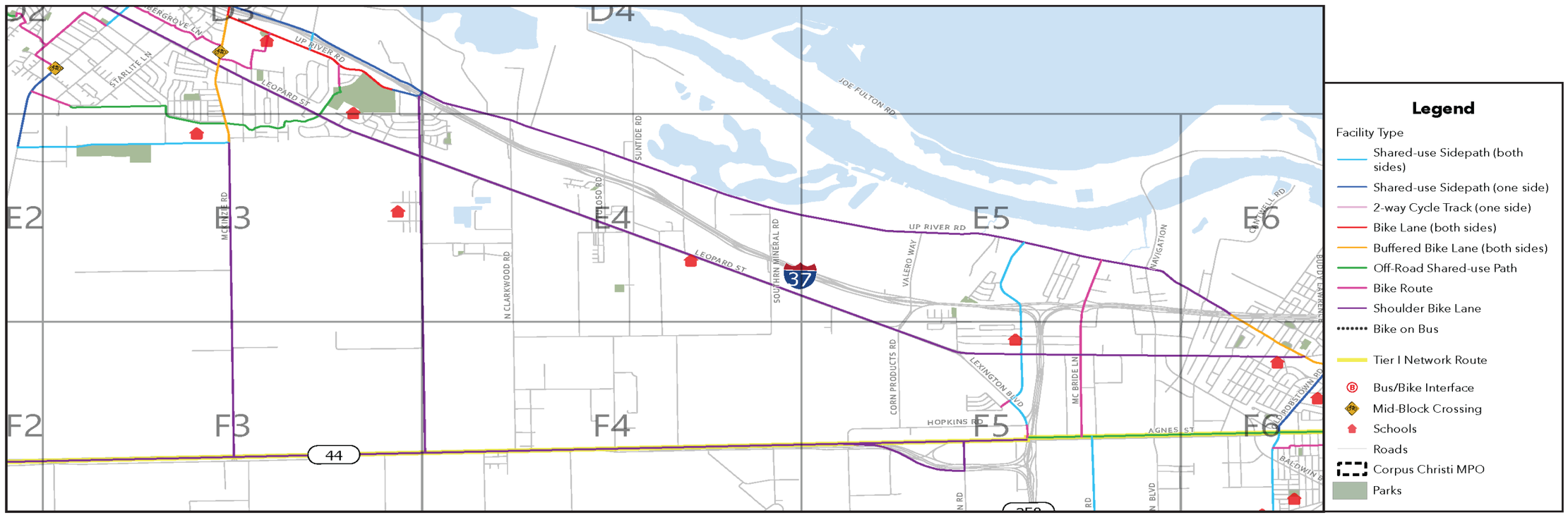
Proposed Improvements to East-West Connection/Texas Bicycle Network

EWC 1 – Transition between SH 44 Service Roads and Agnes Street Rail to Trail

Between Corpus Christi Airport and SH 358, SH 44 has a transition to the Agnes Street alignment. Eastbound bicyclists on SH 44 Service Road should continue to Heinsohn Road and turn left onto Heinsohn Road. Westbound bicyclists on Agnes Street can continue straight directly onto the SH 44 westbound Service Road shoulder lanes.

- EWC 1.1 – Heinsohn Road Bike Lane
  - Heinsohn Road is only a 2-lane two-way 28-foot-wide curbed roadway crossing under the SH 44 freeway. But there is a large paved median between Heinsohn Road and the westbound to eastbound U-turn lane that, with the addition of a ramp at each end, could serve as a raised one-way cycle track for eastbound bicyclists to go northbound on Heinsohn Road toward Agnes Street.
- EWC 1.2 - Heinsohn Road Bike Route
  - The 1,000 LF of Heinsohn Road between the SH 44 westbound service road and Agnes Street is a 20-foot-wide 2-lane two-way roadway. It appears to have low volumes, so could serve as a northbound bike route for the touring bicyclists.
- EWC 1.3 – Agnes Street at SH 358 Transition to SUP along North Side of Agnes Street
  - The westbound and eastbound shoulder lanes on Agnes Street west of SH 358 end at the southbound service road of SH 358. Ramps onto the paved areas alongside both sides of Agnes Street between the SH 538 Service Roads would need to be provided so that bicyclists could utilize that area as a one-way cycle track. Some repairs to the roadside paved area would be needed for rideability. Eastbound bicyclists would need to cross Agnes Street at the SH 538 northbound Service Road to access the SUP along the north side of Agnes Street.

Exhibit 4-54: *East-West Connection/Texas Bicycle Network Functional Area*



EWC 2 – Agnes Street Rail to Trail/Rail with Trail

The freight railroad, which parallels the north side of SH 44 and Agnes Street, has a rail yard just west of SH 358 and continues eastward for about ¾ mile to just west of Navigation Boulevard where the service line bends northward to serve the Port of Corpus Christi. A service spur continues eastward to serve a recycling plant just west of Driscoll Drive after which the tracks have been removed from the north side of Agnes Street.

- EWC 2.1 SUP along North Side of Agnes Street/Rail with Trail, SH 358 to Driscoll Drive
  - There is a significant amount of greenspace between the railroad tracks and the north side of Agnes Street curbline east of SH 358. The provision of the westbound right turn lane on Agnes Street at SH 358 narrows the greenspace, but there appears to be sufficient street right-of-way to construct a 10-foot-wide SUP at the back of curb of the right turn lane. Once east of the right turn lane, the SUP can have a minimum 5-foot-wide buffer to the Agnes Street roadway.
- EWC 2.2 SUP/Hike and Bike Trail along North Side of Agnes Street, Driscoll Drive to Port Avenue
  - At Driscoll Drive and eastward, the railroad tracks have been removed, indicating railroad abandonment of the right-of-way. The ownership of that former railroad corridor needs to be determined, whether it is still in railroad ownership or has been quit claimed and reverted to the state of Texas as the adjacent landowner. A 12-foot-wide hike and bike trail would be constructed atop the former railroad bed. At Port Avenue, the trail would be brought onto the SUP along Port Avenue to utilize the traffic signal at Agnes Street, less than 100 feet away.
- EWC 3 – Leopard Street (SH 407) Shoulder Bikeways
  - As TxDOT continues to upgrade and enhance Leopard Street, retention of the paved shoulder should be included with additional width as needed to effect a 6-foot-wide designated shoulder bikeway on the 35 mph roadway.
- EWC 4 – Upriver Road Shoulder Bikeways
  - When the City of Corpus Christi programs pavement improvements on Upriver Road, improvement of the paved shoulder should be included with additional width as needed to effect a 6-foot-wide designated shoulder bikeway on the 35 mph roadway.
- EWC 5 - Cross-connecting Bikeways
  - Routes extending between SH 44, SH 407 and Upriver Road allow flexibility in making longer or shorter excursion routes and accessing desired destinations.
- EWC 5.1 – FM 1694 Shoulder Lanes
- EWC 5.2 – Rand Morgan Road (FM 2292) Shoulder Lanes
- EWC 5.3 – Lantana Street Shoulder Lanes and SUP along East Side
- EWC 5.4 – McBride Lane Shoulder Lanes/Bike Route

Exhibit 4-55: *Transition between SH 44 Service Roads and Agnes Street*



Calallen/Annaville

Several bicycle facilities exist in this area, mostly focusing on access to parks. Upriver Road south of I-37, beginning 500 feet west of Rand Morgan Road (FM 2292) has 5-foot-wide bike lanes on a 2-lane two-way roadway past the entrance to West Guth Park and extending 1.6 miles to McKinzie Road. In Guth Park a network of bikeable roadways and SUPs is provided.

Proposed Improvements to Calallen/Annaville

CAL 1 – Upriver Road Bike Lane Connection through FM 2292 Interchange at I-37

Tying the existing bike lanes on Upriver Road to accommodations through the interchange and connecting to the proposed shoulder bike lanes on Upriver Road east of FM 2292 north of I-37.

CAL 2 – McKinzie Road Bike Lanes from Upriver Road to Sessions Road

North of I-37, stripe 5-foot-wide bike lanes on the 38-foot-wide 2-lane two-way street with posted 30 mph speed limit. From Upriver Road to the I-37 westbound service road, provide a 10-foot-wide SUP on both sides of McKinzie Road and crossing enhancement at Upriver Road.

CAL 3 – Hike and Bike trail along the ditch west of West Guth Park

Extending to Starlite Lane just east of Violet Road, with enhanced trail crossings of Leopard Street (SH 407) and McKinzie Road.

CAL 4 – SUP along both sides of FM 624 Northwest Boulevard west of I-69

TxDOT is currently in the schematic design stage for improvements on FM 624 from Wildcat Drive (just west of I-69) to CR 73, a distance of about 3 miles. TxDOT is proposing to include a 10-foot-wide SUP along the north side and a 6-foot-wide sidewalk along the south side, both with landscaped buffers to the road, with enhanced crosswalks at controlled crossings at key locations. An extension of the SUP and sidewalks will be needed east of Wildcat Drive through the I-69 interchange to the intersection at Hearn Road.

CAL 5 – SUP along one side of Hearn Road, Northwest Boulevard/ Leopard Road to FM 1694 Callicoatte Road

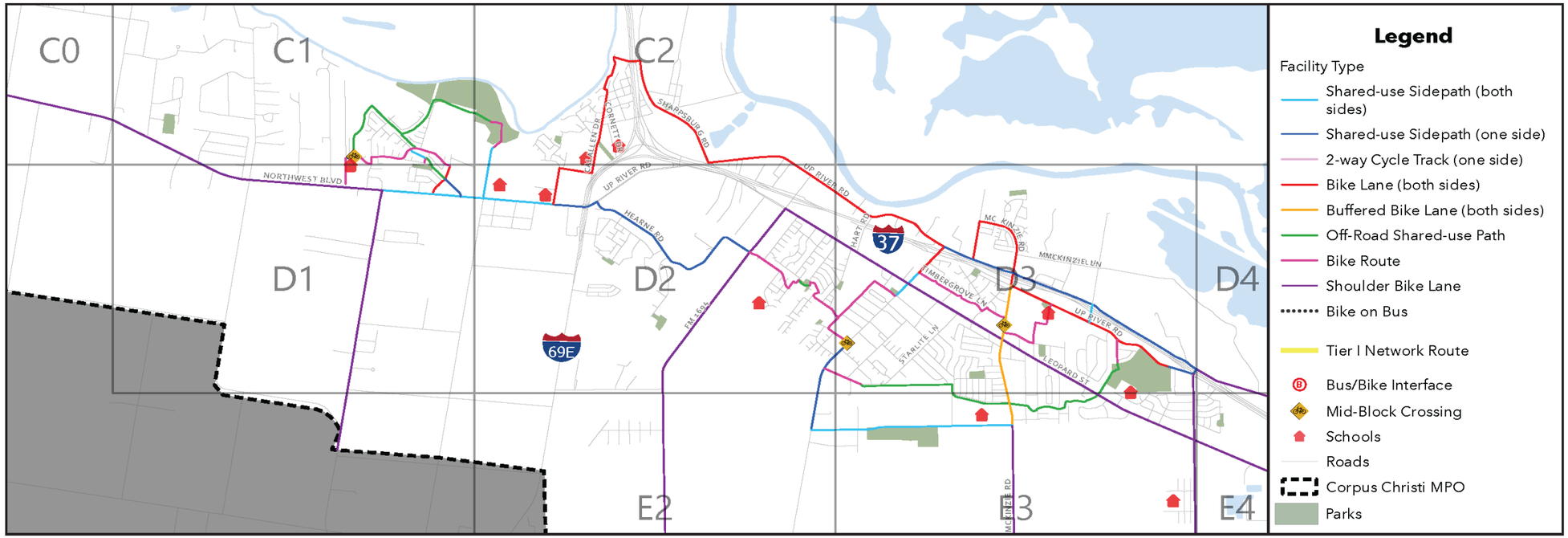
CAL 6 – Local On-Street Connections. Hearn Road, etc. connecting to Starlite Lane at Violet Road and to Upriver Road Bike Lanes

CAL 7 – SUP/Hike and Bike Trail along CO 69 from Northwest Boulevard to Hazel Bazemore-Calallen Park

CAL 8 – Hike and Bike Trail from Hazel Bazemore-Calallen Park through Subdivision

Upgrade existing sidewalks along ditches and add connecting trails to create an off-street network of bikeways. Add connecting on-street bikeways to complete connections within the network.

Exhibit 4-56: *Calallen/Annaville Functional Area*



Portland/Gregory

The Comprehensive Plan for the City of Portland contains a plan for non-motorized transportation facilities including a mixture of SUPs, trails, and some connecting on-street bikeways. The Portland network of SUPs, trails and bike routes were incorporated into this MPO Active Transportation Plan directly from the City of Portland's Comprehensive Plan.

Currently, there are numerous existing active transportation facilities in Portland, including:

- Sunset Lake Park Hike and Bike Trail, accessible via Sunset Drive which has a shoulder lane striped along one side of the 2-lane roadway
- Hike and Bike Trail though Violet Andrews Park and connection to Sunset Drive
- Segments of striped bike lane along Broadway
- Wildcat Drive SUP (10-foot-wide SUP east side, 6-foot-wide sidewalk west side), Memorial Parkway to Buddy Ganem Drive, east side SUP only from Ganem Drive to Solis Drive
- Atkins Drive SUP from Moore Avenue to Wildcat Drive
- FM 3239 Buddy Ganem Drive (10-foot-wide SUP south side, 6-foot-wide sidewalk north side), US 181 to Wildcat Drive

Advancement of the planned Active Transportation Network would coincide with the emerging development in the northwestern sector of Portland.

Proposed Improvements to Portland/Gregory

The proposed improvements to the Portland/Gregory functional area are shown in Exhibit 4-57.

PGR 1 – Sunset Lake Park Bikeways Enhancement

The City of Portland has an active funding application, submitted to the Corpus Christi MPO, for an enhancement to the on-street access to the existing Sunset Lake Park Hike and Bike Trail and expansion of the hike and bike trail.

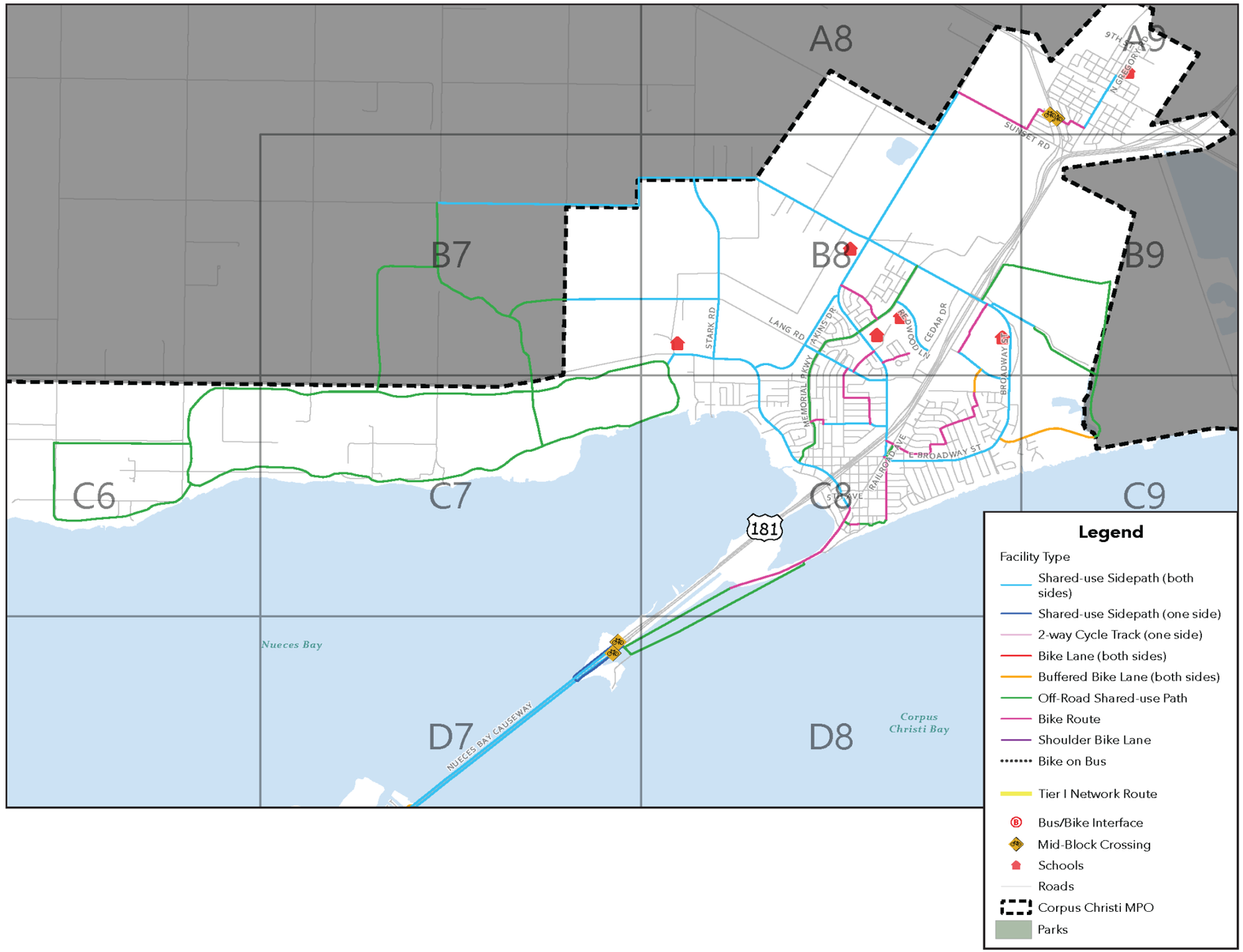
PGR 2 – Memorial Parkway Hike and Bike Trail

Between Buddy Ganem Road and Moore Avenue, utilizing the drainageway greenspace in between the two directions of Memorial Parkway and other channels.

PGR 3 – SUP along both sides of Moore Avenue

From Sunset Drive to Hunt Road, enlarging existing sidewalks.

Exhibit 4-57: *Portland/Gregory Functional Area*



Disposition of Existing Bike Lanes on Arterial Roadways

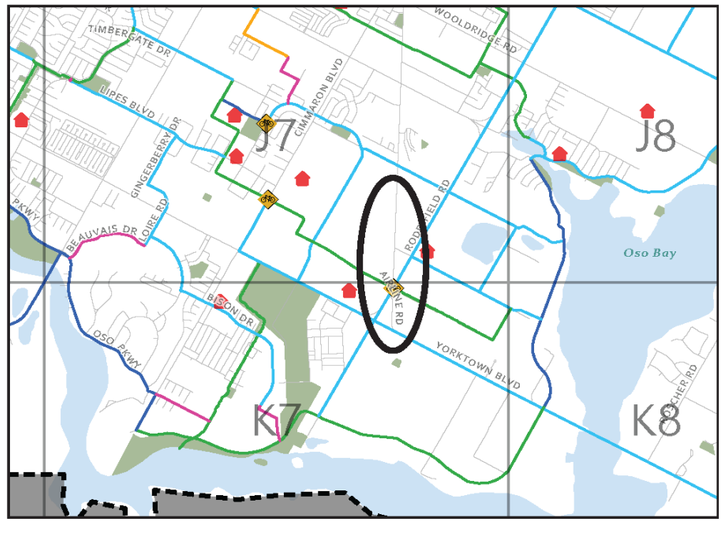
There are five streets with bike lanes that should be reevaluated for their continued inclusion in the bikeway network:

- Airline Road between Saratoga Road and Rodd Field Road – 5-foot-wide bike lanes on a 5-lane roadway with 40 mph speed limit
- Holly Road between Ayers Road and Rodd Field Road – 5-foot bike lanes on a 5-lane roadway with 40 mph speed limit
- Staples Street between Williams Drive and Saratoga Boulevard – 5-foot-wide bike lanes with 2-foot-wide buffer on a 5-lane roadway with 35 mph speed limit
- Greenwood Drive between Saratoga Boulevard and Silverberry Drive – 4-foot-wide bike lane on 5-lane roadway with 35 mph speed limit
- Saratoga Boulevard between Greenwood Drive and SH 286 Crosstown Highway – 5-foot-wide bike lanes on a 5-lane roadway with 55 mph speed limit

Airline Road Bike Lanes between Saratoga Boulevard and Rodd Field Road

Either un-designate this segment as a bike lane or reduce the speeds of the corridor to 30 mph if retaining the lane is desired. Retain the edge line striping of a shoulder area for a safety edge treatment for Airline Road traffic and as a buffer from potential SUP development along the length of Airline Road.

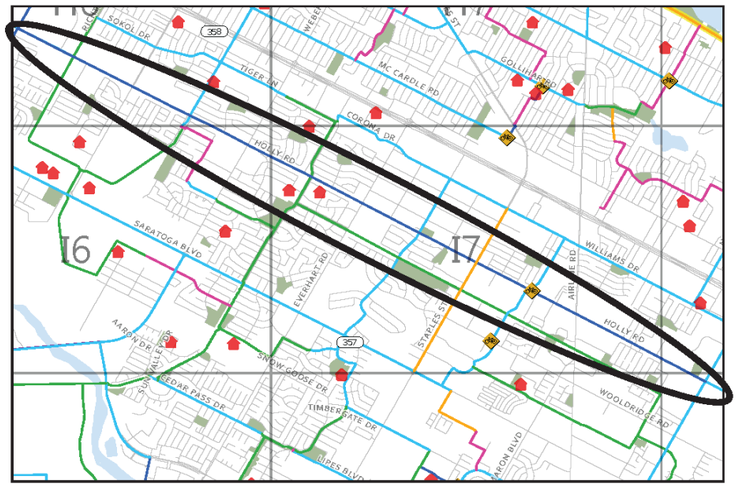
Exhibit 4-58: *Airline Road between Saratoga Boulevard and Rodd Field Road*



Holly Road Bike Lanes between Ayers Road and Rodd Field Road

Either un-designate this segment as a bike lane or reduce the speeds of the corridor to 30 mph if retaining the lane is desired. Retain the edge line striping of a shoulder area for a safety edge treatment for Holly Road traffic and a buffer from proposed SUP development along Holly Road.

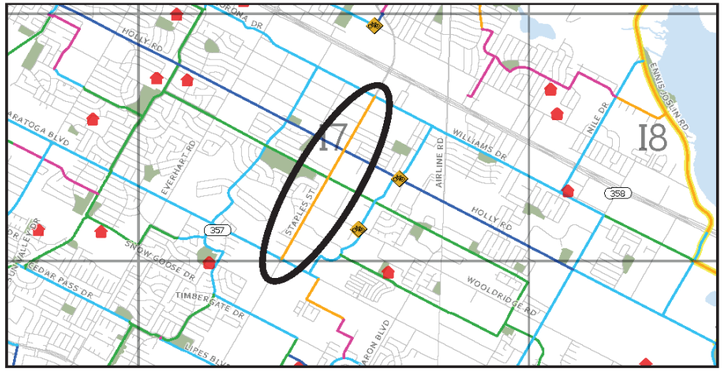
Exhibit 4-59: *Holly Road between Ayers Road and Rodd Field Road*



Staples Street Bike Lanes between Williams Drive and Saratoga Boulevard

Retain this segment of buffered bike lanes on a 35 mph roadway. Consider reducing the posted speed limit to 30 mph. The 8-foot-wide SUP along most of the length of both sides of Staples Street complements the buffered bike lanes.

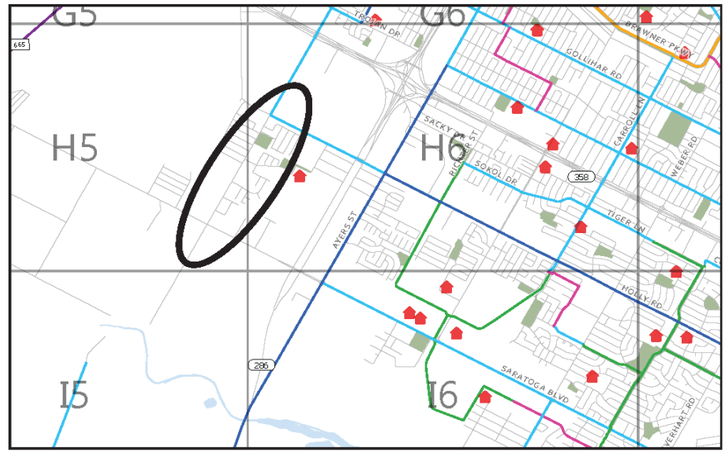
Exhibit 4-60: *Staples Street between Williams Drive and Saratoga Boulevard*



Greenwood Drive between Saratoga Boulevard and Silverberry Drive

Either un-designate this segment as a bike lane or reduce the speeds of the corridor to 30 mph if retaining the lane is desired. Retain the edge line striping of a shoulder area for a safety edge treatment for Greenwood Drive traffic and as buffer for the proposed SUP development along Greenwood Drive between Saratoga Boulevard and north of SPID.

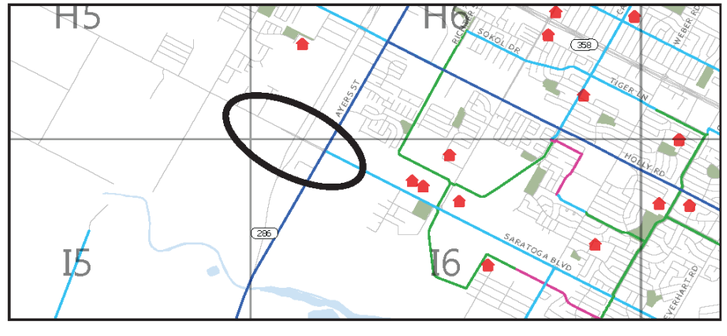
Exhibit 4-61: *Greenwood Drive between Saratoga Boulevard and Silverberry Drive*



Saratoga Boulevard between Greenwood Drive and SH 286 Crosstown Highway

Either un-designate this segment as a bike lane or reduce the speeds of the corridor to 30 mph if retaining the lane is desired. Retain the edge line striping of a shoulder area for a safety edge treatment for Saratoga Boulevard traffic and as buffer for the proposed SUP development along Saratoga Boulevard between Greenwood Drive and Staples Street.

Exhibit 4-62: *Saratoga Boulevard between Greenwood Drive and SH 286 Crosstown Hwy*



Sidewalks

Chapters 2 and 3 introduce the existing network of more than 2,700 sidewalks in the MPO planning area, with over 2,500 miles of sidewalks in the City of Corpus Christi. The network of sidewalks serves as the underlying fabric of personal mobility for many urban area residents. Several maps present the juxtaposition of sidewalks near schools, parks, service centers and areas of disadvantaged populations. To address any shortcomings of the sidewalk network serving these areas and locations, detailed assessments should be performed to identify the missing, gaps or damaged areas in the sidewalk system. The following detailed analyses should be conducted.

Safe Routes to Schools

The Corpus Christi ISD and Gregory-Portland ISD do well in addressing the provision of crossing guards for students to cross busy streets at the edge of their school campuses. The cities collaborate with their ISDs to ensure that school speed zones are correctly signed and crosswalks are visibly marked each school year.

However, a Safe Routes to School (SRTS) Plan should be prepared for each school to encourage students to walk and bicycle to elementary and middle school campuses. After identifying the areas where students live within a one-mile walking distance of each school, an assessment should be made of the needed improvements to sidewalks and crossings along the student's route to school. An example of a SRTS assessment for the Flour Bluff ISD complex is shown in Exhibit 4-63.

With schools placed strategically throughout the communities, after each school prepares an SRTS Plan, a significant portion of the sidewalk network in the urban areas of the cities will be assessed, and areas in need of improvement will be identified.

Safe Routes to Parks

The Parks, Recreation and Open Space Departments of the cities of Corpus Christi and Portland have been including park access via sidewalks and short trail segments to and from nearby residential areas as part of their park planning efforts for the past several years. The departments should continue these efforts, extending their purview to a connecting trails network and the safe crossings of busy streets.

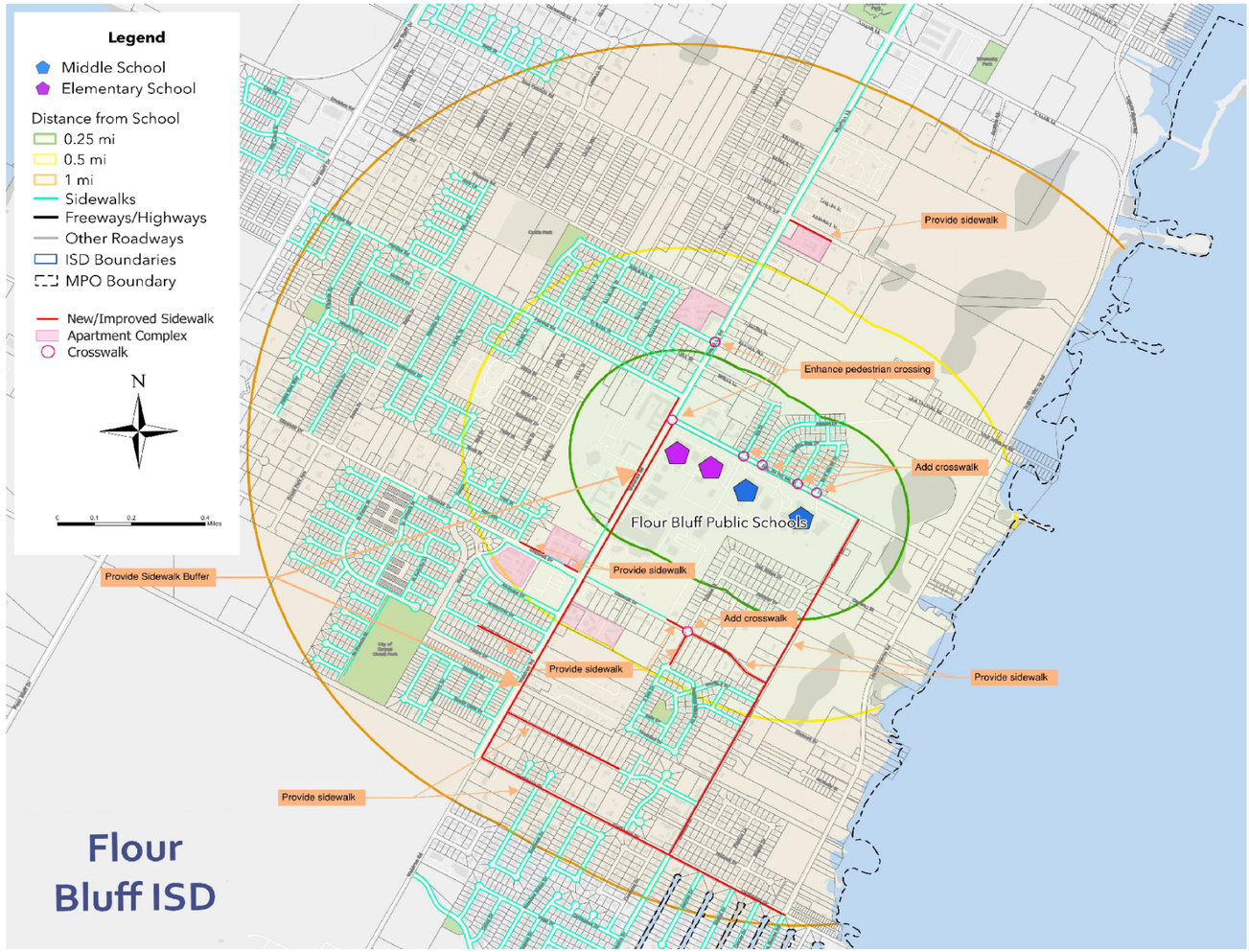
Safe Routes to Transit

The CCRTA regularly assesses the sidewalk access to and from their bus stops. Federal funding is available to provide or improve sidewalks and improved crossings within a certain walking distance of each bus stop. In 2022, CCRTA completed an ADA assessment of its 1,300 active bus stops, noting any shortcomings of the accessible routes due to width, debris or sidewalk ending, and any ADA non-compliance at the boarding and alighting area. Hundreds of improvement needs were identified. Where an accessible route issue was identified, CCRTA coordinates with the cities with jurisdiction to devise a solution. Once accessible routes are improved, ADA accessibility at bus stops should be reevaluated every two to three years to address any emerging needs.

Citywide Sidewalk Conditions Assessment

In concert with or subsequent to the outlined safe routes initiatives, a complete assessment of the conditions of all existing sidewalks and curb ramps in the urbanized area of the MPO planning area should be conducted. The identified areas needing improvement should comply with the current PROWAG published in August 2024. An annual funding allocation for sidewalk repairs and ramp upgrades and/or installations should be established. Special attention should be given to areas near service centers and areas of disadvantaged populations.

Exhibit 4-63: *Example of a Safe Routes to School Assessment*





5. RECOMMENDATIONS AND IMPLEMENTATION

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5. RECOMMENDATIONS AND IMPLEMENTATION

PROJECT RECOMMENDATIONS

Based upon a synthesis of the review of existing conditions, addressing of stakeholder comments, application of best practices and leveraging of ongoing transportation initiatives, an Active Transportation Network, and a set of supporting policies and programs have been developed.

Active Transportation Network

Exhibit 5-01 summarizes the existing and proposed length of each bike/ped facility by cities in the Corpus Christi MPA. The network map in Exhibit 5-03 on page 5-2 and tables in Exhibit 5-04 on pages 5-4 to 5-7 list the network recommendations described in Chapter 4. The proposed projects are assigned as Tier I, Tier II or Tier III to guide their relative priority of implementation.

Tier I

The priority network of trails, SUPs and bike lanes that provide connectivity to the high profile destinations and locations in the region.

Tier II

The second tier of projects, though equally important, would be completed in conjunction with ongoing CIP projects.

Tier III

The third tier of projects includes the remaining trails, bike lanes and bike routes that connect to the various neighborhoods, schools and parks that are not in the priority network nor in a current capital improvement project.

Project Implementation

The following strategy is recommended to advance the projects and programs of the Active Transportation Plan.

1. The elements of the Tier I network should be continuously advanced for funding and implementation of the enhanced and completed high quality network.
2. The elements of the Tier II network may advance short segments of the larger network and should be brought to a logical terminus while awaiting completion of the network.
3. The network elements in the Tier III network would be implemented as opportunities arise in conjunction with development and as special funding is available such as might be dedicated for safe routes for schools and parks under the Transportation Alternatives program.

Exhibit 5-01: *Mileage of Existing and Proposed Active Transportation Facilities*

Facility Type	Existing Miles				Proposed Miles				Total Miles
	Corpus Christi	Portland	Gregory	Outside City Limits	Corpus Christi	Portland	Gregory	Outside City Limits	
2-way Cycle Track (one side)	-	-	-	-	1.43	-	-	-	1.43
Bike Lane	59.18	3.06	-	3.06	10.63	-	-	-	75.93
Bike on Bus	-	-	-	-	4.86	-	-	-	4.86
Bike Route	2.67	-	-	-	55.18	5.16	0.55	1.16	64.73
Buffered Bike Lane	1.57	6.22	-	-	30.82	0.21	-	-	38.82
Off-Road Shared-use Path	17.38	1.57	-	-	71.63	6.49	0.05	17.64	114.77
Shared-use Sidepath (both sides)	17.50	0.52	-	-	180.02	19.22	0.50	34.17	251.93
Shared-use Sidepath (one side)	6.32	-	-	-	43.39	0.98	-	11.59	62.28
Shoulder Bike Lane	-	-	-	-	75.59	-	-	37.15	112.74
Total Miles per City	**104.62**	**11.38**	**-**	**3.06**	**473.55**	**32.05**	**1.11**	**101.71**	**727.48**
Total Existing vs Proposed Miles	**119.06**				**608.43**				

Prioritization

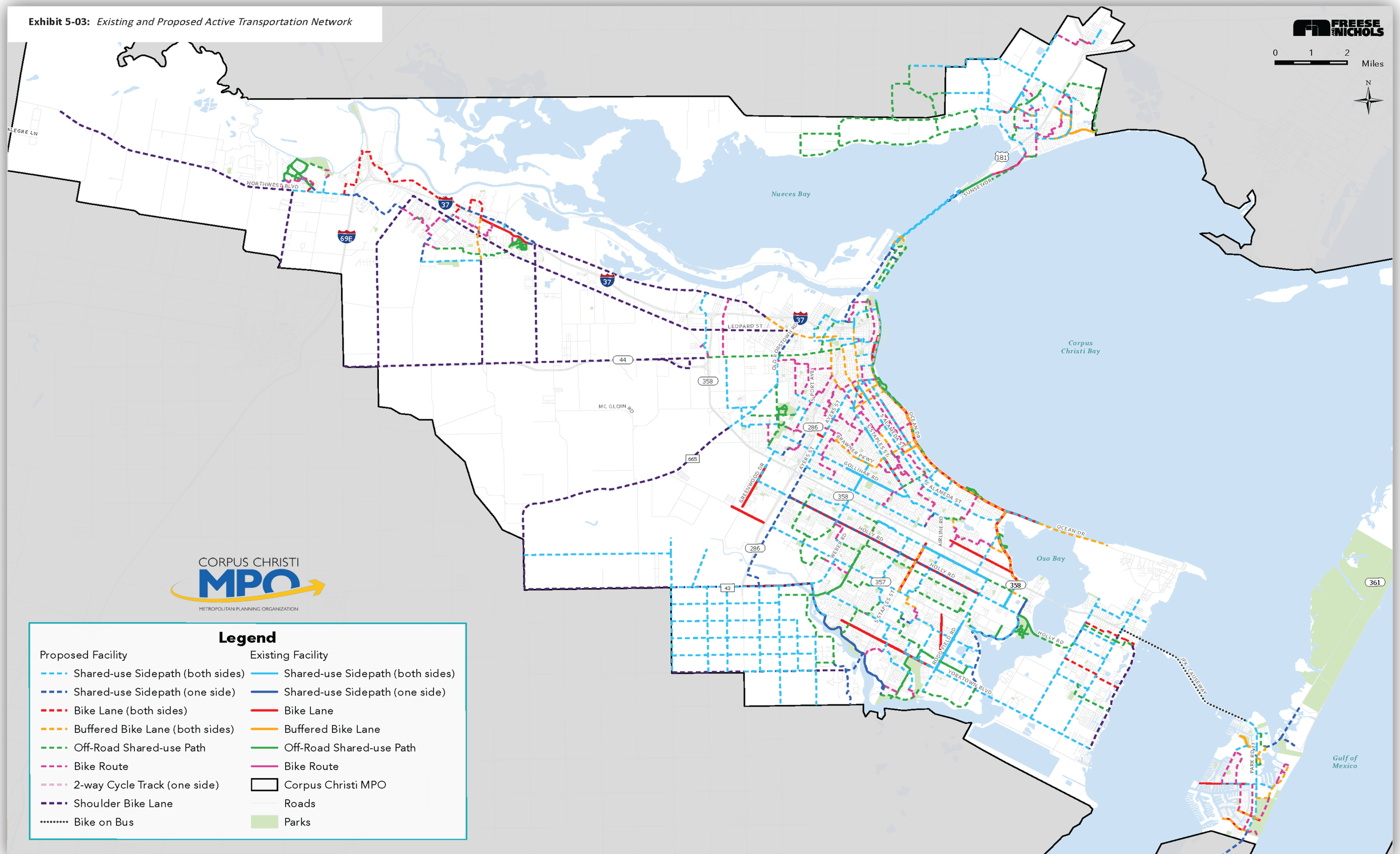
In addition to the three-tier priority project framework, advancement of highly desired active transportation projects should focus on providing easily implementable and high-value active transportation projects emphasizing ADA compliance, safety, network connectivity, and promoting walking and cycling activity within the region.

An example of a screening methodology for advancing projects is shown in Exhibit 5-02. As the network grows and becomes more established, many of these criteria can be altered to support the maintenance and expansion of a more comprehensive and defined network.

Exhibit 5-02: *Proposed Prioritization Methodology for Bike/Ped Projects*

Criteria	Metric
Multi-Modal Opportunity	How many bus routes are within ½ mile of the project?
	Does the project involve a strong ADA compliance component?
	Is this project within ½ mile of an identified scooter corral?
Access / Place-Based Connections	How many high-value civic/health (clinics/pharmacies/hospitals) destinations are within ½ mile?
	How many high-value recreational amenities (community centers/pools) are within ½ mile?
	How many high-value tourist attractions are within ½ mile?
Network Connectivity	Does the project provide a key connection between bike/ped facilities or to a major bike path or attraction?
	Does the project remove a barrier to overall bike/ped network development?
Target Populations	Does the project support access to known key service points for at-risk disadvantaged groups?
	Is the project within one of the Corpus Christi MPO identified disadvantaged populations areas?
Public Safety	How many annual fatal or severe crashes involved bike/ped users (last 5 years)
	Would the proposed improvement resolve/mitigate contributing factors associated with the crash?
	Will the improvement include lighting or shading improvements?
Imminent Funding	Is the project on the roadway that is part of the bond program, CIP project listing, Rapid Replacement Program, or TxDOT project?
Schools	Is the project within ¼ mile of a school? Does the school participate in a Safe Routes to School Program? Is the improvement consistent with its program?
Activity Promotion	Will this activity directly help promote walking and cycling? Is it adjacent to or provides access to major walking/cycling events or known area bike/ped activity?
Area Plans	Is the project listed in an area development plan?

Exhibit 5-03: *Existing and Proposed Active Transportation Network*



CORPUS CHRISTI MPO
METROPOLITAN PLANNING ORGANIZATION

Legend

Proposed Facility	Existing Facility
Shared-use Sidepath (both sides)	Shared-use Sidepath (both sides)
Shared-use Sidepath (one side)	Shared-use Sidepath (one side)
Bike Lane (both sides)	Bike Lane
Buffered Bike Lane (both sides)	Buffered Bike Lane
Off-Road Shared-use Path	Off-Road Shared-use Path
Bike Route	Bike Route
2-way Cycle Track (one side)	Corpus Christi MPO
Shoulder Bike Lane	Roads
Bike on Bus	Parks

Exhibit 5-04: *List of Proposed Bike/Ped Network Improvements*

Functional Area	Project ID	Description	From	To	Priority
SEA/ New Harbor Bridge/ North Beach	**NHB 1 New Harbor Bridge South End Connection to Shoreline Boulevard SUP**				
	NHB 1.1	Lake Avenue SUP/Trail	Sam Rankin Street	N. Alameda Street	Tier I
	NHB 1.2	Lake Avenue SUP	N. Alameda Street	N. Staples Street	Tier I
	NHB 1.3	N. Staples Street SUP on both sides	I-37 WB Service Road	W. Broadway Street	Tier I
	NHB 1.4	N. Staples Street SUP extension on both sides	W. Broadway Street	N. Broadway Street	Tier I
	NHB 1.5	Fitzgerald Street SUP on both sides	N. Broadway Street	Shoreline Boulevard	Tier I
	NHB 2 New Harbor Bridge South End Connection to Agnes Street Rail-to-Trail SUP				
	NHB 2.1	W. Broadway Street SUP	Stillman Street	Port Avenue	Tier I
	NHB 2.2	Nueces/Winnebego SUP	Lake Avenue	Nueces Bay Boulevard	Tier I
	NHB 2.3	Stillman Street SUP	W. Broadway Street	I-37 WB Service Road	Tier I
	NHB 2.4	Antelope/Palm Drive SUP	I-37 EB Service Road	Comanche Street	Tier I
	NHB 2.5	Comanche SUP	Palm Drive	Staples Street	Tier I
	NHB 2.6	Port Avenue Road Diet/SUP	I-37 WB Service Road	Agnes Street	Tier I
	NHB 2.7	Nueces Bay Boulevard SUP	Nueces Bay Boulevard	Agnes Street	Tier I
	NHB 2.8	Rail-to-Trail	W. Broadway Street	I-37 WB Service Road	Tier I
	NHB 3 New Harbor Bridge North End Connection to Waterfront, Lex, Aquarium				
	NHB 3.1	Beach Avenue SUP (proposed in City of Corpus Christi 2024 Bond program)	US 281 NB Service Road	Beachfront Path	Tier I
	NHB 3.2	Gulfspray Avenue SUP (proposed in City of Corpus Christi 2024 Bond program)	US 281 NB Service Road	Gulfspray Park	Tier I
	NHB 3.3	Median SUP	Dolphin Park	Pearl Avenue	Tier I
	NHB 3.4	Breaker Avenue SUP	Median SUP	Beachfront Path	Tier I
	NHB 3.5	Golf Place SUP	Median SUP	Beachfront Path	Tier I
Shoreline Boulevard/ Ocean Drive	**SLB 1 - Shoreline Boulevard Reconfiguration Completion**				
	SLB 1.1	Widen SB Shoreline Boulevard pavement to provide 5 lanes. As space allows, provide a parking lane each side.	Ocean Drive/Buford Street	Power Street	Tier I
	SLB 1.2	Modify existing traffic signals and pavement markings to accommodate two-way traffic in the 5-lane roadway.			Tier I
	SLB 1.3	Shift the NB Shoreline Boulevard traffic onto the new 5-lane roadway.			Tier I
	SLB 1.4	Abandon the former 3-lane NB roadway and adapt for use as a two-way bikeway.			Tier I
	SLB 1.5	Remove unneeded roadway pavement, add off-street parking and landscape as appropriate.			Tier I
	SLB 1.6	Re-stripe the two-way Shoreline Boulevard to eliminate the shoulder bikeway and restripe to provide a continuous left turn lane and dedicated left turn lanes at cross streets.	Furman Avenue	Coopers Alley	Tier I
	SLB 2 – Shoreline Boulevard/Ocean Drive Shoulder Bike Lanes Enhancement				
	SLB 2.1	Within the 8-foot-wide shoulder bike lanes, add a second 4-foot-wide stripe to create a 2-foot-wide buffer for the remaining 6-foot-wide bike lanes, with special treatments at key locations.	Furman Avenue	Ennis Joslin Road	Tier I
	SLB 2.2	Install flexible bollards within the 2-foot-wide buffer at approximately 40 feet on center along the buffered bike lanes. Leave (200-foot) gaps in bollards at locations that need parking for maintenance vehicles.	Furman Avenue	Ennis Joslin Road	Tier I
	SLB 2.3	Widen sidewalks along Ocean Drive. There are segments of sidewalk along the west side of Ocean Drive that are only about 3-feet wide. Improve sidewalks along the west side of Ocean Drive to a minimum of 5-feet wide and preferably 8-feet wide.	Shoreline Boulevard/ Buford Street	Texas A&M University-Corpus Christi	Tier I
	SLB 3 – Establish Bike Lane Continuity through Intersections along Shoreline Boulevard and Ocean Drive				
	SLB 3.1	Shoreline Boulevard at Furman Avenue – A new traffic signal is proposed for interrupting continuous flow to accommodate bicycle and pedestrian connectivity at this junction of two-way separated bikeway to the north, buffered one-way bike lanes to the south and bike lanes with SUPs to the west along Furman.	Furman Avenue		Tier I
	SLB 3.2	Shoreline Boulevard at Louisiana Avenue – Convert this complex directional intersection into a standard roundabout with pedestrian crossings and bike lane conveyance through roundabout.	Louisiana Avenue		Tier III
	SLB 3.3	Ocean Drive at Doddridge Street – Eliminate the SB right turn lane and continue the buffered bike lane to the intersection.	Doddridge Street		Tier II
	SLB 3.4	Ocean Drive at Robert Drive – Narrow the SB through lanes to maintain a minimum 4-foot-wide bike lane up to the intersection.	Robert Drive		Tier II

Functional Area	Project ID	Description	From	To	Priority
Shoreline Boulevard/ Ocean Drive	SLB 3.5	Ocean Drive at Airline Road - Narrow the southbound through lanes to maintain a minimum 4-foot-wide bike lane up to the intersection, positioned between the through lane and the right turn lane. Narrow the northbound lanes to maintain a minimum 4-foot-wide bike lane through the intersection.	Airline Road		Tier II
	SLB 4 – Agnes Street Rail to Trail Connector to Shoreline Boulevard				
	SLB 4.1	Rail-to-Trail SUP from near Port Avenue to SH 286 Crosstown Expressway service roads crossing and use a remnant of the NB service road to tie-in to Musset Street	(near) Port Avenue	Musset Street	Tier III
	SLB 4.2	SUP along one side of Mussett Street to Staples Street, chevron pavement markings	Musset Street	Staples Street	Tier III
	SLB 4.3	Offset crossing of Staples Street at Musset/Blucher, enhanced bus stop and crossing	Staples Street	Carrizo Street	Tier III
	SLB 4.4	SUP along Blucher Street to Carrizo Street, chevron pavement markings. Tie into Blucher Nature Park	Mussett Street	Blucher Street	Tier III
	SLB 4.5	An SUP along edges of La Retama Central Library on Tancahua Street to Coopers Alley, enhanced crossing at Tancahua Street	Comanche Street	Coopers Alley	Tier III
	SLB 4.6	Bike lanes along Coopers Alley from Blucher Nature Park to Mesquite Street (TX 544), enhanced crossing at Mesquite Street	Blucher Nature Park	Mesquite Street	Tier III
	SLB 4.7	Bike lanes along Coopers Alley from Mesquite Street (TX 544) to Shoreline Boulevard	Mesquite Street	Shoreline Boulevard	Tier III
	SLB 4.8.1	SUP along both sides of Comanche Street	Crosstown Expressway	Carancahua Street	Tier III
	SLB 4.8.2	SUP along both sides of Comanche Street	Crosstown Expressway	Lipan Street	Tier III
	SLB 5 – Del Mar Boulevard Connection to Ocean Drive				
	SLB 5.1	Del Mar Boulevard is proposed to be strengthened as a multimodal, complete street with traffic calming treatments. The treatment would add a 12-foot-wide bike lane stripe with bollards to reduce the through lanes to 11 feet and create a buffered 5-foot-wide bike lane in each direction.	Ocean Drive	S. Staples Street	Tier I
	SLB 5.2	A roundabout-controlled intersection would be installed at S. Alameda Street for traffic calming in both directions and to facilitate pedestrian crossings.	S. Alameda Street		Tier III
	SLB 6 – Louisiana Avenue Connection to Ocean Drive				
	SLB 6.1	Reduce the two 11-foot-wide travel lanes (each way) to one 12-foot-wide travel lane plus a buffered bike lane, retaining the existing parking	Ocean Drive	S. Staples Street	Tier I
	SLB 6.2	Improve the existing sidewalks, enhancing as needed to a minimum width of 5 feet and preferably 8 feet			Tier III
	SLB 6.3	Hike and Bike trail (SUP) within center median landscaped drainage area			Tier III
	SLB 7 – Doddridge Road Buffered Bike Lanes to Protected Bike Lanes		Ocean Drive	S. Alameda Street	Tier III
	SLB 8 – Modify the S. Alameda Street SUP Intersection Treatments		S. Alameda Street		Tier III
	SLB 9 – Alameda SUP, Louisiana Avenue to Airline Road				
	SLB 9.1	The City of Corpus Christi is currently in design of the reconstruction of Alameda Street between Louisiana Avenue and Doddridge Road	Louisiana Avenue	Doddridge Road	Tier II
	SLB 9.2	The typical section would continue along Alameda Street between Doddridge Road and Airline Road	Doddridge Road	Airline Road	Tier II
	SLB 9.3	Southeast of Airline Road to Ennis Joslin Road, the typical section would reduce to a 3-lane roadway with buffered/protected bike lanes	SE of Airline Road	Ennis Joslin Road	Tier III
	SLB 10 – Local Street Bike Route Network Surrounding Alameda Street				Tier III
Ocean Drive/ Ennis Joslin/Holly Bridge	**EJR 1 - Ocean Drive at Ennis Joslin Road**				
	EJR 1.1	An enhanced channelization of the intersection of the two roadways	Ennis Joslin Road		Tier I
	EJR 1.2	Add RRFB or PHB at the ped/bike crosswalks across the two high-speed uninterrupted right turn lanes			Tier III
	EJR 2 - Conversion of Ennis Joslin Road to a High Quality Multimodal Corridor, Ocean Drive to SPID				
	EJR 2.1	The proposed conversion concept for the roadway is to reallocate the outside lane to the provision of a buffered bike lane. There would be special accommodations for conditions on various segments	Ocean Drive	SPID Interchange	Tier I
	EJR 3 – Ennis Joslin Road from SPID interchange to Williams Drive				
	EJR 3.1	Ennis Joslin Road just north of SPID	N of SPID Interchange	SPID Interchange	Tier I
	EJR 3.2	Ennis Joslin Road at SPID Interchange	SPID Interchange		Tier I
	EJR 3.3	Ennis Joslin Road south of SPID	SPID Interchange	Williams Road	Tier I
	EJR 4 – Connection from Ennis Joslin Road to Holly Road Trail				
	EJR 4.1	Williams Drive Extension SUP/Trail	W of Rodd Field Road	Ennis Joslin Road	Tier II
	EJR 4.2	Williams Drive Connection to Paul Jones Drive Trail	Ennis Joslin Road	Paul Jones Drive	Tier I
	EJR 5 – Holly Road Trail and Bridge				
	EJR 5.1	Railroad Trestle Connection to Flour Bluff Drive SUP	Holly Road	Flour Bluff Drive	Tier II

Functional Area	Project ID	Description	From	To	Priority
Flour Bluff	**FLB 1 – Graham Road SUP**		Flour Bluff Drive	Waldron at Graham Bus Stop	Tier I
	FLB 2 – Flour Bluff Drive				
	FLB 2.1	A 10-foot-wide SUP would extend south from Don Patricio Road to Yorktown to complete the circuit of SUP on either side of the Oso Bay.	Don Patricio Road	Yorktown Boulevard	Tier II
	FLB 2.2	The existing SUP along Flour Bluff Drive would be extended NB from its terminus north of Graham Road to north of SPID at Sunbird Street, widening existing sidewalks.	N of Graham Road	Sunbird Street	Tier III
	FLB 3 – Yorktown Boulevard SUP to Laguna Shores Road		E of Rodd Field Road	Laguna Shores Road	Tier III
	FLB 4 – Waldron Road SUP, Yorktown to NAS Drive		Yorktown Boulevard	NAS Drive	Tier III
	FLB 5 – Laguna Shores Road Shoulder Bikeway		Yorktown Boulevard	Graham Road	Tier III
	FLB 6 - Knickerbocker Street/Compton Road Bike Lanes, Laguna Shores Road to Flour Bluff Drive		Laguna Shores Road	Flour Bluff Drive	Tier III
	FLB 7 – Don Patricio Road SUP, Flour Bluff Drive to Waldron Road		Flour Bluff Drive	Waldron Road	Tier III
	FLB 8 – Purdue Road Bike Lane, Flour Bluff Drive to Waldron Road		Flour Bluff Drive	Waldron Road	Tier III
	FLB 9 – Hustlin' Hornet Drive Bike Lanes		Waldron Road	Laguna Shores Road	Tier III
	FLB 10 – Glendale Drive SUP, Flour Bluff Drive to Debra Lane		Flour Bluff Drive	Waldon Road	Tier III
	FLB 11 - Trail along Ditch North of Graham Road and S of Compton Road		Flour Bluff Drive	Waldon Road	Tier III
	FLB 12 - FLB 12 JFK Causeway Crossing via Bike-on-Bus		Waldron Bus Stop	Park Road 22	Tier III
Padre/Mustang Island	**PMI 1 – Park Road 22 SUP**		Verdmar Drive	Sea Pines Drive	Tier III
	PMI 2 – Whitecap Boulevard SUP				
	PMI 2.1	Whitecap Boulevard SUP west of PR 22	Aquarius Street	Park Road 22	Tier III
	PMI 2.2	Whitecap Boulevard SUP east of PR 22	Park Road 22	Windward Drive	Tier III
	PMI 3 – Sea Pines Drive/Access Road 6				
	PMI 3.1	The existing bike lanes along Sea Pines Drive would be enhanced to be buffered bike lanes by a lane diet or road diet of the 4-lane divided Sea Pines Drive.	S. Padre Island Drive	El Soccorro Loop	Tier III
	PMI 3.2	Bike lanes along Access Road 6 would be provided by widening the narrow 2-lane roadway.	S. Padre Island Drive	Beach Access	Tier III
	PMI 4 - Elliff Road and Windward/Leeward Drive		Encantada Avenue	Windward Drive	Tier III
Midtown	**MDT 1 - Brawner Parkway**				
	MDT 1.1	Convert Brawner Parkway from a pair of two-way streets to a one-way couplet of streets on either side of the drainage ditch. Assess local circulation needs for additional crossover streets between the two sides of the drainage channel.	Santa Fe Street	Ramsey Street	Tier II
	MDT 1.2	Right-size the one-way couplet to provide one travel lane (each side) and a buffered bike lane with curbside parking.			Tier II
	MDT 1.3	Provide SUPs within center landscaped drainage area, along both sides if feasible.			Tier III
	MDT 1.4	Improve the intersection of Brawner Parkway at South Staples Street.	S. Staples Street		Tier III
	MDT 2 – Carmel Parkway				
	MDT 2.1	Convert Carmel Parkway from a pair of two-way streets to a one-way couplet of streets on either side of the drainage ditch. Assess local circulation needs for additional crossover streets between the two sides of the drainage channel at San Fernando Place.	S. Staples Street	Center Drive/Lamar Park	Tier II
	MDT 2.2	Right-size the one-way couplet to provide one travel lane (each side) and a buffered bike lane with curbside parking, improve sidewalks as needed.			Tier II
	MDT 2.3	Provides SUPs within center landscaped drainage area, along both sides if feasible.			Tier III
	MDT 2.4	Realign WB Carmel Parkway to come to a single point at the intersection with Staples Street.	S. Staples Street		Tier III
	MDT 2.5	Realign with EB Carmel Parkway to come to a single point at the intersection with Alameda Street and add traffic control at the intersection and a turnaround.	S. Alameda Street		Tier III
	MDT 3 - Carroll Lane Bikeway				
	MDT 3.1	Extend the SUP along both sides of Carroll Lane	Houston Street	Brawner Parkway	Tier III
	MDT 3.2	1. Extend the SUP along both sides of Carroll Lane, tie to the 8-foot-wide SUP on the west side of Staples Street. 2. Designate Dabney Street as a bike route between Staples Street and Fort Worth Street.	1. Brawner Parkway 2. S. Staples Street	1. S. Staples Street 2. Fort Worth Street	Tier III
	MDT 3.3	Extend the SUP along both sides of Carroll Lane. There are houses that front onto Carroll Lane between McArdle and SPID that have their own driveways but will likely be sensitive to converting the parking lane to provide the needed width for the SUP on both sides of Carroll Lane.	McArdle Street	SPID Interchange	Tier III
	MDT 3.4	Add 10-foot-wide SUP along both sides of Carroll Lane from SPID to Tiger Lane.	SPID Interchange	Tiger Lane	Tier III
	MDT 3.5	Add 10-foot-wide SUP along both sides of Carroll Lane, connecting to the trail along Carroll Ditch that leads to Mary Carroll High School.	Tiger Lane	Holly Road	Tier III
	MDT 4 - Brownlee Boulevard		Louisiana Avenue	Mussett Street	Tier II

Functional Area	Project ID	Description	From	To	Priority
Southside	**SSD 1 – Expansion of the Schanen Hike and Bike Trail beyond Killarmet Drive**		Killarmet Drive	Tiger Lane/Corona Drive/Williams Drive	Tier III
	SSD 2 – Expansion of the (ditch) Trail from Morteza Drive to Timbergate Drive		Morteza Drive	Timbergate Drive	Tier III
	SSD 3 – Timbergate Drive Bike Lane/Parking Lane		Hunt Drive	Spanish Wood Drive	Tier III
East-West Connection/Texas Bicycle Network	**EWC 1 – Transition between SH 44 Service Roads and Agnes Street Rail to Trail**				
	EWC 1.1	Heinsohn Road Bike Lane	SH 44	Agnes Street	Tier III
	EWC 1.2	Heinsohn Road Bike Route	SH 44	Agnes Street	Tier III
	EWC 1.3	SH 544 Agnes Street at SH 358 NPID Transition to SUP along North Side of Agnes Street	NPID Interchange		Tier III
	EWC 2 – Agnes Street Rail to Trail/Rail with Trail				
	EWC 2.1	SUP along North Side of Agnes Street/Rail with Trail, SH 358 to Driscoll Drive	SH 358	Driscoll Drive	Tier III
	EWC 2.2	SUP/Hike and Bike Trail along North Side of Agnes Street	Driscoll Drive	Port Avenue	Tier III
	EWC 3 – Leopard Street (SH 407) Shoulder Bikeways		I-69E	N. Upper Broadway	Tier III
	EWC 4 – Upriver Road Shoulder Bikeways		I-37	Rand Morgan Road	Tier III
	EWC 5 - Cross-connecting Bikeways				
	EWC 5.1	FM 1694 Shoulder Lanes	Leopard Street	SH 44	Tier III
	EWC 5.2	Rand Morgan Road (FM 2292) Shoulder Lanes	Upriver Road	SH 44	Tier III
	EWC 5.3	Lantana Street Shoulder Lanes and SUP along East Side	Upriver Road	N. Lexington Boulevard	Tier III
	EWC 5.4	McBride Lane Shoulder Lanes	Upriver Road	Agnes Street	Tier III
Calallen/ Annaville	**CAL 1 – Upriver Road Bike Lane Connection through FM 2292 interchange at I-37**		FM 2292/Rand Morgan Road at I-37		Tier III
	CAL 2 – McKinzie Road Bike Lanes from Upriver Road to Sessions Road		Upriver Road	Session Road	Tier III
	CAL 3 – Hike and Bike trail along the ditch west of West Guth Park		West Guth Park	Starlite Lane	Tier III
	CAL 4 – SUP along both sides of FM 624/Northwest Boulevard west of I-69		I-69	WB MPA Limits	Tier III
	CAL 5 – SUP along one side of Hearn Road, Northwest Boulevard/Leopard Road to FM 1694 Callicoatte Road		Northwest Boulevard	Callicoatte Road	Tier III
	CAL 6 – Local on-street Connections. Hearn Road etc. connecting to Starlite Lane at Violet Road and to Upriver Road Bike Lanes		Hearn Road	Starlite Lane	Tier III
	CAL 7 – SUP/Hike and Bike Trail along CO 69 from Northwest Boulevard to Hazel Bazemore-Calallen Park		Northwest Boulevard	Hazel Bazemore-Calallen Park	Tier III
	CAL 8 – Hike and Bike Trail from Hazel Bazemore-Calallen Park		Hazel Bazemore-Calallen Park	Dry Creek Drive	Tier III
Portland/Gregory	**PGR 1 – Sunset Lake Park Bikeways Enhancement**		Indian Point Pier	4th Street	Tier I
	PGR 2 – Memorial Parkway Hike and Bike Trail		Moore Avenue	Buddy Ganem Drive	Tier II
	PGR 3 – SUP along both sides of Moore Avenue		Houston Street	Hunt Road	Tier II

CODE, POLICY AND PROGRAM RECOMMENDATIONS

While the Corpus Christi MPO jurisdictions are too diverse in size, topography, demographics, built environments, and resources to apply a single set of recommendations to all communities, the following general recommendations provide a foundation for improving the walking and bicycling environment.

Code Recommendations

The existing foundation for active transportation and ADA compliance in the Corpus Christi MPO municipalities could be enhanced by adopting bike/ped-specific ordinances. Example language for sidewalks, bicycle facilities and bicycle parking is outlined in Exhibit 5-05.

Exhibit 5-05: *Active Transportation Plan Code Language Recommendations*

Code Topic	Example Language
Sidewalks and Bicycle Facilities – General Requirements	a) Where required, sidewalks shall be installed on both sides of the local residential, collector and arterial streets right-of-way and adjacent to the property line and parallel to the curb line. All major and minor arterials, collectors and other thoroughfares appearing on the City's bike plan shall have bike facilities installed in accordance with its Street Design Manual or equivalent as determined by the City Engineer and/or the Planning Department. b) Sidewalks shall be 5-feet-wide if separated from the curb and be separated from the adjacent travel lane by at least 3 feet; if tied to the back of a curb or edge of roadway, the sidewalk should be at least 7-feet-wide c) The sidewalk must be wide enough to provide a minimum clear width of 4 feet at encroachments, including street lights, traffic signs, traffic control devices, utility installations, or other facilities. d) All new sidewalks must adhere to the City Design Manual's technical standards and design requirements and applicable state and federal disability rights laws. e) Sidewalks determined to be in high pedestrian traffic areas, or pedestrian-oriented developments determined by the City Planning Department may required to be wider than the minimum widths. f) A SUP shall be required within the street right-of-way if the street is within a two-mile radius of a public school. A SUP may be substituted for one of the required sidewalks.
Bicycle Parking	a) Bicycle parking facilities shall be provided for new buildings or facilities, additions to or enlargements of existing buildings, or for changes in the use of buildings or facilities that result in the need for additional auto parking facilities in accordance with City parking requirements. b) One bicycle space shall be required for every 20 dwelling units in a multifamily (apartment-style) building, with fractions rounded to the next highest whole number. c) Individual bicycle parking spaces shall be a minimum of 75 inches by 24 inches wide for each space. Where double-sided multi-racks are utilized in overlapping of bicycle parking spaces, the minimum bicycle parking space shall be 100 inches long by 36 inches wide. d) Bicycle parking racks shall be located in areas visible from the public ROW and shall be provided with adequate lighting if intended for use after dark. e) Bicycle parking racks shall be placed a minimum of 24 inches away from walls and other elements that may create an obstacle to accessing the bike parking spaces. f) The City may authorize a reduction in the number of required off-street parking spaces for development uses that make special provisions to accommodate bicyclists, such as bicycle lockers, employee showers, and changing areas for employees. g) Bicycle parking spaces may be installed to alleviate vehicle parking space requirements if the development is located adjacent to a bike lane or an off-road bike path or adjacent to a street with an existing bike lane or off-road path. The provision of bicycle parking spaces can be used to reduce the number of required vehicle parking spaces by up to 10%. Up to six bicycle parking spaces (bike racks) can be used for every vehicle parking space.

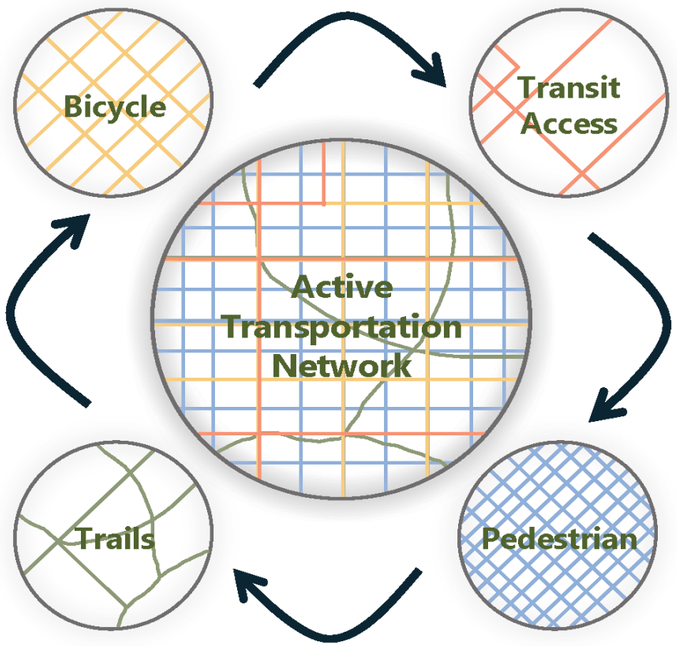
Policy and Program Recommendations

Integrate street infrastructure that provides balanced transportation options and design features into street design and construction to create safe and inviting environments for all users to walk, bicycle and use public transportation.

1. Ensure that sidewalks, crosswalks, public transportation stops and facilities, and other aspects of the transportation right-of-way are ADA-compliant and meet the needs of people with different types of disabilities, including mobility, vision, and hearing impairments.
    - It is recommended that a code review workshop be created in partnership with Portland and Corpus Christi to review existing codes and provide recommendations to ensure ADA compliance and adequate provision of bicycle and pedestrian facilities in city codes and ordinances.
2. Prioritize incorporating Complete Street design features and techniques that promote safe and comfortable travel by pedestrians, bicyclists, and public transportation riders, such as roundabouts, road diets, high street connectivity, and physical buffers and separations between vehicular traffic and users.

Make practices that balance transportation options a routine part of everyday operations.

1. As new guidance and data becomes available, restructure and revise the zoning and subdivision codes and other plans, laws, procedures, rules, regulations, guidelines, programs, templates and design manuals, including the Unified Development Code, to integrate, accommodate, and balance the needs of all users in all street projects on public and private streets.
2. Develop or revise street and trail standards and design manuals, including cross-section templates and design treatment details, to ensure that standards support and do not impede Complete Streets; coordinate with related policy documents, including the trail master plans, ADA master plans and the Transportation Plan.
3. Encourage targeted outreach and public participation in community decisions concerning street design and use.
4. Reconsider using the automobile level of service as a dominant determinant when assessing mobility needs. Consider additional assessment criteria that support the expansion of active transportation when developing the final design.



Make public transportation an interconnected part of the transportation network.

1. Partner with CCRTA to enhance and expand public transportation services and infrastructure throughout the City of Corpus Christi and the surrounding region; encourage the development of a public transportation system that increases personal mobility and travel choices, conserves energy resources, preserves air quality and fosters economic growth.
2. Work with CCRTA to provide destinations and activities that can be reached by public transportation and are of interest to public transportation-dependent populations, including youth, older adults and people with disabilities.
3. Collaborate with the CCRTA to incorporate infrastructure to assist users in employing multiple means of transportation in a single trip in order to increase transportation access and flexibility; examples include, but are not limited to:
    - Seamless bicycle access to the transit system
    - Secure bicycle storage at transit stops
    - Connections to trails and recreational destinations
4. Ensure safe and accessible pedestrian routes to transit stops; relocate stops if safe routes are not feasible at current location.
5. Work with the CCRTA to ensure that public transportation facilities and vehicles are fully accessible to persons with disabilities.

Promote safety of all users.

1. Assess existing efforts by transit agencies in improving passenger safety accessing bus stops. Identify safety improvements to pedestrian and bicycle routes used to access public transportation stops; collaborate with transit to relocate stops where advisable.
2. Identify intersections and other locations where collisions have occurred or that present safety challenges for pedestrians, bicyclists, or other users; consider gathering additional data through methods such as walkability/bikeability solutions to safety issues.
3. Collaborate with schools, senior centers, advocacy groups and public safety departments to provide community education about safe travel for pedestrians, bicyclists and other users.

Sidewalk Network Enhancements and Expansion Recommendations

Provide children with safe and appealing opportunities for walking and bicycling to school to decrease rush-hour traffic and fossil fuel consumption, encourage exercise and healthy living habits in children, and reduce the risk of injury to children by vehicle traffic near schools.

1. Support Safe Routes to School Programs.
    - Work with local public and private school districts to pursue encouragement programs such as Walk and Bike to School Days, as well as Walking School Bus/Bike Train programs at elementary schools, where parents take turns accompanying groups of children to school on foot or via bicycle.
    - Gather baseline data on attitudes about and levels of walking and bicycling to school through student tallies and parent surveys; gather additional data each spring and fall to measure progress.
    - Work with local public and private school districts and advocates to obtain Safe Routes to School funding to implement education programs.
    - Work with local and private school districts to encourage education programs that teach students walking and bicycling behaviors, and educate parents and drivers in the community about the importance of safe driving.
    - Work with law enforcement to enforce speed limits and traffic laws, assist in ensuring safe crossings, and promote safe travel behavior within the schools.
    - Encourage parents to get children to school through active travel such as walking or bicycling.
2. Prioritize safety and roadway improvements around our schools.
    - Conduct walkability and bikeability audits along routes to schools to identify opportunities and needs for infrastructure improvements.
    - Ensure that speed limits in areas within 1,000 feet of schools are no greater than 15 mph below the posted speed limit.
    - Assess traffic speeds, volumes, and vehicle types around schools; implement traffic calming in areas immediately around schools where indicated by speed and volume; consider closing streets to through traffic during school hours if other methods cannot reduce the threat to safety.
    - Pursue Safe Routes to School funding to implement infrastructure improvements.

Create safe routes to parks and open spaces.

1. Encourage the development of parks and open space with a network of safe and convenient walking and bicycle routes, including routes that access other popular destinations, such as schools.
2. Implement traffic calming measures near parks where advisable due to vehicle speeds and volumes.
3. Improve intersections at park access points to create greater visibility for all users and provide accessible curb ramps and additional time to cross the street.
4. Improve public transportation connections to trails, parks and other recreational locations.
5. Ensure that all parks and open spaces are accessible by safe bicycling, walking, micro-mobility and public transit routes.
6. Ensure that trails, parks and open spaces have secure bicycle parking facilities.

Ensure that residents of all ages and income levels can walk and bicycle to meet their daily needs.

1. Improve bicycle, pedestrian, and public transportation access to residential areas, educational and child care facilities, employment centers, grocery stores, retail centers, recreational areas, historic sites, hospitals and clinics, and other destination points.



Source: Seattle Public Schools

FUNDING RECOMMENDATIONS

Appendix B provides a list of the funding sources that could be pursued to implement the active transportation, Complete Streets, and micro-mobility projects. The Corpus Christi MPO and cities may leverage their local resources by tapping into state, federal and other resources to enhance their Active Transportation Network and programs.

As can be seen in the tables in the appendix, there are numerous funding opportunities available for project and program development from sources at the local, state and federal level. Some funding sources require significant efforts to prepare an application and some funding sources are highly competitive and/or over-subscribed. There should be careful consideration of the competitive strength of the projects and the inter-agency support needed for the pursuit. The Corpus Christi MPO and the cities in its jurisdiction should collaborate to identify and pursue outside funding sources to supplement the available local funds to more readily advance the planned network and programs.

MPO Strategic Assistance for Grant Pursuits

To overcome the challenges of applying for funding grants and other opportunities, the Corpus Christi MPO should use its knowledge of grants available and the interagency procedures to facilitate the pursuit and effective attainment of non-local funds for active transportation.

Grant Matching Fund Assistance

The Corpus Christi MPO should establish a Matching Funds Program that could be utilized as matching funds for state and federal grant pursuits.

Local Support to Implement Active Transportation Plan Recommendations

There are many individuals in the communities that have skills that can be utilized by the MPO and cities to assist with grant writing, project conceptual designs, illustrative graphics and other grant writing support. Many are willing to offer their assistance at little or no cost for the betterment of their community. The MPO should utilize the local talent of its active citizens and consulting community to develop and promote the Active Transportation Plan.



Source: TxDOT



Source: Valley Transportation Authority



Source: USDOT



Corpus Christi Metropolitan Planning Organization

APPENDIX A: COMPLETE STREETS PROGRAM GUIDE

CORPUS CHRISTI MPO
METROPOLITAN PLANNING ORGANIZATION

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LOS ANGELES COUNTY COMPLETE STREETS MODEL DESIGN FOR LIVING STREETS

Selected chapters adopted with permission.

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1. Introduction

BACKGROUND

A growing number of communities are discovering the value of their streets as important public spaces for many aspects of daily life. People want streets that are safe to cross or walk along, offer places to meet people, link healthy neighborhoods and have a vibrant mix of retail. More people are enjoying the value of farmers' markets, street festivals and gathering places. And more people want to be able to walk and ride bicycles in their neighborhoods.

People from a wide variety of backgrounds are forming partnerships with schools, health agencies, neighborhood associations, environmental organizations and other groups in asking their city councils to create streets and neighborhoods that fit this vision.

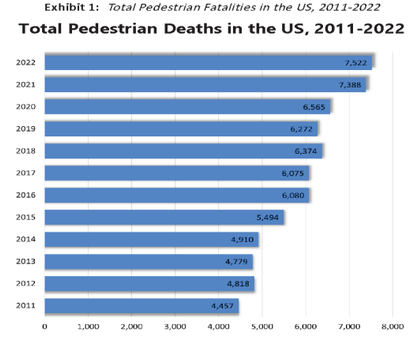


Street with accommodations for multimodal transportation (Credit: FNI)

As a result, an increasing number of cities are looking to modify the way they design their streets. According to Smart Growth America, as of 2023, 503 Complete Streets policies have been adopted across the United States.

Additionally, safety is a mounting concern. On a national level, America is experiencing increasing pedestrian fatalities. According to the US Department of Transportation (USDOT), pedestrian fatalities increased by 68% between 2011 and 2022.

Exhibit 1: *Total Pedestrian Fatalities in the US, 2011-2022*



COMPLETE STREETS

According to the National Complete Streets Coalition (NCSC), Complete Streets is a **process and approach** that enables safe access to streets for all users. Complete Streets aims to redesign or reimagine existing **streets** that have an outdated design that can be dangerous or deadly for users without a personal vehicle.

There is no single solution, approach, or road design which applies to all streets. A Complete Streets approach considers the environmental and social context of the area and applies a safety and equity lens. It also involves emphasizing those persons or communities whose needs have historically not been met by traditional roadway design, including those with disabilities, those without access to vehicles and other historically disadvantaged communities.

Complete street elements may include:

- sidewalks,
- bike lanes (or paved shoulders) and storage,
- special bus lanes,
- comfortable and accessible public transportation stops,
- frequent and safe crosswalks and ramps,
- median islands,
- accessible pedestrian signals,
- curb extensions and curb cuts,
- narrower travel lanes,
- roundabouts,
- wayfinding signage,
- lighting,
- shade structures,
- scooter corrals,
- seating,
- trash bins,
- xeriscaping,
- bioswales,
- curbside access management and more.

> "Complete Streets are streets for everyone. Complete Streets is an approach to planning, designing, building, operating, and maintaining streets that enables safe access for all people who need to use them, including pedestrians, bicyclists, motorists and transit riders of all ages and abilities."
>
> *Source: NCSC, Smart Growth America*



Benches and landscaping (Credit: FNI)



Pedestrian refuge area (Credit: FNI)



ADA accessibility ramp (Credit: FNI)



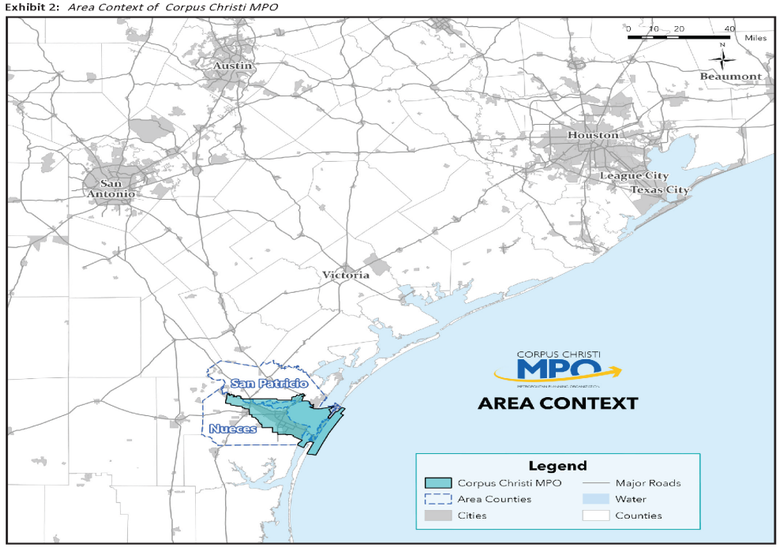
Buffered bike lane (Credit: FNI)

AREA CONTEXT

The Corpus Christi Metropolitan Planning Organization (Corpus Christi MPO) has identified the need for street design standards which advance the needs of all users of the transportation network. In the area, low-density residential land uses, industrial activity, climate and auto-centric design and development have contributed to a sprawling effect, exacerbating a car-centric transportation system.

In 2021, 92.2% of commuters in the city of Corpus Christi drove alone to work, compared to 86.7% in Texas[1]. As part of the Complete Streets, Active Transportation, and Micro-Mobility Plan, the Complete Streets Program Guide will help address various issues within the MPO planning area and provide local jurisdictions with guidance for adopting their own Complete Streets policies and standards.

Exhibit 2: *Area Context of Corpus Christi MPO*



1 U.S. Census Bureau. "COMMUTING CHARACTERISTICS BY SEX." ACS 5-Year Estimates Subject Tables, Table S0801, 2021. Accessed on May 21, 2024.

2. Vision, Goals, Policies & Benchmarks

INTRODUCTION

This chapter sets the framework for the street design manual. A manual should not prescribe how to design every segment of every street; rather, after clearly defining what a community wants to accomplish with its streets, designers can apply this framework along with the specific guidance from other chapters to meet the community's goals.



Alley activation: Denver, CO. (Credit: FNI)

VISION

The vision of the Complete Streets Design Manual is to encourage and guide the planning, design and implementation of streets rights of way to enable safe access and mobility for all users including pedestrians, bicyclists, motorists and transit riders of all ages and abilities. Complete Streets should:

- Integrate connectivity and traffic calming with pedestrian-oriented site and building design to create safe and inviting places
- Foster vibrant and resilient commercial activity
- Strengthen and enhance neighborhoods as envisioned by community members without displacing current residents
- Encourage active and healthy lifestyles
- Vary in character by neighborhood, density and function

GOALS

Goals state the broad, overriding outcomes a city wants to achieve. The goals of designing living streets are to:

- Serve the land uses that are adjacent to the street
- Encourage people to travel by walking, bicycling, and transit, and to drive less
- Provide transportation options for people of all ages, physical abilities and income levels
- Enhance the safety and security of streets, from both a traffic and personal perspective
- Promote the economic well-being of both businesses and residents
- Increase civic space and encourage human interaction

POLICIES

Policies (or objectives) assist in implementing the goals and overall vision. Proposed policies are related to the elements of complete streets established by the National Complete Streets Coalition and are listed in Exhibit 3.

Local jurisdictions may follow this template, or adopt other similar policies. Agencies can enact these policies through a living streets ordinance or resolution.



Walkable communities are livable communities. (Credit: FNI)

Exhibit 3: *Street Elements and Policies*

Complete Streets Elements	Living Streets Policies
Vision	Cities should develop policies and practices that cause them to design their streets according to the bullet points in the Vision section above.
Connectivity	Cities should design, operate and maintain a transportation system that provides a highly connected network of streets that accommodate all modes of travel. Cities should seek opportunities to repurpose rights-of-way and to add new rights-of-way to enhance connectivity for pedestrians, bicyclists and transit. Cities should prioritize non-motorized connectivity improvements to services, schools, parks, civic uses, regional connections and commercial uses. Cities should require large, new developments to provide interconnected street networks with small blocks that connect to existing or planned streets on the perimeter of the development.

Complete Streets Elements	Living Streets Policies
Jurisdiction	A city's living streets policy document is intended to cover all roads, streets and alleys in the city. Every city agency, including public works, planning, redevelopment, street services and others should follow the policies in this document. Cities should require all developers to obtain and comply with their standards.
Exceptions	Living streets should be included in all street construction, reconstruction, repaving and rehabilitation projects, except under one or more of the following conditions: A. A project involves only ordinary maintenance activities designed to keep assets in serviceable condition, such as mowing, cleaning, sweeping, spot repair, concrete joint repair, or pothole filling, or when interim measures are implemented on temporary detour or haul routes. B. The city council exempts a project due to an excessively disproportionate cost of establishing a bikeway, walkway, or transit enhancement as part of a project. C. The city engineer and the director of the planning department jointly determine that incorporation of complete streets elements in the construction is not practically feasible or cost effective because of significant or adverse environmental impacts to waterways, flood plains, remnants of native vegetation, wetlands, mountainsides, or other critical areas, or due to impacts on neighboring land uses, including from right of way acquisitions. D. The director of the planning department issues a documented exception where changes to the street may detract from the historical or cultural nature of the street or neighborhood
Sensitivity	Cities should design their streets with full input from local stakeholders. Cities should design their streets with a strong sense of place. They should use architecture, landscaping, streetscaping, public art, signage, etc. to reflect the community, neighborhood, history and natural setting.
Context	Cities should plan their streets in harmony with the adjacent land uses and neighborhoods.
Implementation Plan	Cities should either implement living streets designs on every street, or initiate the process by preparing and adopting bicycle plans, pedestrian plans, green streets plans, Safe Routes to School plans and an Americans with Disabilities Act transition plan. Cities should draw on all sources of transportation funding to implement living streets.

Complete Streets Elements	Living Streets Policies
Design	Cities should adopt new living streets design guidelines to guide the planning, funding, design, construction, operation and maintenance of new and modified streets while remaining flexible to the unique circumstances of different streets where sound engineering and planning judgment will produce context-sensitive designs. Cities should incorporate the street design guidelines' principles into all city plans, manuals, rules, regulations and programs as appropriate. As new and better practices evolve, cities should incorporate those as well. Cities should provide well-designed pedestrian accommodation in the form of sidewalks or shared-use pathways on all arterial and collector streets and on local streets. Cities should provide frequent, convenient and safe street crossings. These may be at intersections designed to be pedestrian friendly, or at mid-block locations where needed and appropriate. Cities should provide bicycle accommodation along all avenues, boulevards and connector streets. Where physical conditions warrant, cities should plant trees and manage streetwater whenever a street is newly constructed, reconstructed, or relocated.
Performance measures	Use performance measures described in the following section.

BENCHMARKS AND PERFORMANCE MEASURES

Conventional street design applies traditional performance measures, which focus on auto mobility measures. The most common is the Level of Service (LOS), which seeks to maintain flow of vehicles and leads to widening streets and intersections, removing on-street parking and other strategies to accommodate the flow of traffic. Because LOS focuses on a singular solution of resolving congestion by adding intersection or roadway capacity, it can undermine the basic tenets of complete streets if the needs of other users and the urban context are not considered.

To meet the goals and tenets of living streets, communities should adopt the following aspirational benchmarks and performance measures.

Benchmarks

- Every street and neighborhood is comfortable to walk along.
- Every child can walk or bike to school safely.
- Seniors, children and disabled people can cross all streets safely and comfortably.
- An active way of life is available to all.

Performance Measures

- Street fatalities and injuries decrease for all age groups.
- The number of trips by walking, cycling and transit increases.
- Prevailing speeds of vehicles on local streets decrease.
- Resident satisfaction increases.

VISION ZERO

Vision Zero is a strategy to eliminate all traffic fatalities and severe injuries, while increasing safe, healthy, equitable mobility for all. Implemented in Europe in the 1990s, cities across the USA have successfully implemented its strategies.

In 2020, the City of Corpus Christi joined the Vision Zero movement with its Vision Zero Program. The City is committed to eliminating deaths and serious injuries on Corpus Christi streets and waterways by 2040. Go to www.cctexas.com/visionzero to take the pledge and join the Vision Zero movement.

VISION ZERO CORPUS CHRISTI

3. Street Networks And Classifications

INTRODUCTION

The United States has a long history of developing beautifully designed master planned communities. These include: Savannah, Charleston, Washington, D.C., Boston, Santa Monica and San Francisco. The success of these cities is partially attributed to their well-designed street networks. Well-planned street networks help create sustainable cities that support the environmental, social and economic needs of their residents.

Over 40,000 Americans perish each year in traffic crashes (NHTSA, 2021). A well-designed and -maintained street network can be a powerful tool for reducing traffic crashes and fatalities while creating beautiful places.

Complete Street networks improve traffic safety, increase the number of people walking and bicycling, reduce vehicle trips and reduce response times for emergency service vehicles.



Cul-de-sac developments break up connectivity and create longer trips. (Credit: Michele Weisbart)



Interconnected street network with small block. (Credit: Marty Bruinsma)

PRINCIPLES OF COMPLETE STREET NETWORKS

Complete Street networks come in many shapes and forms, but have the following overarching principles in common:

- The Complete Street network both shapes and responds to the natural and built environment.
- The Complete Street network fosters trips by foot, bike and transit because these are the most sustainable types of trips.
- The Complete Street network is built to accommodate walking.
- The Complete Street network works in harmony with pedestrian, bicycle, transit and private vehicle networks. They connect and interact with the vehicle network.
- The Complete Street network protects, respects and enhances a city's natural features and ecological systems.
- The Complete Street network maximizes social and economic activity.

STREET CHARACTERISTICS AND CLASSIFICATION

A Complete Street network provides a pattern of multimodal streets that serve all community land uses and facilitate easy access to local, city and regional destinations. The pattern results in distribution of traffic that is consistent with the desired function of the street. It offers its users a choice of several routes that connect origins with their destinations.

The street network works best when it provides a variety of street types. These types are defined by the pattern of the street network itself and the design of individual street segments. Natural and built features, including topography and important community destinations, should be taken into account to create unique designs.

In new subdivisions, integrating a network of shared use paths and earthen trails into the street network should be considered. Under this concept, every fourth or fifth "street" provides quiet, comfortable access for bicyclists, pedestrians, joggers, skaters and others along a linear parkway with limited motor vehicle traffic. Where these provisions intersect streets, they should be treated as intersections with appropriate treatments.

This type of network would allow people to circulate in their new communities to schools, parks, stores and offices while staying primarily on dedicated paths and trails. These networks can also link to paths and trails along waterways, utility corridors, rail rights-of-way and other more common active transportation corridors. Exhibit 4 illustrates this concept.

The types of streets used in the network differ in terms of their network continuity, cross-section design and adjoining land use. The individual streets themselves will change in character depending on their immediate land use context.



Exhibit 4: *Integrating bicycle and pedestrian paths into new development. (Credit: Michele Weisbart)*

STREET CONFIGURATIONS

The following are standards for creating a complete street network.

1. Establish a block size maximum of 1,600 linear feet (perimeter):
   - » Ensure greater accessibility within the block through alleys, service courts and other access ways
   - » Where block size is exceeded, retrofit large blocks with new street, alleys, pedestrian and/or bicycle connections
   - » For existing street networks, do not allow street closures that would result in larger blocks
2. Require multiple street connections between neighborhoods and districts across the whole region. This is achieved by having boulevards and avenues that extend beyond the local area. Adjacent neighborhoods must also be connected by multiple local streets.
3. Connect streets across urban freeways so that pedestrians and bicyclists have links to neighborhoods without having to use streets with freeway on and off ramps.
4. Maintain network quality by accepting growth and expansion of the street network (including development, revitalization, intensification, or redevelopment) while avoiding increases in street width or in number of lanes.
5. Provide on-street curbside parking on most streets. Exceptions can be made for very narrow streets, streets with bus lanes, or where there is a better use of the space.
6. Establish maximum speeds of 20 to 35 mph:
   - » Use design features that support lower-speed environments
   - » On local streets, the speed should be 20 to 25 mph or less
7. Maintain network function by discouraging:
   - » One-way streets
   - » Turn prohibitions
   - » Full or partial closures (except on bike boulevards, or areas taken over for other uses of public space)
   - » Removal of on-street parking (except when replaced by wider sidewalks, an enhanced streetscape, bus lanes, bike lanes, etc. rather than additional vehicle lanes)
   - » Gated streets
   - » Widening of individual streets
   - » Conversion of city streets to limited access facilities
8. Classify major streets using the common street and context types presented on the following pages. However, some streets are unique and deserve a special category that lies outside the common street network types. Exhibit 6 on page 17 describes these special streets. Chapter 4, "Traveled Way Design," contains guidance related to cross sections of these street typologies.

Context: The Transect

Street design should consider the context of the area in which the street exists. The appropriate complete street design will support and enhance the surrounding character while providing flexibility to accommodate future changes.

Context is defined as the environment in which the street is built and includes the placement and frontage of buildings, adjacent land uses and open space, and historic, cultural, and other characteristics that form the built and natural environments of a given place. The transect defines the context and assists in creating an appropriate design.

The transect zones range from Natural (T-1) to Urban Core (T-6). In the least-intensive T-Zones of a community, T1 and T2, a rural road or highway is appropriate.

Urban zones do not exist as "stand alone" zones, but rather are organized in relationship to each other within a community. Each zone is highly walkable and assumes the pedestrian mode as a viable and often preferred travel mode, especially for the ¼ mile, five-minute walk.

The T3 suburban zone defines the urban to rural edge. Of all the T-Zones, T3 appears most like conventional sprawl. It has single-family dwellings and a limited mix of uses and housing types, and it tends to be more automobile-oriented than T4, T5, or T6. The five-minute test of walkable distance (¼ mile radius) limits the overall size of a T3 transect zone. The T3 zone often defines the edge of the more developed urban condition, so is sometimes called the "neighborhood edge."

For example, knowing that a particular area is a T5, Town Center, defines the context for the built environment including the street design criteria and elements, such as the width of sidewalks, the presence of on-street parking and the use of tree wells instead of planting strips. Buildings built to the sidewalk with parking on the street and behind, for instance, are appropriate in T5 and T6. Referring to a set of tables and design recommendations correlated to the transect helps the designer determine how a street should function in each T-Zone.

Contexts will not always flow evenly and incrementally from T1 to T6: there may be gaps. For example, T2 jumps to T5 may occur, or a rural community may have only T2 with a community center that is not urban enough to be T5 (for example, a church, convenience store, antique store and gas station at the one intersection in the whole town).

An important element of the design process is to ensure the traveled way design fits the context of the intended design. Through use of a regulating plan, the appropriate street design will be established to fit the context, purpose and type of street.

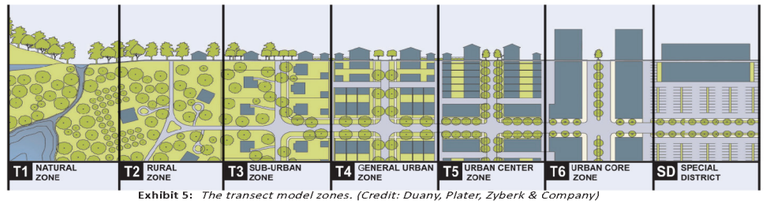


Exhibit 5: *The transect model zones. (Credit: Duany, Plater, Zyberk & Company)*

Types and Roles of Streets

Federal Highway Function and Classification system contains the conventional classification system that is commonly accepted to define the function and operational requirements for streets. These classifications are also used as the primary basis for geometric design criteria.

Traffic volume, trip characteristics, speed and level of service and other factors in the functional classification system relate to the mobility of motor vehicles, not bicyclists or pedestrians, and do not consider the context or land use of the surrounding environment. This approach, while appropriate for high speed rural and some suburban roadways, does not provide designers with guidance on how to design for living streets or in a context-sensitive manner.

The street types described here provide mobility for all modes of transportation with a greater focus on the pedestrian. The functional classification system can be generally applied to the street types in this document. Designers should recognize the need for greater flexibility in applying design criteria, based more heavily on context and the need to create a safe environment for pedestrians, rather than strictly following the conventional application of functional classification in determining geometric criteria.

The terms for street types for complete streets are described in the following sections.

Boulevard

A boulevard is a street designed for high vehicular capacity and moderate speed, traversing an urbanized area. Boulevards serve as primary transit routes. Boulevards should have sidewalks and buffered bike lanes. They may be equipped with bus lanes or side access lanes buffering sidewalks and buildings. Many boulevards also have landscaped medians.



Boulevard example. (Credit: Ryan Snyder)

Avenue

An avenue is a street of moderate to high vehicular capacity and low to moderate speed acting as a short distance connector between urban centers and may be equipped with a landscaped median.



Avenue example. (Credit: Ryan Snyder)

Street

A street is a local, multi-movement facility suitable for all urbanized transect zones and all frontages and uses. A street is urban in character, with raised curbs (except where curbless treatments are designed), drainage inlets, sidewalks, parallel parking and trees. Character may vary in response to the commercial or residential uses lining the street.



Street example: Sanford, FL. (Credit: Billy Hattaway)

Alley/Lane

An alley or lane is a narrow street, often without sidewalks. Alleys and lanes connect streets and can provide access to the backs of buildings and garages.



Alley example: Chapel Hill, NC. (Credit: Ryan Snyder)

Special Street Typologies

The special street typologies listed below have particular functions within the street network.

Exhibit 6: *Special Street Typologies*

Street Type	Description	Comment
Main Street	Slower vehicle speeds, favors pedestrians most, contains the highest level of streetscape features, typically dominated by retail and other commercial uses.	Functions differently than other streets in that it is a destination.
Transit Mall	The traveled way is for exclusive use by buses or trains, typically dominated by retail and other commercial uses.	Excellent pedestrian and emergency vehicle access to and along the transit mall is critical. Bicycle access may be supported.
Bike Boulevard	A through street for bicycles, but short distance travel for motor vehicles.	Usually a local street with low traffic volumes.
Festival Street	Contains traffic calming, flush curbs and streetscape features that allow for easy conversion to public uses such as farmers' markets and music events.	
Shared Space	Slow, curbless street where pedestrians, motor vehicles and bicyclists share space.	May support café seating, play areas and other uses.

4. Traveled Way Design

INTRODUCTION

Streets and their geometric design have traditionally focused on the movement of motor vehicles, resulting in street environments that neglect other users. This emphasis can be seen in wide travel lanes, large corner radii and turn lanes that severely impede the safety of pedestrians and the overall connectivity for non-automobile users. The geometric design of the traveled way and intersections has usually reflected the need to move traffic as quickly as possible. Existing roadway designs need to be considered to reclaim the public right-of-way for pedestrians and bicyclists and create living streets.

Traveled way design is defined as the part of the street right-of-way between the two faces of curbs and can include parking lanes, bicycle lanes, transit lanes, general use travel lanes and medians. The design of the traveled way is critical to the design of the entire street right-of-way because it affects not just the users in the traveled way, but those using the entire right-of-way, including the areas adjacent to the street. As a note on terminology, "traveled way" in this document is more or less the equivalent of "roadway" in most conventional design manuals: the curb-to-curb portion of a curbed street.



Wide, uninviting street. (Credit: Dan Burden)

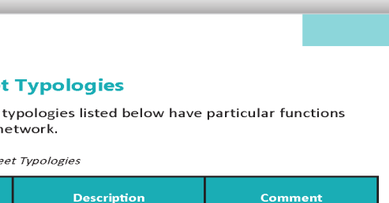
PRINCIPLES OF TRAVELED WAY DESIGN

The following key principles should be kept in mind for a well-designed traveled way:

- **Design to accommodate all users**. Street design should accommodate all users of the street, including pedestrians, bicyclists, transit users, automobiles and commercial vehicles. A well-designed traveled way provides appropriate space for all street users to coexist.
- **Design using the appropriate speed for the surrounding context**. The right design speed should respect the desired role and responsibility of the street, including the type and intensity of land use, urban form, the desired activities on the sidewalk, such as outdoor dining, and the overall safety and comfort of pedestrians and bicyclists. The speed of vehicles impacts all users of the street and the livability of the surrounding area. Lower speeds reduce crashes and injuries.
- **Design for safety.** The safety of all street users, especially the most vulnerable users (children, the elderly and disabled) and modes (pedestrians and bicyclists) should be paramount in any design of the traveled way. The safety of streets can be dramatically improved through appropriate geometric design and operations.

Building on the momentum of complete streets that have been successfully implemented in different parts of the nation and around the world, there is a strong need to retrofit existing streets and create new types of street environments that reflect the values and desires of all users. This chapter discusses different factors affecting traveled way design. Individual geometric design elements such as lane width and sight distance are examined in detail.

The benefits and constraints of each element are examined and the appropriate location and correct use of each element is defined to maximize the creation of living streets.



Senior citizens need more time to cross the street. (Credit: Ryan Snyder)

FACTORS AFFECTING STREET DESIGN

Pedestrians

Walking is the most basic mode of transportation, yet pedestrians are often ignored in roadway design. Certain areas generate high pedestrian activity, such as downtowns, residential, commercial and entertainment areas, and schools. Yet even in areas of low pedestrian activity, such as along commercial strip-developed arterials, pedestrian needs and safety must be addressed, as drivers usually don't expect pedestrians

As speeds increase, drivers are less attentive to what is happening on the side of the road, reaction time is increased, and the pedestrian has a higher chance of dying or becoming severely injured in case of a crash.

Most pedestrian crashes occur when a person crosses the road, and the most common crash type is a conflict between a crossing pedestrian and a turning vehicle at an intersection. But designing for pedestrians should not focus primarily on avoiding crashes; the goal of roadway and intersection design should be to create an environment that is conducive to walking, where people can walk along and cross the road, where the roadside becomes a place where people want to be. The two most effective methods to achieve these goals are to minimize the footprint dedicated to motor vehicle traffic and to slow down the speed of moving traffic. This approach allows the designer to use many features that enhance the walking environment, such as trees, curb extensions and street furniture, which in turn slow traffic: a virtuous cycle. All streets should have sidewalks except for rural roads and shared-space streets.

Bicyclists

All streets should be designed with the expectation that bicyclists will use them. This does not mean every street needs a dedicated bicycle facility, nor will every road accommodate all types of bicyclists. Minimizing the footprint dedicated to motor vehicle traffic and slowing down the speed of moving traffic benefits bicyclists. Ideally, all multi-lane streets should have buffered bike lanes. On multi-lane streets where buffered bike lanes aren't feasible because of space constraints, other bikeway treatments should be considered.

Public Transportation

Designing for transit vehicles on roadways takes into consideration many factors. Buses have operational characteristics that resemble trucks. Buses usually operate in mixed traffic, they stop and start often for passengers, and they must be accessible to people boarding the bus. The consequences for roadway design include lane width, intersection design (turning radius or width of channelization lane), signal timing (often adjusted to give transit an advantage—queue jumping), pedestrian access (crossing the street at bus stops), sidewalk design (making room for bus shelters in the furniture zone), and bus stop placement and design (farside/nearside at intersections, bus pullouts, or bulb outs).

Where express bus service or Bus Rapid Transit is provided, exclusive bus lanes are desirable. These have unique operating characteristics that are beyond the scope of this manual.

Design Vehicles

The design vehicle influences several geometric design features including lane width, corner radii, median nose design and other intersection design details. Designing for a larger vehicle than necessary is undesirable, due to the potential negative impacts larger dimensions may have on pedestrian crossing distances and the speed of turning vehicles. On the other hand, designing for a vehicle that is too small can result in operational problems if larger vehicles frequently use the facility.

For design purposes, the WB-40 (wheel-base 40 feet) is appropriate unless larger vehicles are more common. On bus routes and truck routes, designing for the bus (CITY-BUS or similar) or large truck (either the WB-50 or WB-62FL design vehicle) may be appropriate, but only at intersections where these vehicles make turns. For example, for intersection geometry design features such as corner radii, different design vehicles should be used for each intersection or even each corner, rather than a "one-size-fits-all" approach, which results in larger radii than needed at most corners. The design vehicle should be accommodated without encroachment into opposing traffic lanes. It is generally acceptable to have encroachment onto multiple same-direction traffic lanes on the receiving roadway.

Furthermore, it may be inappropriate to design a facility by using a larger "control vehicle," which uses the street infrequently, or infrequently makes turns at a specific location. An example of a control vehicle is a vehicle that makes no more than one delivery per day at a business. Depending on the frequency, by under designing the control vehicle can be allowed to encroach on opposing traffic lanes or make multiple-point turns.



Transit Design. (Source: NACTO)

TRAFFIC VOLUME AND COMPOSITION

Traffic volume data collection is an integral part of transportation planning and decision making. Traffic volume data are collected for various periods of the day depending on the purpose for which the data is used. For most analyses it is necessary to collect peak period and daily traffic.

There are special types of traffic volume counts such as vehicle classification counts and average vehicle occupancy. The traffic volumes collected are also used for a variety of studies, including forecasting. Traffic volume on a segment of a road or at an intersection can be collected either manually or by using tubes.

DESIGN SPEED

The application of design speed for living streets is philosophically different than for conventional transportation practices. Traditionally, the approach for setting design speed is to use as high a design speed as practical. This has many negative effects. For pedestrians in particular, when in a collision with a vehicle, the vehicle's speed has drastic effects on the pedestrian's chance of surviving (Exhibit 5). According to the USDOT, a pedestrian is 70% more likely to die in a crash with a vehicle when the vehicle's speed is 40 mph compared to 20 mph[1].

Speed kills places as well as people and places efficiency over access. Because high design speeds reduce access to places on foot, they degrade the social and retail life of a street and devalue the adjacent land. Local economies thrive on attracting people.



Street with high auto LOS. (Credit: Dan Burden)

1 US Department of Transportation, Literature Reviewed on Vehicle Travel Speeds and Pedestrian Injuries, March 2000

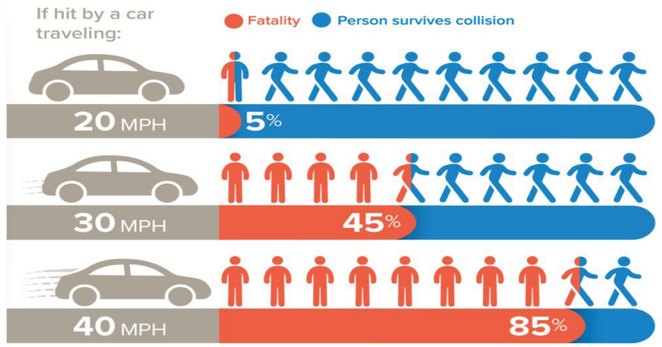
In contrast to this approach, the goal for complete streets is to establish a design speed that creates a safer and more comfortable environment for motorists, pedestrians and bicyclists. This approach also increases access to adjacent land, thereby increasing its value. For complete streets, design speeds of 20 to 35 mph are desirable. Alleys and narrow roadways intended to function as shared spaces may have design speeds as low as 10 mph.

Design speed does not determine nor predict exactly at what speed motorists will travel on a roadway segment; rather, design speed determines which design features are allowable (or mandated). Features associated with high-speed designs, such as large curb radii, straight and wide travel lanes, ample clear zones (no on-street parking or street trees), guardrails, etc., degrade the walking experience and make it difficult to design living streets. In the end, the design of the road encourages high speeds and creates a vicious cycle. A slower design speed allows the use of features that enhance the walking environment, such as small curb radii, narrower sections, trees, on-street parking, curb extensions and street furniture, which in turn slow traffic: a virtuous cycle.

Design speeds higher than 35 mph should not normally be used within communities, or in Transects T-3 and above. Speeds greater than 30 mph or 35 mph are not recommended.

Communities that have streets functioning at speeds greater than 35 mph may want to re-design the corridor to reduce the speed to 35 mph or less. When the speed reduction cannot be achieved, measures to improve pedestrian safety for those crossing the corridor should be evaluated and installed when appropriate.

Exhibit 7: *Vehicle Travel Speeds and Pedestrian Injuries. (Credit: National Traffic Safety Board)*



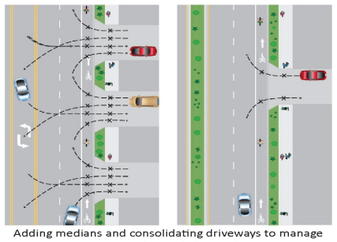
ACCESS MANAGEMENT

A major challenge in street design is balancing the number of access points to a street. The presence of many driveways in addition to the necessary intersections creates many conflicts between vehicles entering or leaving a street and bicyclists and pedestrians riding or walking along the street. When possible, new driveways should be minimized and old driveways should be eliminated or consolidated, and raised medians should be placed to limit left turns into and out of driveways.

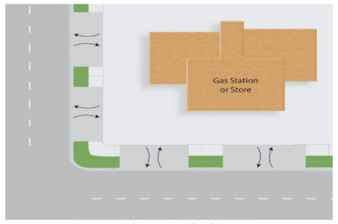
Benefits of Access Management

Access management through limiting driveways and providing raised medians has many benefits:

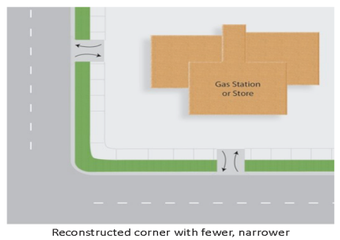
- The number of conflict points is reduced, especially by replacing center-turn lanes with raised medians.
- Pedestrian crossing opportunities are enhanced with a raised median.
- Universal access for pedestrians is easier, since the sidewalk is less frequently interrupted by driveway slopes.
- Fewer driveways result in more space available for higher and better uses (e.g. more parking spaces).
- Improved traffic flow may reduce the need for road widening, allowing part of the right-of-way to be recaptured for other users.



Adding medians and consolidating driveways to manage access. (Credit: Michele Weisbart)



Corner with many wide driveways. (Credit: Michele Weisbart)



Reconstructed corner with fewer, narrower driveways. (Credit: Michele Weisbart)

CROSS SECTIONAL ELEMENTS

Complete street design treats streets as part of the public realm. The street portion of the public realm is shaped by the features and cross section elements used in creating the street. Attention to what features are included, where they are placed and how the cross section elements are assembled are necessary for successful design.

On-Street Parking

On street parking can be important in the urban environment for the success of the retail businesses that line the street and to provide a buffer for pedestrians and help calm traffic speeds. On-street parking occupies about half the surface area per car compared to off-street, which requires driveways and aisles for access and maneuvering.

However, cities should manage demand for on-street parking by charging market-rate prices. Free or under-priced parking encourages people to drive instead of taking transit, biking, or walking. Parking expert Donald Shoup recommends setting variable parking prices to target a 15 percent vacancy rate for curb parking. In addition to encouraging people to curtail driving, it also creates turnover that benefits retailers by making convenient parking available for short shopping trips.

Where angle parking is proposed for on-street parking, designers should consider the use of reverse-in angle (or front out) parking in lieu of front-in angled parking. Motorists pulling out of reverse-in angled parking can better see the active street they are entering. This is especially important to bicyclists. Moreover, people exiting cars do so on the curb side and aren't likely to step into an active travel lane.

Another tool for on-street parking is the park assist lane. Often when on-street parking is provided on busy roads, drivers find it difficult to enter and leave their parked vehicle. Where space is available, consideration should be given to adding a park assist lane between the parking lane and travel way to provide 3 feet of space so car doors can be opened and vehicles can enter or depart with a higher degree of safety and less delay. Bike lanes can serve this function as well. Parking assist lanes also narrow the feel of the travel lane and slow traffic.



Reverse-in angled parking: Boise, ID. (Credit: Dan Burden)



Parking assist lane (Credit: Michael Wallwork)

Bicycle Facilities

Bicycle facilities within the traveled way may include bicycle lanes of various configurations, cycle tracks and other types of shared roadways (with or without shared lane markings).

Transit Facilities

Transit accommodations within the traveled way may include dedicated transit lanes, bus bulbs, bus pullouts and other features.

Travel Lanes

Travel lane widths should be provided based on the context and desired speed for the area that the street is located in. In low-speed urban environments, lane widths are typically measured to the curb face instead of the edge of the gutter pan. Consequently, when curb sections with gutter pans are used, the vehicle, bike and parking lane all include the width of the gutter pan.

In order for drivers to understand how fast they should drive, lane widths have to create some level of driver discomfort when driving too fast. When designated bike lanes or multi-lane configurations are used, there is more room for large vehicles, such as buses, to operate in, but car drivers will feel more comfortable driving faster than is desired.

Alleys can be designed as one-way or two-way. Right-of-way width should be a minimum of 20 feet with no permanent structures located within the right-of-way that would interfere with vehicle access to garages or parking spaces, access for trash collection and other operational needs. Pavement width should be a minimum of 12 feet. Coordination with local municipalities on operational requirements is essential to ensure that trash collection and fire protection services can be completed.

Turn Lanes

The need for turn lanes for vehicle mobility should be balanced with the need to manage vehicle speeds and the potential impact on the border width such as sidewalk width. Turn lanes tend to allow higher speeds to occur through intersections, since turning vehicles can move over to the turn lane, allowing the through vehicles to maintain their speed.

Left-turn lanes are considered to be acceptable in an urban environment since there are negative impacts to roadway capacity when left turns block the through movement of vehicles. Sometimes just a left-turn pocket is sufficient, just long enough for one or two cars to wait out of traffic. The installation of a left-turn lane can be beneficial when used to perform a road diet such as reducing a four lane section to three lanes with the center lane providing for turning movements.

In urban places, normally no more than one left-turn lane should be provided. While right turns from through lanes may delay through movements, they also create a reduction in speed due to the slowing of turning vehicles. The installation of right-turn lanes increases the crossing distance for pedestrians and the speed of vehicles; therefore, exclusive right turn lanes should rarely be used except at "T" intersections. When used, they should be mitigated with raised channelization islands.



Narrow two-lane street. (Credit: Michael Ronkin)



Wide two-lane street. (Credit: Ryan Snyder)

Medians

Medians used on urban streets provide access management by limiting left turn movements into and out of abutting development to select locations where a separate left turn lane or pocket can be provided. The reduced number of conflicts and conflict points decreases vehicle crashes, provides pedestrians with a refuge as they cross the road and provides space for landscaping, lighting and utilities. These medians are usually raised and curbed. Landscaped medians enhance the street or help to create a gateway entrance into a community.

Medians can be used to create tree canopies over travel lanes, contributing to a sense of enclosure. As shown in Exhibit 8, medians vary in width. Recommended widths depend on available right-of-way and function. Because medians require a wider right-of-way, the designer must weigh the benefits of a median with the issues of pedestrian crossing: distance, speed, context and available roadside width.

Exhibit 8: *Median Types and Widths*

Median Type	Minimum Width	Recommended Width
Median for access control	4 feet	6 feet
Median for pedestrian refuge	6 feet	8 feet
Median for trees and lighting	6 feet [1]	10 feet [2]
Median for single left-turn lane	10 feet [3]	10 feet [2]
Median for single left-turn lane and pedestrian refuge	16 feet [4]	16 feet

Notes:
[1] Six feet measured curb face to curb face is generally considered the minimum width for proper growth of small caliper trees (less than 4 inches).
[2] Wider medians provide room for larger caliper trees and more extensive landscaping.
[3] A 10-foot lane provides for a turn lane without a concrete traffic separator.
[4] Includes a 10-foot turn lane and a 6-foot pedestrian refuge.



Well-designed street medians bring multiple benefits. (Credit: Dan Burden)

OTHER GEOMETRIC DESIGN ELEMENTS

Vertical Alignment

The American Association of State Highway and Transportation Officials (AASHTO) Geometric Design of Highways and Streets manual (AASHTO Green Book) provides acceptable values for designing vertical curves for living streets. The values used in design of vertical curve design should be selected based on the design speed appropriate for the context of the street. Using higher values can contribute to increased vehicle speeds and may require increased modification to the natural terrain, increasing negative impacts to the natural environment.

Horizontal Alignment

The AASHTO Green Book provides appropriate values for designing horizontal curves for living streets. The values used in horizontal curve design should be selected based on the design speed appropriate for the context of the street. Using higher values can contribute to increased vehicle speeds and also impacts the character of the street. Larger horizontal curves also create a more "suburban" or "rural" highway feel.

Sight Distance

Stopping Sight Distance

The AASHTO Green Book provides appropriate values for designing stopping sight distance for living streets. The 2004 AASHTO Guide for Achieving Flexibility in Highway Design is based on the latest research concerning the establishment of stopping sight distance. The document states that the established values for stopping sight distance are very conservative and provide adequate flexibility without creating increased crash risk. Consequently, appropriate design speed selection is critical to avoid overly negative impacts such as unnecessarily limiting on-street parking and tree planting.

Intersection Sight Distance

Intersection sight distance should be calculated in accordance with the AASHTO Green Book using the design speed appropriate for the street being evaluated. When executing a crossing or turning maneuver onto a street after stopping at a stop sign, stop bar, or crosswalk, drivers will move slowly forward to obtain sight distance (without intruding into the crossing travel lane) stopping a second time as necessary.

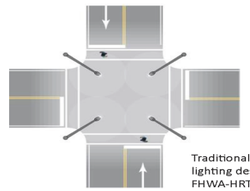
Therefore, when curb extensions are used or on-street parking is in place, the vehicle can be assumed to move forward on the second step movement, stopping just shy of the travel lane, increasing the driver's potential to see further than when stopped at the stop bar. As a result, the increased sight distance provided by the two step movement allows parking to be located closer to the intersection.

Horizontal Clearance/Clear Zone

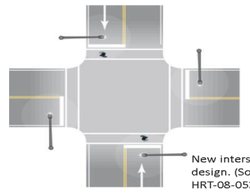
Horizontal clearance is the lateral distance from a specified point on the roadway, such as the edge of the travel lane or face of the curb, to a roadside feature or object. The clear zone is the relatively flat unobstructed area that is to be provided for safe use by errant vehicles.

In urban areas, horizontal clearance based on clear zone requirements for rural and suburban highways is not practical because urban areas are characterized by more bicyclists and pedestrians, lower speeds, more dense abutting development, closer spaced intersections and accesses to property, higher traffic volumes and restricted right-of-way. Therefore, streets with curbs and gutters in urban areas do not have sufficiently wide roadsides to provide clear zones.

Consequently, while there are specific horizontal clearance requirements for these streets, they are based on clearances for normal operation and not based on maintaining a clear roadside for errant vehicles. The minimum horizontal clearance is 1.5 feet measured from the face of the curb. This is primarily intended for sign posts and poles, so they aren't hit by large vehicles with overhangs maneuvering close to the curb.



Traditional intersection lighting design. (Source: FHWA-HRT-08-053)



New intersection lighting design. (Source: FHWA-HRT-08-053)

Traveled Way Lighting

Pedestrians are disproportionately hit when visibility is poor: at dusk, night and dawn. Many crossings are not well lit. Providing illumination or improving existing lighting increases nighttime safety at intersections and midblock crossings, as motorists can better see pedestrians. Pedestrian scale lighting along sidewalks provides greater security, especially for people walking alone at night.

Transit stops require both kinds of lighting: strong illumination of the traveled way for safer street crossing and pedestrian scale illumination at the stop or shelter for security.

FHWA-HRT-08-053, Informational Report on Lighting Design for Midblock Crosswalks, (April 2008) is a very good resource. It also contains very useful information about lighting design for pedestrians at intersections.

If bus stops are present between roadway sections, it is necessary to illuminate the roadway and the bus stop. The lighting at the bus stop is essential to provide safety for transit users. Bus stops have high pedestrian activity; therefore, it is necessary to provide adequate lighting at these facilities.

5. Intersection Design

INTRODUCTION

Most conflicts between roadway users occur at intersections, where travelers cross each other's path. Good intersection design indicates to those approaching the intersection what they must do and who has to yield. Exceptions to this include places where speeds are low (typically less than 18 mph) or where a shared space design ("naked streets") causes users to approach intersections with caution. Conflicts for pedestrians and bicyclists are exacerbated due to their greater vulnerability, lesser size and reduced visibility to other users.

This chapter describes design considerations in intersection geometry and intersection signalization, as well as roundabouts and other features to improve safety, accessibility and mobility for all users. The benefits and constraints of each feature are examined, and the appropriate use and design of each feature are described.



Lively intersection. (Credit: Dan Burden)

PRINCIPLES OF INTERSECTION DESIGN

The following principles apply to the design of intersections:

- Good intersection designs are compact.
- Conflicts should be avoided.
- Simple right-angle intersections are best for all users since many intersection problems are worsened at skewed and multi-legged intersections.
- Uninterrupted/free-flowing movements should be avoided.
- Access management practices should be used to remove additional vehicular conflict points near the intersection.
- Signal timing should consider the safety and convenience of all users and should not hinder bicycle or foot traffic with overly long waits or insufficient crossing times.

INTERSECTION GEOMETRY

Intersection geometry is a critical element of intersection design, regardless of the type of traffic control used. Geometry sets the basis for how all users traverse intersections and interact with each other. The principles of intersection geometry apply to both street intersections and freeway on- and off-ramps.

Skewed Intersections

Skewed intersections are generally undesirable and introduce the following complications for all users:

- The travel distance across the intersection is greater, which increases exposure to conflicts and lengthens signal phases for pedestrians and vehicles.
- Skews require users to crane their necks to see other approaching users, making it less likely that some users will be seen.
- Obtuse angles encourage speeding

To alleviate the problems with skewed intersections, several options are available:

- Every reasonable effort should be made to design or redesign the intersection closer to a right angle. Some right-of-way may have to be purchased, but this can be offset by the larger area no longer needed for the intersection, which can be sold back to adjoining property owners or repurposed for a pocket park, rain garden, greenery, etc.



Skewed intersection, Airline Rd/Alameda St in Corpus Christi (Credit: FNI)

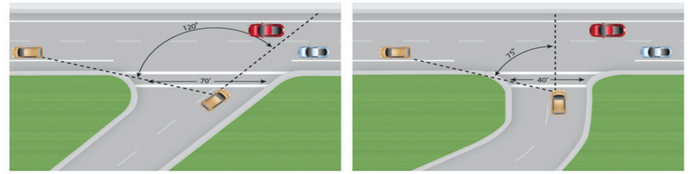


Exhibit 9: *Realigning the skewed intersection in the graphic on the left to the right-angle connection in the graphic on the right results in less exposure distance and better visibility for all users. (Credit: Michele Weisbart)*

- Pedestrian refuges should be provided if the crossing distance exceeds approximately 40 feet.
- General use travel lanes and bike lanes may be striped with dashes to guide bicyclists and motorists through a long undefined area

Multi-leg intersections (more than two approaching roadways) are generally undesirable and introduce the following complications for all users:

- Multiple conflict points are added as users arrive from several directions.
- Users may have difficulty assessing all approaches to identify all possible conflicts.
- At least one leg will be skewed.
- Users must cross more lanes of traffic and the total travel distance across the intersection is increased.

To alleviate the problems with multi-leg intersections, several options are available:

- Every reasonable effort should be made to design the intersection so there are no more than four legs. This is accomplished by removing one or more legs from the major intersection and creating a minor intersection further up or downstream.
- As an alternative, one or more of the approach roads can be closed to motor vehicle traffic, while still allowing access for pedestrians and bicyclists.
- Roundabouts should be considered.
- Pedestrian refuges should be created if the crossing distance exceeds approximately 40 feet.
- General use travel lanes and bike lanes may be striped with dashes to guide bicyclists and motorists through a long undefined area.

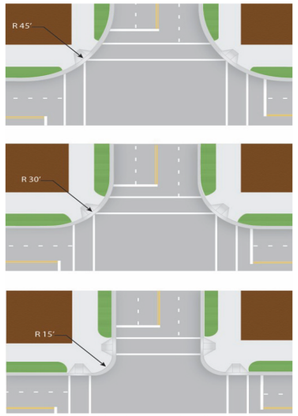
Corner Radii

This intersection geometry feature has a significant impact on the comfort and safety of non-motorized users. Small corner radii provide the following benefits:

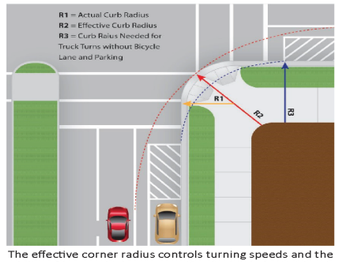
- Smaller, more pedestrian-scale intersections resulting in shorter crossing distances
- Slower vehicular turning speeds
- Reduced pedestrian crossing distance and crossing time
- Better geometry for installing perpendicular ramps for both crosswalks at each corner
- Simpler, more appropriate crosswalk placement, in line with the approaching sidewalks

When designing corner radii for complete streets, the default design vehicle should be the passenger (P) vehicle. Therefore, the default corner radius is 15 feet. Larger design vehicles should be used only where they are known to regularly make turns at the intersection, and corner radii should be designed based on the larger design vehicle traveling at crawl speed. In addition, designers should consider the effect that bicycle lanes and on-street parking have on the effective radius, increasing the ease with which large vehicles can turn.

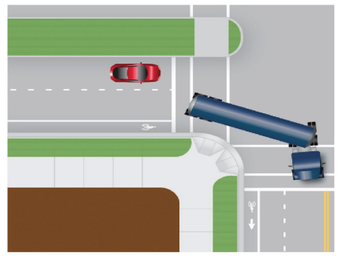
Encroachment by large vehicles is acceptable onto multiple receiving lanes. When a design vehicle larger than the passenger (P) vehicle is used, the truck or bus should be allowed to turn into all available receiving lanes. Larger, infrequent vehicles (the "control vehicle") can be allowed to encroach on multiple departure lanes and partway into opposing traffic lanes.



Tighter corner radii reduce crossing distance and slow turning traffic. (Credit: Michele Weisbart)



The effective corner radius controls turning speeds and the ability of large vehicles to turn. (Credit: Michele Weisbart)



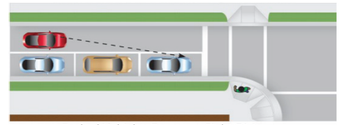
Corner radii can be kept smaller by allowing trucks and buses to turn into multiple receiving lanes. (Credit: Michele Weisbart)

Curb Extensions

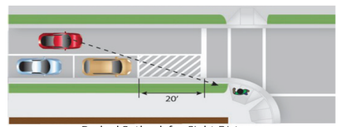
Where on-street parking is allowed, curb extensions should be considered to replace the parking lane at crosswalks. Curb extensions should be the same width as the parking lane. The appropriate corner radius should be applied based on the guidance in the section above. Due to reduced road width, the corner radius on a curb extension may need to be larger than if curb extensions were not installed.

Curb extensions offer many benefits related to livability:

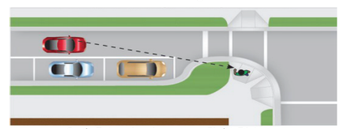
- Reduced pedestrian crossing distance resulting in less exposure to vehicles and shorter pedestrian clearance intervals at signals
- Improved visibility between pedestrians and motorists
- A narrowed roadway, which has a potential traffic calming effect
- Additional room for street furniture, landscaping and curb ramps
- Slower turning vehicles
- Additional on-street parking potential due to improved sight lines at intersections. Since curb extensions allow pedestrians to walk out toward the edge of the parking lane without entering the roadway, pedestrians can better see vehicles and motorists can better see pedestrians.
- Management of streetwater runoff



Parked Vehicles Decrease Sight Distance



Parked Setback for Sight Distance



Curb Extension Improves Sight Distance (Credit: Michele Weisbart)

To fully achieve livability goals, the curb extension and parking area can be integrated into the furniture zone portion of the sidewalk corridor. This technique involves using similar surface materials for the curb extension, parking area and the sidewalk. Instead of the curb extensions appearing to jut out into the street, the parking appears as "parking pockets" in the furniture zone.



Integrating curb extensions and on-street parking into the sidewalk corridor enhances pedestrian safety and the walking experience. (Credit: Michele Weisbart)

To reinforce this design where street grades permit, the gutter line and drainage grates should be placed between the travel lane and the parking lane/curb extensions. This is called a "valley gutter" and creates a stronger visual cue separating the parking lane from the bicycle lane or travel lane. It can sometimes allow existing drainage infrastructure to be left in place.



An example of integrating curb extensions and parking into the sidewalk corridor by placing a valley gutter between the parking and the traveled way. (Credit: Michele Weisbart)

Crosswalk And Ramp Placement

Crosswalks and ramps at intersections should be placed so they provide convenience and safety for pedestrians. The following recommended practices will help achieve these goals:

- Allow crossings on all legs of an intersection, unless there are no pedestrian accessible destinations on one or more of the corners. Closing a crosswalk usually results in a pedestrian either walking around several legs of the intersection, exposing them to more conflicts, or crossing at the closed location, with no clear path or signal indication as to when to cross.
- Provide marked crosswalks at signalized intersections.
- Place crosswalks as close as possible to the desire line of pedestrians, which is generally in line with the approaching sidewalks.
- Provide as short as possible a crossing distance to reduce the time that pedestrians are exposed to motor vehicles; this is usually as close as possible to right angles across the roadway, except for skewed intersections.
- Ensure that there are adequate sight lines between pedestrians and motorists. This typically means that the crosswalks should not be placed too far back from the intersection.
- When a raised median is present, extend the nose of the median past the crosswalk with a cut-through for pedestrians.
- Provide one ramp per crosswalk (two per corner for standard intersections with no closed crosswalks). Ramps must be entirely contained within a crosswalk (the crosswalk can be flared to capture a ramp that cannot be easily relocated). Align the ramp run with the crosswalk when possible, as ramps that are angled away from the crosswalk may lead some users into the intersection.

At intersections where roads are skewed or where larger radii are necessary for trucks, it can be difficult to determine the best location for crosswalks and sidewalk ramps. In these situations, it is important to balance the recommended practices above. Tighter curb radii make implementing these recommendations easier, especially Recommendations 3, 4 and 5.



One curb ramp per crosswalk should be provided at corners. Ramps should align with sidewalks and crosswalks. (Credit: Michele Weisbart)

Crosswalk On-Street parking Near Intersections

On-street parking should be positioned far enough away from intersections to allow for good visibility of pedestrians preparing to cross the street. Curb extensions allow parking to be placed closer to the intersection.

Right-Turn Channelization Islands

Right-turn lanes should generally be avoided as they increase the size of the intersection, the pedestrian crossing distance and the likelihood of right-turns-on-red by inattentive motorists who do not notice pedestrians on their right. However, where there are heavy volumes of right turns (approximately 200 vehicles per hour or more), a right-turn lane may be the best solution to provide additional vehicle capacity without adding additional lanes elsewhere in the intersection. For turns onto roads with only one through lane and where truck turning movements are rare, providing a small corner radius at the right-turn lane often provides the best solution for pedestrians' safety and comfort.

At intersections of multi-lane roadways where trucks make frequent right turns, a raised channelization island between the through lanes and the right-turn lane is a good alternative to an overly large corner radius and enhances pedestrian safety and access. If designed correctly, a raised island can achieve the following objectives:



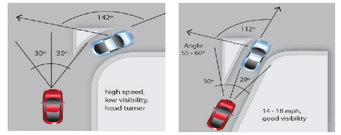
Traffic channelization is an effective mitigation strategy when intersection radii reduction is not an option. (Credit: Michele Weisbart)

- Allow pedestrians to cross fewer lanes at a time
- Allow motorists and pedestrians to judge the right turn/pedestrian conflict separately
- Reduce pedestrian crossing distance, which can improve signal timing for all users
- Balance vehicle capacity and truck turning needs with pedestrian safety
- Provide an opportunity for landscape and hardscape enhancement

The following design practices for right-turn lane channelization islands should be used to provide safety and convenience for pedestrians, bicyclists and motorists:

- Provide a yield sign for the slip lane
- Provide at least a 60-degree angle between vehicle flows, which reduces turning speeds and improves the yielding driver's visibility of pedestrians and vehicles
- Place the crosswalk across the right-turn lane about one car length back from where drivers yield to traffic on the other street, allowing the yielding driver to respond to a potential pedestrian conflict first, independently of the vehicle conflict, and then move forward, with no more pedestrian conflict

These goals are best accomplished by creating an island that is roughly twice as long as it is wide. The corner radius will typically have a long radius (150 feet to 300 feet) followed by a short radius (20 feet to 50 feet). When creating this design, it is necessary to allow large trucks to turn into multiple receiving lanes. This design is often not practical for right-turn lanes onto roads with only one through lane. This right-turn channelization design is different from designs that provide free-flow movements (through a slip lane) where right-turning motorists turn into an exclusive receiving lane at high speed. Right turns should be signal-controlled in this situation to provide for a signalized pedestrian walk phase.



Sharper angles of slip lanes are important to slow cars and increase visibility. (Credit: Michele Weisbart)

SIGNALIZED INTERSECTIONS

Signalized intersections provide unique challenges and opportunities for livable communities and complete streets. On one hand, signals provide control of pedestrians and motor vehicles with numerous benefits. Where signalized intersections are closely spaced, signals can be used to control vehicle speeds by providing appropriate signal progression on a corridor.

Traffic signals allow pedestrians and bicyclists to cross major streets with only minimal conflict with motor vehicle traffic. On the other hand, traffic signals create challenges for non-motorized users. Signalized intersections often have significant turning volumes, which conflict with concurrent pedestrian and bicycle movements. In many cases, roundabouts offer safer, more convenient intersection treatment than signals.

To improve livability and pedestrian safety, signalized intersections should:

- Provide signal progression at speeds that support the target speed of a corridor whenever feasible
- Provide short signal cycle lengths, which allow frequent opportunities to cross major roadways, improving the usability and livability of the surrounding area for all modes
- Ensure that signals detect bicycles
- Place pedestrian signal heads in locations where they are visible
- At locations with many crossing pedestrians, time the pedestrian phase to be on automatic recall, so pedestrians don't have to seek and push a pushbutton.
- Where few pedestrians are expected and automatic recall of walk signals is not desirable, place pedestrian pushbuttons in convenient locations, using separate pedestals if necessary. Use the recommendations regarding pushbutton placement for accessible pedestrian signals found in the Manual on Uniform Traffic Control Devices (MUTCD).
- Include pedestrian signal phasing that increases safety and convenience for pedestrians, as discussed in more detail below

Operational Design

Approximately 2 percent of intersections are signalized, and approximately 20 percent of all intersection crashes occur at signalized intersections. Unfortunately, in many locations signalization is the only option because of right-of-way limitations, high vehicle volumes and the need to create gaps to provide reasonable operation for all users.

Over the years, the most common signal hardware has changed from post-mounted signals to overhead mast arms. This change has lifted drivers' eyes upward and created a situation in many east/west streets where drivers must look toward a rising or setting sun that can block vision of a signal. In urban areas the large mast arms are intrusive. As part of the conversion to healthier streets, changing to post-mounted signals in urban areas could lower the cost of installing and maintaining signals, reduce the vision intrusion, and help lower a driver's vision back to pedestrians. There are two advantages for pedestrians and bicyclists to pole-mounted signals:

- Drivers have to stop back from the crosswalk to see the indication so they are less likely to encroach into the crosswalk, and more likely to see pedestrians and bicyclists when turning right.
- Mast-arm signals encourage higher speeds since drivers can see several in a row. If they are green, drivers are more likely to accelerate. But pole-mounted signals are typically only visible to drivers closer to the intersection, causing them to drive slower



Pole-mounted signal. (Credit: Ryan Snyder)

Phasing

A signal phase is defined as the cycle length allocated to a traffic movement at an intersection receiving the right-of-way, or to any combination of traffic movements receiving the right of way simultaneously. The combination of all phases is equal to one cycle length.

Basic Signal Timing

The "timing" is the time in seconds allocated to various vehicular and pedestrian movements. A traffic control signal transmits information to the users by selective illumination of different color lights at a signalized intersection. The illuminated color indicates the user should take a specific action at the signalized intersection:

- **Green time**. Green time is when motorists and bicyclists may proceed through the intersection.
- **Yellow time**. Yellow time is the cycle phase before changing to the red interval that prohibits traffic movement. It signifies to users the light is about to turn red and they should stop if they can safely do so, or continue proceeding if that is safer. A properly timed yellow time interval is important to reduce signal violations by users passing through the intersection.
- **All-red time**. All-red time is that portion of a traffic cycle time where all vehicles are prohibited from any movements at the intersection. The all-red time follows the yellow time interval and precedes the next green interval. The purpose of the all-red time is to allow vehicles that entered the intersection late during the yellow time to clear the intersection before the traffic signal displays green time for conflicting approaches.

Left-Turn Phasing

The most commonly used "left turn" phases at an intersection with a left-turn lane are:

- **Permissive**. Under permissive left turn phasing, through traffic may proceed straight through the intersection with a green ball, as side traffic is stopped (with a red ball); the left turning vehicles are permitted to make the turn when they find a safe and adequate gap from the approaching vehicles. Permissive left turn phases create conflicts with pedestrians crossing the street as the timing puts the two on a collision course.
- **Protected**. Under protected left turn phasing, drivers can only turn left with a left-turn green arrow. Protected left-turn phases are preferred to permissive phases because they eliminate the inherent conflict between left turning vehicles and pedestrians. Protected left turns provide the greatest safety for pedestrians. Permissive phases are typically used to maintain a higher LOS for motorists



Permissive left-turn signal. Protected left-turn signal.

(Credit: Michele Weisbart)

Pedestrian Phasing

Basic pedestrian signal timing principles should be combined with innovative pedestrian signal timing techniques to enhance pedestrian safety and convenience.

Pedestrian signal heads provide indications exclusively intended for controlling pedestrian traffic. These signal indications consist of the illuminated symbols of a WALKING PERSON (symbolizing WALK) and an UPRAISED HAND (symbolizing DON'T WALK). Pedestrian signal head indications have the following meanings:

- A steady WALKING PERSON (WALK) signal indication means that a pedestrian facing the signal indication is permitted to start to cross the roadway in the direction of the signal indication, possibly in conflict with turning vehicles.
- A flashing UPRAISED HAND (DON'T WALK) signal indication means that a pedestrian shall not start to cross the roadway in the direction of the signal indication, but that any pedestrian who has already started to cross shall proceed to the far side of the traveled way of the street or highway, unless otherwise directed by a traffic control device to proceed only to a median or pedestrian refuge area.
- A steady UPRAISED HAND (DON'T WALK) signal indication means that a pedestrian shall not enter the roadway in the direction of the signal indication.

The text below discusses the timing of each of these indicators.

Walk Interval

The WALK interval (white walking person) must typically be a minimum of 7 seconds. However, to provide more convenience for pedestrians, and possibly more safety due to better pedestrian behavior, the WALK interval should be maximized using the following techniques:

- Instead of providing the minimum WALK interval, maximize the WALK interval within the available green interval. This is accomplished by subtracting the necessary pedestrian clearance interval (discussed below) from the available green time for the concurrent vehicular movements.
- Except at intersections where pedestrians are relatively few, and anywhere that vehicle signals are set on fixed time, WALK intervals should be set on "recall" so that they are automatically provided during every signal cycle.
- Where a major street intersects a minor side street, the WALK interval for crossing the minor street can be set on recall, concurrent with the green interval for the parallel through vehicle movement, which is typically set to recall as well. This minimizes pedestrian delay along the major street with no impact to motor vehicle capacity.

Pedestrian Clearance Interval

The procedures for calculating the timing of the pedestrian clearance interval (flashing orange hand) are included in the Manual on Uniform Traffic Control Devices (MUTCD). The pedestrian clearance interval is calculated to allow a pedestrian traveling at a walking speed of 3.5 feet per second to travel the length of the crosswalk. The crosswalk length should be measured from the center of one curb ramp to the center of the opposing curb ramp. This speed allows pedestrians, especially seniors, children and disabled people, to clear the intersection.

The MUTCD includes another test that requires the total of the WALK interval plus the pedestrian clearance interval to be sufficient to allow a pedestrian traveling at a walking speed of 3 feet per second to travel the length of the crosswalk, measured from the top of one ramp to the bottom of the opposing ramp. Any additional time that is required to satisfy this second requirement should be added to the walk interval. In neighborhoods where high numbers of slow pedestrians are present, such as near senior centers, rehabilitation centers and disabled centers, the interval should be set for even slower speeds.

The MUTCD also requires that countdown pedestrian signals be installed for all pedestrian signals. These signals count down the pedestrian clearance interval and provide more information to pedestrians, allowing them to more easily adjust their walking patterns to ensure they are out of the crosswalk before the end of the pedestrian clearance interval. Research on pedestrian countdown signals has determined:

- Pedestrians understand how they work.
- Fewer people start walking in the pedestrian clearance interval.
- Very few pedestrians are left in the crosswalk during the steady orange hand.
- Drivers don't accelerate to beat the light.
- Research in San Francisco shows a 25 percent reduction in all crashes.



Pedestrian countdown signals. (Credit: Michele Weisbart)

Other Signal Design Changes for Pedestrians

Where appropriate, use signal timing and operations techniques that minimize conflicts with pedestrians and motor vehicles, including the following:

- Protected only left-turn phases
- Leading pedestrian intervals (LPI) where the pedestrian WALK interval is displayed 2 to 5 seconds prior to the concurrent green interval. This enables pedestrians to enter the crosswalk before drivers turn, increasing their chances of being seen by drivers.
- Prohibiting right-turns-on-red where there are restricted sight lines between motorists and pedestrians, where there are an unusual number of pedestrian conflicts with turns on red compared to right-turns-on-green, or where a leading pedestrian interval is used
- Signs that remind drivers to yield to pedestrians when turning at signals
- Pedestrian-user-friendly-intelligent (PUFFIN) signals, which detect slower pedestrians in crosswalks and add clearance interval time to the pedestrian signal
- Pedestrian scrambles, which stop traffic on all legs of the intersection and allow pedestrians to cross diagonally, may be used where turning vehicles conflict with very high pedestrian volumes. Although pedestrians can cross in any direction during the pedestrian phase, pedestrians typically have to wait for both vehicle phases before they get the walk signal again. Scramble intersections can incorporate a walk phase concurrent with the green phase for pedestrians continuing along a straight path to eliminate this delay.



Benefits of LPIs. (Source: FHWA)

ROUNDABOUTS

Modern roundabouts are potentially the cheapest, safest and most aesthetic form of traffic control for many intersections. A roundabout is an intersection design with the following characteristics and features.

Users approach the intersection, slow down, stop and/or yield to pedestrians in a crosswalk, and then enter a circulating roadway, yielding to drivers already in the roundabout. The circulating roadway encircles a central island around which vehicles travel counterclockwise. Splitter islands force drivers to turn right and provide a refuge for pedestrians. Deflection encourages slow traffic speeds, but allows movement by trucks. A landscaped visual obstruction in the central island obscures the driver's view of the road ahead, to discourage users from entering the roundabout at high speeds. Pedestrians are not allowed to access the central island, which should not contain attractions. The central island can vary in shape from a circle to a "square-a-bout" in historic areas, ellipses at odd shaped intersections, dumbbell, or even peanut shapes.

Each leg of a roundabout has a triangular splitter island that provides a refuge for pedestrians, prevents drivers from turning left (the "wrong-way"), guides drivers through the roundabout by directing them to the edge of the central island, and helps to slow drivers. Roundabouts can range from quite small to quite large, from a central island diameter of about 12 feet for a traffic calming device at a neighborhood intersection to 294 feet to the back of sidewalk on a large multi-lane roundabout.

Advantages of Roundabouts

Roundabouts reduce vehicle-to-vehicle and vehicle-to-pedestrian conflicts and, thanks to a substantial reduction in vehicle speeds, reduce all forms of crashes and crash severity. In particular, roundabouts eliminate the most dangerous and common crashes at signalized intersections: left-turn and right-angle crashes. Other benefits of roundabouts include the following:

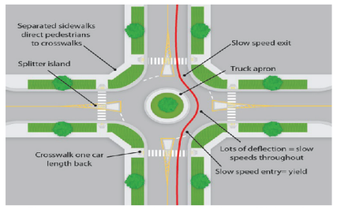
- Little to no delay for pedestrians, who have to cross only one direction of traffic at a time
- Improved accessibility to intersections for bicyclists through reduced conflicts and vehicle speeds
- A smaller carbon footprint (no electricity is required for operation and fuel consumption and air pollution are reduced as motor vehicles spend less time idling and don't have to accelerate as often from a dead stop)
- The opportunity to reduce the number of vehicle lanes between intersections (e.g., increased vehicle capacity at intersections allows reducing a five-lane road to a two-lane road)
- Little to no stopping during periods of low flow
- Significantly reduced maintenance and operational costs because the only costs are related to the landscape and litter control
- Reduced delay, travel time and vehicle queue lengths
- Lowered noise levels
- Simplified intersections, facilitated U-turns
- The ability to create a gateway and/or a transition between distinct areas through landscaping
- When constructed as a part of a new road or the reconstruction of an existing road, the cost of a roundabout is minimal and can be cheaper than the construction of an intersection and the associated installation of traffic signals and additional turn lanes

The primary disadvantage to roundabouts is that sight-impaired people can have difficulty navigating around large roundabouts. But this can be mitigated with ground level wayfinding devices.

General Design Elements of Roundabouts

Central Island

The design of the central island is an important element of a roundabout. In conjunction with well-designed approach and departure lanes, the central island controls vehicle speeds through deflection and controls the size of vehicles that can pass through and turn at a roundabout. It provides space for landscaping to beautify an intersection or create a focal point or community enhancement, but it also provides space for the inclusion of a vertical element such as a tree, which is important in providing long range conspicuity of a roundabout.



Single-lane roundabout. (Credit: Michele Weisbart)

Splitter Islands

Splitter islands and/or medians on each approach serve several functions. Most importantly, they provide a refuge for pedestrians crossing at the roundabout, breaking the crossing into two smaller crossings. This allows pedestrians to select smaller gaps and cross more quickly. Splitter islands and medians direct vehicles toward the edge of the central island and limit the ability of drivers to make left turns the wrong way into the circulating roadway. Splitter islands should have a minimum width of 6 feet, and preferably 8 feet, from the face-of-curb to the opposite face-of-curb.

Truck Apron

Because central islands must be made large enough to deflect and hence control the speed of passenger vehicles, they can limit the ability of trucks to pass through or turn at a roundabout. To accommodate large vehicles, a truck apron (a paved, load-bearing area) is included around the edge of the central island. The truck apron is often paved with a fairly rough texture and raised enough to discourage encroachment by smaller high-speed passenger cars. The truck apron should be 3 inches high.

Pedestrian Crossing

Pedestrian crossings are located one car length away from the circulating roadway to shorten the crossing distance, separate vehicle-to-pedestrian conflicts from vehicle-to-vehicle conflicts, and allow pedestrians to cross between waiting vehicles.

Signing and Marking

Signing and marking should be in compliance with the current version of the MUTCD. For detailed design guidance on roundabouts, refer to the NCHRP Report 672, Roundabouts: An Informational Guide, Second Edition, 2010. However, care must be taken to not oversign roundabouts by including every sign allowed at roundabouts, except for needed directional signs; most roundabouts are designed so their function and use are self-explanatory.



Roundabout: San Diego, CA. (Credit: Michael Wallwork)

Accessibility

Multi-lane roundabouts are more complex for pedestrians and bicyclists to use because of the additional lanes, slightly higher speeds and longer crossing distances. Crossing by some pedestrians with disabilities is a more complex task. As a consequence, the current draft (Proposed Right-of-Way Accessibility Guidelines) PROWAG includes a requirement to install accessible pedestrian signals at all crosswalks across any roundabout approach with two or more lanes in one direction. The PROWAG requirement does not specify the type of signal except that it must be accessible, including a locator tone at the pushbutton, with audible and vibrotactile indications of the pedestrian walk interval.

Mini Roundabouts

Mini-roundabouts are a new form of roundabout that includes a traversable central island and traversable splitter islands to accommodate large vehicles.

Appropriate Applications

Mini-roundabouts are used in low-speed urban environments, where operating speeds are 30 mph or less, and right-of-way constraints preclude the use of a standard roundabout. The design is based on passenger vehicles passing through the roundabout without traveling over the central island, whereas large vehicles will turn over the central island and in some cases, the splitter islands.

Design

The design of mini-roundabouts is similar to other roundabouts in that the design vehicle for each movement must be determined following a capacity analysis. The design is undertaken using the same combination of design vehicle templates and speed curves.



Mini roundabout/neighborhood traffic circle. (Credit: Ryan Snyder)

6. Universal Pedestrian Access

INTRODUCTION

Nowhere is the concept of universal access more important than in the design of the pedestrian environment. While perhaps not intuitively obvious at first glance, this is the realm of streets with the greatest variation in user capabilities, and where attention to design detail is essential to effectively balance user needs. This is also the realm where signs and street furniture are located and where transitions are made between modes (e.g., driver or passenger to pedestrian via parking, bus stop/train station, or bike rack). The pedestrian environment includes sidewalks, curb ramps, crosswalks, bus stops, signs and street furniture.

Without design guidelines, sidewalks are often too narrow, utility poles obstruct travel, steep driveway ramps are impassable to wheelchair users, and bus stops become blocked by the disorderly placement of shelters, poles, trash receptacles and bike racks.





Sidewalks designed without adequate guidelines (Credit: Chanda Singh)



(Credit: FNI)

With well-defined guidelines, sidewalks can be built to accommodate pedestrians of all ages and physical abilities and become inviting pedestrian environments as the adjacent picture shows.

Designing the pedestrian realm for universal access enables persons with disabilities to live independently and lead full, enriched lives; they are able to go to work and to school, to shop and otherwise to engage in normal activities. Moreover, walking environments that accommodate people with disabilities improve walking conditions for everyone. People with strollers can make their way about with ease. Children can have more independence to travel within their communities. Inaccessible pedestrian networks, on the other hand, can lead to people becoming housebound and socially isolated, which in turn can lead to a decline in well-being and a host of associated negative health outcomes such as depression.

This chapter describes the legal framework for accessible design of streets and sidewalks, various users of streets and sidewalks and their needs, and important elements of pedestrian facility design. The chapter ends with sidewalk design guidelines.

PRINCIPLES OF UNIVERSAL PEDESTRIAN ACCESS

The following design principles inform the recommendations made in this chapter and should be incorporated into every pedestrian improvement:

The walking environment should be **safe**, **inviting** and **accessible** to people of all ages and physical abilities.

The walking environment should be **easy to use** and **understand**.

The walking environment should seamlessly **connect** people to places. It should be characterized by **continuous** and well-designed sidewalks, curb ramps and street crossings.

LEGAL FRAMEWORK

Under Title II of the Americans with Disabilities Act (ADA) of 1990, state and local governments and public transit authorities must ensure that all of their programs, services and activities are accessible to and usable by individuals with disabilities. They must ensure that new construction and altered facilities are designed and constructed to be accessible to persons with disabilities. State and local governments must also keep the accessible features of facilities in operable working condition through maintenance measures including sidewalk repair, landscape trimming, work zone accessibility and snow removal.

Public Right-of-Way Accessibility Guidelines (PROWAG)

Under the ADA, the Architectural and Transportation Barriers Compliance Board (U.S. Access Board) is responsible for developing the minimum accessibility guidelines needed to measure compliance with ADA obligations when new construction and alterations projects are planned and engineered. **PROWAG** contains requirements to ensure that pedestrian facilities located in the public right-of-way are readily accessible and usable by pedestrians with disabilities. As of September 2023, these standards are enforceable by law. In 2017, the Texas Department of Licensing and Regulation began allowing TxDOT to use the PROWAG as its de facto 'standards'.

PROWAG requires to provide curb ramps where street level pedestrian walkways cross curbs whenever streets, roadways, or highways are altered. Resurfacing, rehabilitation, reconstruction, historic restoration, or changes or rearrangement of structural parts or elements of a facility, among other things, constitute an alteration under the ADA. This means that where resurfacing a street "involves work on a street or roadway spanning from one intersection to another, and includes overlays of additional material to the road surface, with or without milling", the accessibility and usability of the pedestrian walkway for persons with disabilities must be ensured.

The PROWAG specifies guidelines for pedestrian access routes, alternate pedestrian access routes, accessible pedestrian signals, crosswalks, transit stops and on-street parking.

ADA Transition Plans

In addition to the PROWAG guidelines, Title II of the ADA also requires states and localities to develop ADA Transition Plans that remove barriers to disabled travel.

These plans must:

- Inventory physical obstacles and their location
- Provide adequate opportunity for residents with disabilities to provide input into the Transition Plan
- Describe in detail the methods the entity will use to make the facilities accessible
- Provide a yearly schedule for making modifications
- Name an official/position responsible for implementing the Transition Plan
- Set aside a budget to implement the Transition Plan

ADA Transition Plans are intended to ensure that existing inaccessible facilities are not neglected indefinitely and that the community has a detailed plan in place to provide a continuous pedestrian environment for all residents.

The Texas Department of Transportation (TxDOT) ADA Transition Plan was completed in 2022. The plan included a self-evaluation of TxDOT's services, policies and practices along with a plan to modify policies or practices that discriminate against people with disabilities and physical changes to facilities necessary to achieve "program success". Since 2004, TxDOT has authorized over $280 million in funding to remove then identified barriers and planned to spend $500 million between fiscal years 2022-2025.

The 2022 update identified barriers on TxDOT's physical assets, shown in Exhibit 10 (sidewalks, curb ramps, bus stops, pedestrian signals, safety rest areas, administrative buildings, information centers, ferries), services and means of communication (website, public engagement). The plan included an implementation plan to eliminate these barriers systematically over continuous four-year planning cycles.

Exhibit 10: *TxDOT ADA Transition Plan Pedestrian Access Inventory*

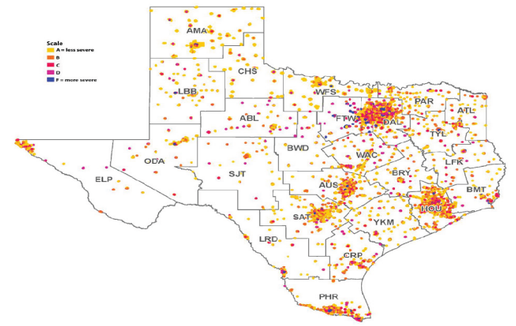


Exhibit 11: *City of Corpus Christi ADA Master Plan*



USERS AND NEEDS

To fully accommodate everyone, designers must consider the widely varying needs and capabilities of the people in the community. People walk at different speeds, some are able to endure long treks, while others can only go short distances. Some use wheelchairs and are particularly sensitive to uneven pavement and surface materials. Others have limited sight and rely on a cane.

People's strengths, sizes and judgmental capabilities differ significantly. The needs of one group of users may be at odds with those of another group of users. For instance, gradual ramps and smooth transitions to the street help people in wheelchairs, but present challenges for the sight-impaired when they can't easily find the end of the sidewalk and beginning of the street.

This section identifies the unique constraints individuals with different types of disabilities and limitations face as pedestrians. Understanding their needs will help ensure more universal design of the sidewalk network.



Walking-aid users need clear sidewalks (Credit: Dan Burden)



Steep cross slopes create difficulties for wheelchair users (Credit: Michael Ronkin)

People With Mobility Impairments

People with mobility impairments range from those who use assistive devices, such as wheelchairs, crutches, canes, orthotics and prosthetic devices, to those who use no such devices but face constraints walking long distances on non-level surfaces or on steep grades.

Wheelchair and scooter users are most affected by the following:

- Uneven surfaces that hinder movement
- Rough surfaces that make rolling difficult and can cause pain, especially for people with back injuries
- Steep uphill slopes that slow the user
- Steep downhill slopes that cause a loss of control
- Cross slopes that make the assistive device unstable
- Narrow sidewalks that impede the ability of users to turn or to cross paths with others
- Devices that are hard to reach, such as push buttons for walk signals and doors
- The lack of time to cross the street

Walking-aid users are most affected by the following:

- Steep uphill slopes that make movement slow or impossible
- Steep downhill slopes that are difficult to negotiate
- Cross slopes that cause the walker to lose stability
- Uneven surfaces that cause these users to trip or lose balance
- Long distances
- Situations that require fast reaction time
- The lack of time to cross the street

Prosthesis users often move slowly and have difficulty with steep grades or cross slopes.

People with Visual Impairments

People with visual impairments include those who are partially or fully blind, as well as those who are colorblind. Visually impaired people face the following difficulties:

- Limited or no visual perception of the path ahead
- Limited or no visual information about their surroundings, especially in a new place
- Changing environments where they rely on memory
- Lack of non-visual information
- Inability to react quickly
- Unpredictable situations, such as complex intersections that are not at 90 degrees
- Inability to distinguish the edge of the sidewalk from the street
- Compromised ability to detect the proper time to cross a street
- Compromised ability to cross a street along the correct path
- Need for more time to cross the street

People with Cognitive Impairments

People with cognitive impairments encounter difficulties in thinking, learning and responding, and in performing coordinated motor skills. Cognitive disabilities can cause some to become lost or have difficulty finding their way. They may also not understand standard street signs and traffic signals. Some may not be able to read and benefit from signs with symbols and colors.



Sight-impaired pedestrians need additional sensory cues. (Credit: Dan Burden)

Children and Older Adults

Children and many older adults don't fall under specific categories for disabilities, but must be taken into account in pedestrian planning. Children are less mentally and physically developed than adults and have the following characteristics:

- Less peripheral vision
- Limited ability to judge speed and distance
- Difficulty locating sounds
- Limited or no reading ability so don't understand text signs
- Occasional impulsive or unpredictable behavior
- Little familiarity with traffic
- Difficulty in carrying packages

The natural aging process generally results in at least some decline in sensory and physical capability. As a result, many older adults experience the following:

- Declining vision, especially at night
- Decreased ability to hear sounds and detect where they come from
- Less strength to walk up hills and less endurance overall
- Reduced balance, especially on uneven or sloped sidewalks
- Slowed reaction times to dangerous situations
- Slowed walking speed
- Increased fragility and frailty: their bodies are more likely to be seriously injured in a fall or vehicular crash and their recovery becomes longer and more tenuous. This makes older pedestrians the most vulnerable pedestrians.

PEDESTRIAN FACILITY DESIGN

To provide a seamless path of travel throughout the community that is accessible to all, designers should consider five important elements: sidewalks, curb ramps, crosswalks, signals and bus stops.

Sidewalks

Sidewalks should provide a comfortable space for pedestrians between the roadway and adjacent land uses. Sidewalks along city streets are the most important component of pedestrian mobility. They provide access to destinations and critical connections between modes of travel, including automobiles, transit and bicycles. General provisions for sidewalks include pathway width, slope, space for street furniture, utilities, trees and landscaping and building ingress/egress.

Sidewalks include four distinct zones as illustrated in Exhibit 12: the frontage zone, the pedestrian (aka walking) zone, the furniture zone and the curb zone. The minimum widths of each of these zones vary based on street classifications as well as land uses. The Street Classifications section in this chapter describes these recommendations in more detail as applied to individual cities. The table at the end of this chapter recommends minimum widths for each zone for different street types and land uses.

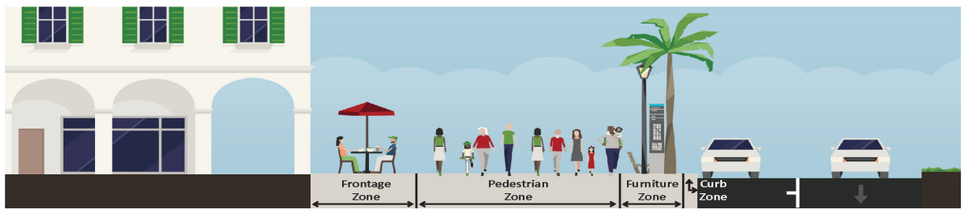
Frontage Zone

The frontage zone is the portion of the sidewalk located immediately adjacent to buildings and provides shy distance from buildings, walls, fences, or property lines. It includes space for building-related features such as entryways and accessible ramps. It can include landscaping as well as awnings, signs, news racks, benches and outdoor café seating. In single family residential neighborhoods, landscaping typically occupies the frontage zone.

Furniture Zone

The furniture zone is located between the curb line and the pedestrian zone. The furniture zone should contain all fixtures, such as street trees, bus stops and shelters, parking meters, utility poles and boxes, lamp posts, signs, bike racks, news racks, benches, waste receptacles, drinking fountains and other street furniture to keep the pedestrian zone free of obstructions. In residential neighborhoods, the furniture zone is often landscaped. Resting areas with benches and space for wheelchairs should be provided in high volume pedestrian districts and along blocks with a steep grade to provide a place to rest for older adults, wheelchair users and others who need to catch their breath.

Exhibit 12: *Sidewalk Zones*



Pedestrian Zone

The pedestrian zone, situated between the frontage zone and the furniture zone, is the area dedicated to walking and should be kept clear of all fixtures and obstructions. Within the pedestrian zone, the Pedestrian Access Route (PAR) is the path that provides continuous connections from the public right-of-way to building and property entry points, parking areas and public transportation.

This pathway is required to comply with ADA guidelines and is intended to be a seamless pathway for wheelchair and white cane users. As such, this route should be firm, stable and slip-resistant, and should comply with maximum cross slope requirements (2 percent grade). The walkway grade shall not exceed the general grade of the adjacent street. Aesthetic textured pavement materials (e.g., brick and pavers) are best used in the frontage and furniture zones, rather than the PAR. The PAR should be a minimum of 4 feet, but preferably at least 5 feet in width to provide adequate space for two pedestrians to comfortably pass or walk side by side. All transitions (e.g., from street to ramp or ramp to landing) must be flush and free of changes in level. The engineer should determine the pedestrian zone width to accommodate the projected volume of users. In no case will this zone be less than the width of the PAR.

Non-compliant driveways often present significant obstacles to wheelchair users. The cross slope on these driveways is often much steeper than the 2 percent maximum grade. Driveway aprons that extend into the pedestrian zone can render a sidewalk impassable to users of wheelchairs, walkers and crutches. They need a flat plane on which to rest all four supports (two in the case of crutches). To provide a continuous PAR across driveways, aprons should be confined to the furniture and curb zones.

Curb Zone

The curb zone serves primarily to prevent water and cars from encroaching on the sidewalk. It defines the areas of pedestrian and automobile activity in the right-of-way. It is the area people using assistive devices must traverse to get from the street to the sidewalk, so its design is critical to accessibility.

Other Sidewalk Guidelines

- Landscaped buffers or fences should separate sidewalks from off-street parking lots or off-street passenger loading areas.
- Pedestrian and driver sight distances should be maintained near driveways. Fencing and foliage near the intersection of sidewalks and driveways should ensure adequate sight distance as vehicles enter or exit.
- Where no frontage zone exists, driveway ramps usually violate cross slope requirements. In these situations, sidewalks should be built back from the curb at the driveway as shown in the adjacent photo.



Routing sidewalks around driveway ramps maintain a flush surface. (Credit: Dan Burden)

LAND USE AND SIDEWALK DESIGN GUIDELINES

The sidewalk design guidelines in this chapter integrate design and land use to provide safe and convenient passage for pedestrians. Sidewalks should have adequate walking areas and provide comfortable buffers between pedestrians and traffic. These guidelines will ensure sidewalks in all development and redevelopment provide access for people of all ages and physical abilities.

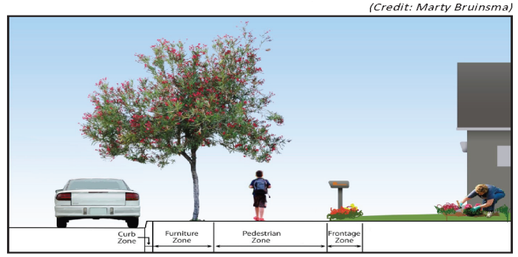
Sidewalks will vary according to the type of street. A local street with residences will require different sidewalk dimensions than a boulevard with commercial establishments. The following descriptions indicate the type of pedestrian activity expected at each of the specified land uses. The graphics illustrate the minimum widths of the sidewalk zones for each of the contexts. The matrix in the following section provides specific minimum requirements for the four sidewalk zones according to combinations of land use and street classifications.

The Furnishing Zone serves an important function for the pedestrian by creating a more comfortable and safer pedestrian zone. Street furniture is an opportunity to provide a barrier between vehicular traffic and pedestrians, but it can also serve other purposes depending on the choice of furniture. Seating creates a place to rest or gather; bicycle racks and shelters allow for the orderly parking of bikes; and trash receptacles help keep the public space clean. Street furniture should be shaded during the day and lighted at night.

Low / Medium Density Residential

These streets are typically quieter than others and generally do not carry transit vehicles or high volumes of traffic. Pedestrians require a pleasant walking environment within these neighborhoods, as well as to access land uses and transit on nearby streets. Of the four sidewalk zones seen in Section “Pedestrian Facility Design” on page 47, the furniture zone is often the widest, to provide room for street trees.

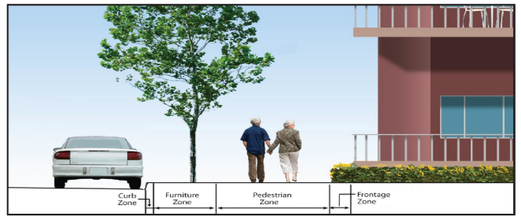
Exhibit 13: *Low/Medium Density Residential Sidewalk Zone Design (Credit: Marty Bruinsma)*



Medium / High Density Residential

These streets support greater volumes of pedestrians. Streets with transit service require good pedestrian links to bus stops. The pedestrian zone should be wider than in low/medium density residential.

Exhibit 14: *Medium/High Density Residential Sidewalk Zone Design (Credit: Marty Buinsma)*



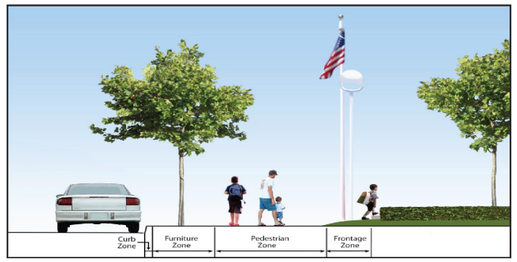
Office Park

These streets are home to national and regional offices of financial institutions, government, large companies and other uses. Cities can expect pedestrians during the morning and evening commutes walking to and from their cars. Visitors will use the sidewalks throughout the day and employees will need them during the lunch hour. The furniture zone should provide adequate buffer from parking lots.

Public Facilities

Public facilities streets, particularly streets near schools, libraries and civic centers, require special attention and treatment. High pedestrian volumes are expected during peak times, such as school pick-up and drop-off, and during the morning and evening commute hours. Sidewalk design should accommodate these peak travel times and include adequate furniture zones to buffer pedestrians from the street. Public facilities are located in various types of streets ranging from local streets to boulevards with transit service.

Exhibit 17: *Downtown/Main Street Sidewalk Zone Design (Credit: Marty Bruinsma)*



DESIGN SPECIFICATIONS

Exhibit 18 lists minimum widths for the frontage, pedestrian, furniture and curb zones, as well as minimum total widths. These minimums should not be considered the recommended final design width; in many cases, wider zones will be needed.

Exhibit 18: *Sidewalk Zone Widths for Each Land Use Context*

Land Use Type	Boulevard	Avenue	Street
Low / Medium Density Residential	Not Applicable	Frontage: 18” Pedestrian: 5’ Furniture: 4’, 6’-8’ at bus stops, and where large trees are desired Curb: 6 Min. Width: 11’	Frontage: 18” Pedestrian: 5’ Furniture: 4’ Curb: 6” Min. Width: 11’
Medium / High Density Residential	Frontage: 18” Pedestrian: 6’ Furniture: 5’, 6’-8’ at bus stops, and where large trees are desired Curb: 6” Min. Width: 13’	Frontage: 18” Pedestrian: 6’ Furniture: 5’, 6’-8’ at bus stops, and where large trees are desired Curb: 6” Min. Width: 13’	Frontage: 18” Pedestrian: 6’ Furniture: 4’, 6’-8’ at bus stops, and where large trees are desired Curb: 6” Min. Width: 12’
Neighborhood Commercial	Not Applicable	Frontage: 18” Pedestrian: 6’ Furniture: 5’, 6’-8’ at bus stops, and where large trees are desired Curb: 6” Min. Width: 13’	Frontage: 18” Pedestrian:6’ Furniture: 4’, 6’-8’ at bus stops, and where large trees are desired Curb: 6” Min. Width: 12’

Neighborhood Commercial

These streets often have grocers, laundromats, drug stores and other neighborhood-serving retail establishments. Sidewalks in neighborhood commercial areas should accommodate pedestrians walking from residences to stores. Of the four sidewalk zones, the pedestrian zone should be the widest, with a generous frontage zone to provide room for features next to buildings such as newspaper boxes. These sidewalk designs should consider cars crossing sidewalks as they enter and exit commercial driveways.

General / Regional Commercial

These streets have retail, office, civic and recreational uses concentrated along boulevards and avenues. Transit service runs along these streets and pedestrians need buffers from traffic. Of the four sidewalk zones, the pedestrian and furniture zones are favored. These sidewalks also should be designed with the understanding that a significant number of cars will cross sidewalks as they enter and exit commercial driveways

Mixed / Multi-Use

The sidewalks along these streets should support significant pedestrian volumes due to their integrated nature and higher densities. Of the four sidewalk zones, the pedestrian and frontage zones will be favored. Transit service runs along these streets and sidewalks will require buffers from traffic.

Downtown Core / Main Street

The downtown core or Main Street is a pedestrian-oriented area where the greatest numbers of pedestrians are encouraged and expected. This land use serves as the retail, restaurant and entertainment center of a community. This area will need the widest sidewalks, the widest crosswalks, the brightest street lighting, the most furnishings and other features that will enhance the pedestrian environment. Of the four sidewalk zones, the pedestrian and frontage zones will be favored, with a furniture zone wide enough for trees.

Industrial

Industrial streets are zoned for manufacturing, office warehousing and distribution. Pedestrian volumes are likely to be lower here given that these land uses typically employ fewer people per square foot than general commercial areas. Employees will need good sidewalks to get to work.

Exhibit 15: *Mixed/Multi-Use Sidewalk Zone Design (Credit: Marty Buinsma)*

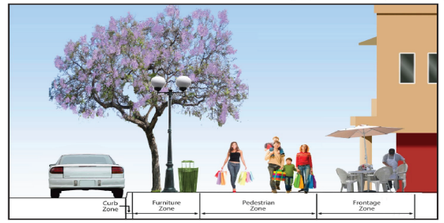
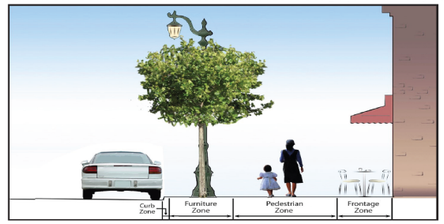


Exhibit 16: *Downtown/Main Street Sidewalk Zone Design (Credit: Marty Buinsma)*



Land Use Type	Boulevard	Avenue	Street
General Commercial	Frontage: 18” Pedestrian: 6’ Furniture: 5’, 6’-8’ at bus stops, and where large trees are desired Curb: 6” Min. Width: 13’	Frontage: 18” Pedestrian: 6’ Furniture: 5’, 6’-8’ at bus stops, and where large trees are desired Curb: 6” Min. Width: 13’	Not Applicable
Mixed / Multi-Use	Frontage: 30”, 8’ with café seating Pedestrian: 6’ Furniture: 5’, 6’-8’ at bus stops, and where large trees are desired Curb: 6” Min. Width: 14’	Frontage: 30”, 8’ with café seating Pedestrian: 6’ Furniture: 4’, 6’-8’ at bus stops, and where large trees are desired Curb: 6” Min. Width: 13’	Frontage: 18” Pedestrian: 6’ Furniture: 4’ Curb: 6” Min. Width: 12’
Industrial	Frontage: 18” Pedestrian: 5’ Furniture: 5’ Curb: 18” Min. Width: 13’	Frontage: 18” Pedestrian: 5’ Furniture: 4’ Curb: 18” Min. Width: 12’	Frontage: 18” Pedestrian:5’ Furniture: 4’ Curb: 18” Min. Width: 12’
Downtown Core / Main Street	Frontage: 30”, 8’ with café seating Pedestrian: 6’ Furniture: 5’, 6’-8’ at bus stops, and where large trees are desired Curb: 6” Min. Width: 14’	Frontage: 30”, 8’ with café seating Pedestrian: 6’ Furniture: 5’, 6’-8’ at bus stops, and where large trees are desired Curb: 6” Min. Width: 14’	Frontage: 30”, 8’ with café seating Pedestrian: 6’ Furniture: 5’ Curb: 6” Min. Width: 14’

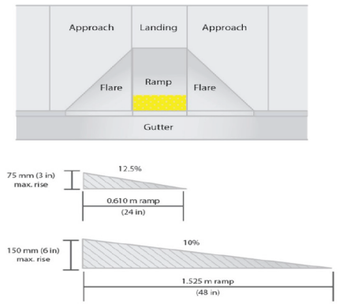
Land Use Type	Boulevard	Avenue	Street
Transit-Oriented Districts	Frontage: 30” Pedestrian: 8’ Furniture: 5’, 6’-8’ at bus stops, and where large trees are desired Curb: 6” Min. Width: 16’	Frontage: 30” Pedestrian:8’ Furniture: 5’, 6’-8’ at bus stops, and where large trees are desired Curb: 6” Min. Width: 16’	Frontage: 18” Pedestrian:6’ Furniture: 5’, 6’-8’ at bus stops, and where large trees are desired Curb: 6” Min. Width: 13’
Office Park	Frontage: 18” Pedestrian: 5’ Furniture: 5’ Curb: 6” Min. Width: 12’	Frontage: 18” Pedestrian:5’ Furniture: 5’ Curb: 6” Min. Width: 12’	Not Applicable
Public Facilities	Frontage: 30” Pedestrian: 8’ Furniture: 5’, 6’-8’ at bus stops, and where large trees are desired Curb: 6” Min. Width: 16’	Frontage: 30” Pedestrian: 8’ Furniture: 5’, 6’-8’ at bus stops, and where large trees are desired Curb: 6” Min. Width: 16’	Frontage: 18” Pedestrian:6’ Furniture: 5’, 6’-8’ at bus stops, and where large trees are desired Curb: 6” Min. Width: 13’

CURB RAMPS

Proper curb ramp design is essential to enable pedestrians using assistive mobility devices (e.g., scooters, walkers and crutches) to transition between the street and the sidewalk. These design guidelines provide a basic overview of curb ramp design. The ADA requires installation of curb ramps in new sidewalks and whenever an alteration is made to an existing sidewalk or street.

Roadway resurfacing is considered an alteration and triggers the requirement for curb ramp installations or retrofits to current standards. Curb ramps are typically installed at intersections, mid-block crossings (including trail connections), accessible on-street parking and passenger loading zones and bus stops.

Exhibit 19: *Curb Ramp Components And Alternate Slopes*



(Credit: Michele Weisbart)

The following define the curb ramp components along with minimum dimensions:

- Landing – the level area at the top of a curb ramp facing the ramp path. Landings allow wheelchairs to enter and exit a curb ramp, as well as travel along the sidewalk without tipping or tilting. This landing must be the width of the ramp and measure at least 4 feet by 4 feet. There should also be a level (not exceeding a 2 percent grade) 4 foot by 4 foot bottom landing of clear space outside of vehicle travel lanes.
- Approach – the portion of the sidewalk on either side of the landing. Approaches provide space for wheelchairs to prepare to enter landings.
- Flare – the transition between the curb and sidewalk. Flares provide a sloped transition (10 percent maximum slope) between the sidewalk and curb ramp to help prevent pedestrians from tripping over an abrupt change in level. Flares can be replaced with curb where the furniture zone is landscaped.
- Ramp – the sloped transition between the sidewalk and street where the grade is constant and cross slope at a minimum. Curb ramps are the main pathway between the sidewalk and street.
- Gutter – the trough that runs between the curb or curb ramp and the street. The slope parallel to the curb should not exceed 2 percent at the curb ramp.
- Detectable Warning – surface with distinct raised areas to alert pedestrians with visual impairments of the sidewalk-to-street transition.

Curb Ramp Types

There are several different types of curb ramps. Selection should be based on local conditions. The most common types are diagonal, perpendicular, parallel and blended transition. PROWAG provides additional design guidance and curb ramp examples appropriate for a variety of contextual constraints.

Exhibit 20: *Curb Ramp Design Standards and Guidelines*

Curb Ramp Type	Characteristic	ADA Standards	PROWAG
Perpendicular	Maximum slope of ramps	8.33%	8.3%
	Maximum cross-slope of ramps	2.1%	2.1%
	Maximum slope of flared sides	10%	10%
	Minimum ramp width	36”	48”
	Minimum landing length	36”	48”
	Minimum landing width		48”
	Maximum gutter slope		5%
	Changes in level	Flush	Flush
	Truncated domes	24” min. from back of curb, full width of ramp	24” min. from back of curb, full width of ramp
Diagonal (at apex)	Maximum slope of ramps	8.33%	Not allowed except in alterations
	Maximum cross-slope of ramps	2.1%	
	Maximum slope of flared sides	10%	
	Minimum ramp width	36”	
	Minimum landing length	36	
	Changes in level	Flush	
Parallel and Combination	Maximum slope of ramps	8.33%	8.3%
	Maximum cross-slope of ramps	2.1%	2.1%
	Maximum slope of flared sides	10%	
	Minimum ramp width	36”	48”
	Minimum landing length	36”	48”
	Minimum landing width	48”	48”
	Changes in level	Flush	Flush
	Truncated domes	24” min. from back of curb, full width of ramp	24” min. from back of curb, full width of ramp

Detectable Warnings

Curb ramps remove the curb that visually impaired persons use to identify the location of a street. Detectable and color-contrasted warning strips must be placed at the back of curbs so partially sighted people can see them. They should be as wide as the ramp and a minimum of 24 inches deep. One corner should be located at the back of the curb and the other corner may be up to 5 feet from the back of the curb. The strips are most effective when adjacent to smooth pavement so the difference is easily detected.

ADAAG Standards

The Americans with Disabilities Act Accessibility Guidelines (ADAAG) standards for detectable warnings are as follows.

- General: Detectable warnings shall consist of a surface of truncated domes and shall meet standards for size, spacing, contrast and edges
- Base diameter: 0.9 inches minimum; 1.4 inches maximum
- Top diameter: 50 percent of base diameter minimum to 65 percent maximum
- Height: 0.2 inches
- Center-to-center spacing: 1.6 inches minimum to 2.4 inches maximum
- Base-to-base spacing: 0.65 inches minimum
- Visual contrast: light on dark, or dark on light with adjacent walking surface
- Platform edges: 24 inches wide and shall extend the full public use area of the platform



Required truncated dome.
(Credit: Ryan Snyder)

Diagonal Curb Ramps

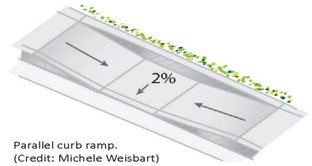
Diagonal curb ramps are single curb ramps at the apex of the corner. These have been commonly installed by many jurisdictions to address the requirements of the ADA, but have since been identified as a non-preferred design type as they introduce dangers to wheelchair users. Diagonal curb ramps send wheelchair users and people with strollers or carts toward the middle of the intersection and make the trip across longer.

Perpendicular Curb Ramps

Perpendicular curb ramps are placed at a 90-degree angle to the curb. They must include a level landing at the top to allow wheelchair users to turn 90 degrees to access the ramp, or to bypass the ramp if they are proceeding straight. Perpendicular ramps work best where there is a wide sidewalk, curb extension, or planter strip. Perpendicular curb ramps provide a direct, short trip across the intersection

Parallel Curb Ramps

Parallel curb ramps are oriented parallel to the street; the sidewalk itself ramps down. They are used on narrow sidewalks where there isn’t enough room to install perpendicular ramps. Parallel curb ramps require pedestrians who are continuing along the sidewalk to ramp down and up. Where space exists in a planting strip, parallel curb ramps can be designed in combination with perpendicular ramps to reduce the ramping for through pedestrians. Careful attention must be paid to the construction of the bottom landing to limit accumulation of water and/or debris.



Parallel curb ramp.
(Credit: Michele Weisbart)

Curb Ramp Placement

One ramp should be provided for each crosswalk, which usually translates to 2 per corner. This maximizes access by placing ramps in line with the sidewalk and crosswalk, and by reducing the distance required to cross the street, compared with a single ramp on the apex.

A single ramp at the apex requires users to take a longer, more circuitous travel path to the other side and causes users to travel towards the center of the intersection where they may be in danger of getting hit by turning cars; being in the intersection longer exposes the user to greater risk of being hit by vehicles. A single ramp at the apex should be avoided in new construction and may be used only for alterations where a design exception is granted because of existing utilities and other significant barriers. In all cases, reducing the curb radius makes ramp placement easier

Blended Transitions

Blended transitions are situations where either the entire sidewalk has been brought down to the street or crosswalk level, or the street has been brought up to the sidewalk level. They work well on large radius corners where it is difficult to line up the crosswalks with the curb ramps, but have drawbacks.

Children, persons with cognitive impairments, and guide dogs may not distinguish the street edge. Turning vehicles may also encroach onto the sidewalk. For these reasons, bollards, planting boxes, or other intermittent barriers should be installed to prevent cars from traveling on the sidewalk. Detectable warnings should also be placed at the edge of the sidewalk to alert pedestrians with visual impairments of the transition to the street.

Municipalities should follow the standards and guidelines for curb ramps provided in Exhibit 20 on page 55.

PROWAG Standards

PROWAG standards for detectable warnings include the following:

- Width: as wide as the ramp and 24 inches deep
- Location: back of the curb or no more than 6 inches from the edge of the pavement where there is no curb
- Used at:
  - The base of curb ramps
  - Blended transitions at crosswalks
  - Pedestrian refuge islands
  - Driveways that are controlled with yield or stop control devices
  - The edge of transit platforms and where railroad tracks cross the sidewalk

Signals

Signalized street crossings require special consideration of people with disabilities.

Crossing Times

In planning for people with disabilities, slower speeds must be considered. This is critical in setting the timing of the walk phase of signalized intersections. PROWAG requires that transportation agencies use an assumed walking speed of 3.5 feet/second for signal timing, with a minimum walk interval of 7 seconds. In situations where a large number of older adults or persons with disabilities cross, this may be inadequate to meet their needs. Some cities instead use 2.8 feet/second.

Cities may also use PUFFIN (Pedestrian-User-Friendly-Intelligent) traffic signals to ensure that all pedestrians have adequate time to cross. PUFFIN crossings use infrared monitors to detect the presence of pedestrians in the crosswalk and will hold the signal red for cross traffic until the pedestrian has left the crosswalk. PUFFIN crossings help slower pedestrians, but also help the flow of traffic because they allow the normal pedestrian design speed to be set at a higher level.



Automated pedestrian sensor used for a PUFFIN signal. (Source: FHWA)

Pedestrian-Activated Push Button

Pedestrian-activated traffic controls require pedestrians to push a button to activate a walk signal. As noted in Chapter 7, “Pedestrian Crossings,” pedestrian-activated signals are generally discouraged.

The “WALK” signal should automatically come on except under circumstances described in that chapter. Where pedestrian-activated traffic controls exist, they should be located as close as possible to curb ramps without reducing the width of the path. The buttons should be at a level that is easily reached by people in wheelchairs near the top of the ramp. The U.S. Access Board guidelines recommend buttons raised above or flush with their housing and large enough (a minimum of 2 inches) for people with visual impairments to see them. The buttons should also be easy to push.



Accessible pedestrian signal.
(Credit: Guidelines for Accessible Pedestrian Signals)

Accessible Pedestrian Signal (APS)

Wayfinding for pedestrians with visual impairments is significantly improved with the use of APS at signalized intersections. In fact, APS are the most commonly requested accommodation under Section 504 of the Rehabilitation Act of 1973. APS communicate information about pedestrian timing in non-visual formats such as audible tones, verbal messages and/or vibrating surfaces.

These devices should be installed close to the departure location and on the side away from the center of the intersection. Since they are

typically only audible 6 to 12 feet from the push button, 10 feet should separate two APS devices on a corner. If two accessible pedestrian pushbuttons are placed less than 10 feet apart or on the same pole, each accessible pedestrian pushbutton shall be provided with a pushbutton locator tone, a tactile arrow, a speech walk message for the WALKING PERSON (symbolizing WALK) indication, and a speech pushbutton information message. Volumes of the walk indication and push button locator tone shall automatically adjust in response to ambient sound.

GENERAL GUIDELINES

The land uses included in Exhibit 18 cover those of most municipalities. For those few areas not covered, the following list provides general guidelines for sidewalks:

- The recommended minimum frontage zone width is 18 inches.
- The recommended minimum pedestrian zone width is 5 feet.
- The recommended minimum curb zone width is 6 inches or 18 inches where pedestrian or freight loading is expected and may conflict with obstacles in the furniture zone.
- The recommended minimum furniture zone width is 4 feet and 6 feet to 8 feet where bus stops exist.
- Low curbs (3 to 4 inches high) reduce the division between the traveled way and the sidewalk. They are favored in areas with significant pedestrian traffic. Low curbs also improve the geometry and feasibility of providing two perpendicular curb ramps per corner.

Some judgment may be needed on a case-by-case basis to establish actual widths of each of the four zones.

7. Pedestrian Crossings

INTRODUCTION

Walking requires two important features in the built environment: people must walk along streets and they must get across streets. Crossing a street should be easy, safe, convenient and comfortable. While pedestrian behavior and intersection or crossing design affect the street crossing experience, motorist behavior (whether and how motorists stop for pedestrians) is the most significant factor in pedestrian safety.

A number of tools exist to improve pedestrian safety and to make crossing streets easier. Effective traffic management can address concerns about traffic speed and volume. A motorist driving more slowly has more time to see, react and stop for a pedestrian. The number of pedestrians also influences motorists; in general, motorists are more aware of pedestrians when there is more pedestrian activity. Most tools to address crossing challenges are engineering treatments, but tools from the enforcement, education and planning toolboxes are also important.

Providing marked crosswalks is only one of the many possible engineering measures. When considering how to provide safer crossings for pedestrians, the question should not be: "Should I provide a marked crosswalk?" Instead, the question should be: "What are the most effective measures that can be used to help pedestrians safely cross the street?" Deciding whether to mark or not mark crosswalks is only one consideration in creating safe and convenient pedestrian crossings.

This chapter describes a number of measures to improve pedestrian crossings, including marked and unmarked crosswalks, raised crossing islands and medians, and lighting.



Crossings are a necessary part of the pedestrian experience. (Credit: Sky Yim)

PRINCIPLES OF PEDESTRIAN CROSSINGS

The following principles should be incorporated into every pedestrian crossing improvement:

- Pedestrians must be able to cross roads safely. Cities have an obligation to provide safe and convenient crossing opportunities.
- The safety of all street users, particularly more vulnerable groups, such as children, the elderly and those with disabilities, and more vulnerable modes, such as walking and bicycling, must be considered when designing streets.
- Pedestrian crossings must meet accessibility standards and guidelines.
- Real and perceived safety must be considered when designing crosswalks—crossing must be "comfortable." A "safe" crossing that no one uses serves no purpose.
- Crossing treatments that have the highest crash reduction factors (CRFs) should be used when designing crossings.
- Safety should not be compromised to accommodate traffic flow.
- Good crossings begin with appropriate speed. In general, urban arterials should be designed to a maximum of 30 mph or 35 mph (note: 30 mph is the optimal speed for moving motor vehicle traffic efficiently).
- Every crossing is different and should be selected and designed to fit its unique environment.

The following issues should also be considered when planning and designing crossings:

- Ideally, uncontrolled crossing distances should be no more than 21 feet, which allows for one 11-foot lane and one 10-foot lane. Ideally, streets wider than 40 feet should be divided (effectively creating two streets) by installing a median or two crossing islands.
- The number of lanes should be limited to a maximum of three lanes per direction on all roads (plus a median or center turn lane).
- There must be a safe, convenient crossing at every transit stop.
- Double (or triple) left or right turns concurrent (permissive) with pedestrian crossings at signalized intersections must never be allowed.
- Avoid concurrent movements of motor vehicles and people at signalized intersections.
- People should never have to wait more than 90 seconds to cross at signalized intersections.
- Pedestrian signals should be provided at all signalized crossings where pedestrians are allowed



Curb extensions and median make crossing four-lane streets safer and more manageable. (Credit: Dan Burden)

PERFORMANCE MEASURES

Performance measures establish how well a crossing is performing. In all cases, baseline data should be collected to allow for before and after analysis. Performance measures for pedestrian crossings include the following:

- The number of pedestrians crossing at a particular crossing location goes up.
- The pedestrian crash rates go down (for an accurate determination, entire corridors should be analyzed since crashes at any one location may be infrequent).
- Pedestrian fatalities and serious injuries should decrease.
- The numbers of children, seniors and people with disabilities crossing the street should reflect their percentage in the larger population.
- The speed of motorists either turning at an intersection or traveling at a mid-block crossing goes down.
- Motorists do not block intersections (including crosswalks).
- At uncontrolled intersections, the percentage of motorists who stop for pedestrians goes up.



Lively streets with many pedestrians indicate a walkable neighborhood: Chicago. (Credit: FNI)

PEDESTRIAN CROSSING TOOLBOX

Many engineering measures may be used at a pedestrian crossing, depending on site conditions and potential users. Marked crosswalks are commonly used at intersections and sometimes at mid-block locations. Marked crosswalks are often the first measure in the toolbox followed by a series of other measures that are used to enhance and improve marked crosswalks. The decision to mark a crosswalk should not be considered in isolation, but rather in conjunction with other measures to increase awareness of pedestrians. Without additional measures, marked crosswalks alone may not increase pedestrian safety, particularly on multi-lane streets.

Marked Crosswalks

Crosswalks are present by law at all intersections, whether marked or unmarked, unless the pedestrian crossing is specifically prohibited. At mid-block locations, crosswalks only exist where marked. At these non-intersection locations, the crosswalk markings legally establish the crosswalk. Crosswalks should be considered at mid-block locations where there is strong evidence that pedestrians want to cross there, due to origins and destinations across from each other and an overly long walking distance to the nearest controlled crossing. Marked crosswalks alert drivers to expect crossing pedestrians and direct pedestrians to desirable crossing locations. Marking crosswalks at every intersection is not necessary or desirable.

Crosswalk Markings

According to the MUTCD, the minimum crosswalk marking shall consist of solid white lines. They shall not be less than 6 inches or greater than 24 inches in width.

Placement

The best locations to install marked crosswalks are:

- All signalized intersections
- Crossings near transit locations
- Trail crossings
- High land use generators
- School walking routes
- When there is a preferred crossing location due to sight distance
- Where needed to enable comfortable crossings of multi-lane streets between controlled crossings spaced at convenient distances

Controlled Intersections

Intersections can be controlled by traffic signals or STOP signs. Marked crosswalks should be provided on all intersection legs controlled by traffic signals, unless the pedestrian crossing is specifically prohibited. Marked crosswalks may be considered at STOP-controlled intersections. Factors to be considered include high pedestrian volumes, high vehicle volumes, school zone location, high volume of elderly or disabled users, or other safety related criteria.

Uncontrolled Intersections and Mid-block Crosswalks

Intersections without traffic signals or STOP signs are considered uncontrolled intersections. The decision to mark a crosswalk at an uncontrolled location should be guided by an engineering study.

Factors considered in the study should include vehicular volumes and speeds, roadway width and number of lanes, stopping sight distance and triangles, distance to the next controlled crossing, night time visibility, grade, origin-destination of trips, left turning conflicts and pedestrian volumes. The engineering study should be based on the FHWA study, Safety Effects of Marked Versus Unmarked Crosswalks at Uncontrolled Locations.

The following list provides some of the key recommendations from the study:

- It is permissible to mark crosswalks on two-lane roadways.
- On multi-lane roadways, marked crosswalks alone are not recommended under the following conditions (the other tools listed in this section can be considered to enhance the crosswalk):
  - ADT > 12,000 w/o median
  - ADT > 15,000 w/ median
  - Speeds greater than 40 mph
- Raised medians can be used to reduce risk.
- Signals or other treatments should be considered where there are many young and/or elderly pedestrians

Frequency of Marked Crosswalks at Uncontrolled Locations

Marked crosswalks should be spaced so people can cross at preferred locations. If people are routinely crossing streets at non-preferred locations, consideration should be given to installing a new crossing. Pedestrians need crossings with appropriate devices (islands, curb extensions, advanced yield lines, etc.) of multi-lane streets where there are strong desire lines. Along urban streets, a well-designed crossing should be provided at least every 1/8 mile.



Example of staggered continental crosswalk. (Credit: Michael Ronkin)

Raised Crossing Islands/Medians

Raised islands and medians (continuous raised areas separating opposite flows of traffic) are the most important, safest and most adaptable engineering tools for improving street crossings. A crossing island is shorter and located just where a pedestrian crossing is needed. Raised medians and crossing islands are commonly used between intersections when blocks are long (500 feet or more in downtowns) and in the following situations:

- Speeds are higher than desired
- Streets are wide
- Traffic volumes are high
- Sight distances are poor

Raised islands have nearly universal applications and should be placed where there is a need for people to cross the street. They are also used to slow traffic.

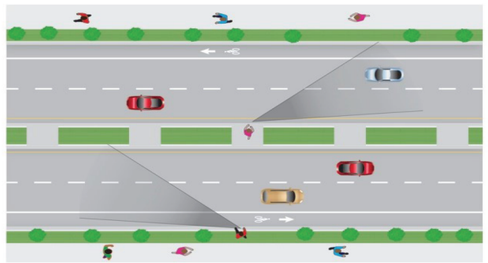


Staggered median crossing. (Credit: Marcel Schmaedick)

Benefits of Raised Crossing Islands

Their use changes a complex task, crossing a wide street with traffic coming from two opposing directions all at once, into two simpler and smaller tasks. With their use, conflicts occur in only one direction at a time, and exposure time can be reduced from more than 20 seconds to just a few seconds.

On streets with traffic speeds higher than 30 mph, it may be unsafe to cross without a median island. At 30 mph, motorists travel 44 feet each second, placing them 880 feet out when a pedestrian starts crossing an 80-foot wide multi-lane road. In this situation, this pedestrian may still be in the last travel lane when the car arrives there; that car was not within view at the time he or she started crossing. With an island on multi-lane roadways, people would cross two or three lanes at a time instead of four or six. Having to wait for a gap in only one direction of travel at a time significantly reduces the wait time to cross. Medians and crossing islands have been shown to reduce crashes by 40 percent (Federal Highway Administration, Designing for Pedestrian Safety course).

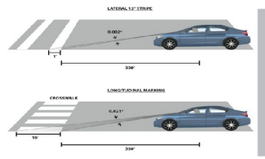


Medians and crossing islands allow pedestrians to complete the crossing in two stages. (Credit: Michele Weisbart)

High-Visibility Crosswalks

Because of the low approach angle at which pavement markings are viewed by drivers, the use of longitudinal stripes in addition to or in place of transverse markings can significantly increase the visibility of a crosswalk to oncoming traffic. While research has not shown a direct link between increased crosswalk visibility and increased pedestrian safety, high-visibility crosswalks have been shown to increase motorist yielding and channelization of pedestrians, leading the Federal Highway Administration to conclude that high-visibility pedestrian crosswalks have a positive effect on pedestrian and driver behavior.

Colored and stamped crosswalks should only be used at controlled locations. Staggered longitudinal markings reduce maintenance since they avoid vehicle wheel paths.



Longitudinal crosswalk markings are more visible than lateral crosswalk markings. (Credit: Michele Weisbart)



Typical crosswalk markings: Continental, Ladder, Staggered Continental. (Credit: Michele Weisbart)

CROSSWALKS AND ACCESSIBILITY

The Pedestrian Access Route continues through the crosswalk and must conform to the surface condition, width and slope requirements.

Longitudinal crosswalk markings provide the best visibility for pedestrians with limited vision.

Decorative crosswalk pavement materials should be chosen with care to ensure that smooth surface conditions and high contrast with surrounding pavement are provided. Textured materials within the crosswalk are not recommended. Without reflective materials, these treatments are not visible to drivers at night. Decorative pavement materials often deteriorate over time and become a maintenance problem while creating uneven pavement. The use of color or material to delineate the crosswalks as a replacement for retro-reflective pavement marking should not be used, except in slow-speed districts where intersecting streets are designed for speeds of 20 mph or less.



Decorative crosswalk treatments made of distinctive materials can become uneven over time. (Credit: Ryan Snyder)



Angled median crossing. (Credit: Paul Zykofsky)

As a general rule, crossing islands are preferable to signal-controlled crossings due to their lower installation and maintenance cost, reduced waiting times and their safety benefits. Crossing islands are also used with road diets, taking four-lane undivided, high-speed roads down to better performing three-lane roadways (two travel lanes and a center turn lane); portions of the center turn lane can be dedicated to crossing islands. Crossing islands can also be used with signals.

Where to Place Crossing Islands

Crossing islands are often used for trails, high pedestrian flow zones, transit stations, schools, work centers and shopping districts.

Crossing islands, like most traffic calming features, perform best with both tall trees and low ground cover. This greatly increases their visibility, reduces surprise and lowers the need for a plethora of signs. When curves or hill crests complicate crossing locations, median islands are often extended over a crest or around a curve to where motorists have a clear (six second or longer) sight line of the downstream change in conditions. Lighting of median islands is essential. The suggested minimum width of a crossing island is 6 feet. When used on higher speed roads, and where there is space available, inserting a 45-degree bend to the right helps orient pedestrians to the risk they encounter from motorists during the second half of their crossing



Crossing islands: Berkeley, CA. (Credit: Ryan Snyder)

Raised Crosswalks

Raised crosswalks slow traffic and put pedestrians in a more visible position. They are trapezoidal in shape on both sides and have a flat top where the pedestrians cross. The level crosswalk area must be paved with smooth materials; any texture or special pavements used for aesthetics should be placed on the beveled slopes, where they will be seen by approaching motorists. They are most appropriate in areas with significant pedestrian traffic and where motor vehicle traffic should move slowly, such as near schools, on college campuses, in Main Street retail environments, and in other similar places. They are especially effective near elementary schools where they raise small children by a few inches and make them more visible.



Raised crosswalk: University of North Carolina Campus, Chapel Hill, NC. (Credit: Ryan Snyder)

Curb Extensions

Curb extensions extend the sidewalk or curb line out into the parking lane, which reduces the effective street width. Curb extensions significantly improve pedestrian crossings by reducing the pedestrian crossing distance, visually and physically narrowing the roadway, improving the ability of pedestrians and motorists to see each other, and reducing the time that pedestrians are in the street. Reducing street widths improves signal timing since pedestrians need less time to cross.

Motorists typically travel more slowly at intersections or mid-block locations with curb extensions, as the restricted street width sends a visual cue to slow down. Turning speeds are lower at intersections with curb extensions (curb radii should be as tight as is practicable). Curb extensions also prevent motorists from parking too close to the intersection.

Curb extensions also provide additional space for two curb ramps and for level sidewalks where existing space is limited, increase the pedestrian waiting space, and provide additional space for pedestrian push button poles, street furnishings, plantings, bike parking and other amenities. A benefit for drivers is that extensions allow for better placement of signs (e.g., stop signs and signals).



Curb extensions. (Credit: Michele Weisbart)



Example of curb extensions. (Credit: Marcel Schmaedick)

Curb extensions are generally only appropriate where there is an on-street parking lane. Where street width permits, a gently tapered curb extension can reduce crossing distance at an intersection along streets without on-street parking, without creating a hazard. Curb extensions must not extend into travel lanes or bicycle lanes.

Curb extensions can impact other aspects of roadway design and operation as follows:

- May impact street drainage and require catch basin relocation
- May impact underground utilities
- May require loss of curbside parking, though careful planning often mitigates this potential loss, for example by relocating curbside fire hydrants, where no parking is allowed, to a curb extension
- May complicate delivery access and garbage removal
- May impact snow plows and street sweepers
- May affect the turning movements of larger vehicles such as school buses and large fire trucks

Pedestrian "Scrambles"

Exclusive pedestrian phases (i.e. pedestrian 'scrambles') may be used where turning vehicles conflict with very high pedestrian volumes and pedestrian crossing distances are short. Although pedestrians can cross in any direction during the pedestrian phase, pedestrians typically have to wait for both vehicle phases before they get the walk signal again. This creates delay for pedestrians traveling straight, but can be mitigated by allowing pedestrians continuing along the same direction to get a WALK signal during the green signal phase and while turns are prohibited for traffic.



Pedestrian scramble. (Credit: Dan Burden)

Signs

Signs can provide important information to improve road safety by letting people know what to expect, so they can react and behave appropriately. Sign use and placement should be done judiciously, as overuse breeds noncompliance and disrespect. Too many signs create visual clutter.

Regulatory signs, such as STOP, YIELD, or turn restrictions, require driver actions and can be enforced. Warning signs provide information, especially to motorists and pedestrians unfamiliar with an area.

Advance pedestrian warning signs should be used where pedestrian crossings may not be expected by motorists, especially if there are many motorists who are unfamiliar with the area. The fluorescent yellow/green color is designated specifically for pedestrian, bicycle and school warning signs (Section 2A.10 of the 2009 MUTCD) and should be used for all new and replacement installations. This bright color attracts the attention of drivers because it is unique.

Sign R1-5 should be used in conjunction with advance yield lines, as described below. Sign R1-6 may be used on median islands, where they will be more visible to motorists than signs placed on the side of the street, especially where there is on-street parking.

All signs should be periodically checked to make sure that they are in good condition, are free from graffiti, are reflective at night and continue to serve a purpose.

All sign installations need to comply with the provisions of the MUTCD.



R1-6 R1-6a

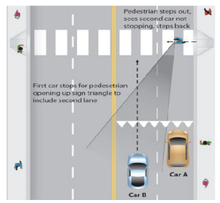


R1-5 R1-5a R1-5b R1-5c

Advanced Yield/Stop Signs

Stop lines are solid white lines 12 to 24 inches wide, extending across all approach lanes to indicate where vehicles must stop in compliance with a stop sign or signal. Advance stop lines reduce vehicle encroachment into the crosswalk and improve drivers' view of pedestrians. At signalized intersections a stop line is typically set back between 4 and 6 feet.

At uncontrolled crossings of multi-lane roads, advance yield lines can be an effective tool for preventing multiple threat vehicle and pedestrian collisions. Section 3B.16 of the MUTCD specifies placing advanced yield markings 20 to 50 feet in advance of crosswalks, depending upon location-specific variables such as vehicle speeds, traffic control, street width, on-street parking, potential for visual confusion, nearby land uses with vulnerable populations and demand for queuing space. Thirty feet is the preferred setback for effectiveness at many locations. This setback allows a pedestrian to see if a car in the second (or third) lane is stopping after a driver in the first lane has stopped.



Advanced yield signs.
(Credit: Michele Weisbart)



Example of advanced yield signs. (Credit: Sky Yim)

Lighting

Lighting is important to include at all pedestrian crossing locations for the comfort and safety of the road users. Lighting should be present at all marked crossing locations. Lighting provides cues to drivers to expect pedestrians earlier.

FHWA HT-08-053, The Information Report on Lighting Design for Mid-block Crosswalks, found that a vertical illumination of 20 lux in front of the crosswalk, measured at a height of 5 feet from the road surface, provided adequate detection distances in most circumstances. Although the research was constrained to mid-block placements of crosswalks, the report includes a brief discussion of considerations in lighting crosswalks co-located with intersections. The same principle applies at intersections. Illumination just in front of crosswalks creates optimal visibility of for pedestrians.

Other good guidance on crosswalk lighting levels comes from the Illuminating Engineering Society of North America (IESNA) intersection guidance to illuminate pedestrians in the crosswalk to vehicles (see the adjacent image). Crosswalk lighting should provide color contrast from standard roadway lighting. Exhibit 21 on the next page shows IESNA's recommended illumination by street type.



Proper placement of crosswalk illumination. (Credit: Michele Weisbart)

Exhibit 21: *Recommended Illumination by Street Type*

Functional Classification	Average Maintained Illumination at Pavement by Pedestrian Area Classification [FC]		
	High	Medium	Low
Major / Major (boulevard)	3.4 fc	2.6 fc	1.8 fc
Major / Collector (boulevard/avenue)	2.9 fc	2.2 fc	1.5 fc
Major / Local (avenue)	2.6 fc	2.0 fc	1.3 fc
Collector / Collector (avenue)	2.4 fc	1.8 fc	1.2 fc
Collector / Local (street)	2.1 fc	1.6 fc	1.0 fc
Local / Local (street)	1.8 fc	1.4 fc	0.8 fc

Note: FC stands for "foot candle" and is defined as the amount of illuminance on a 1 square foot surface of which there is uniformly distributed flux of one lumen. ANSI-IESNA RP-8-00 , "Roadway Lighting," P. 15.

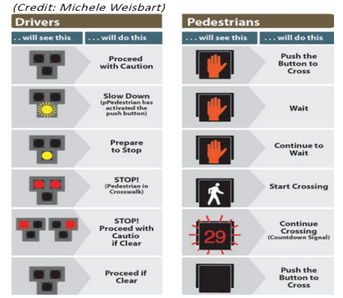
Pedestrian Hybrid Beacon

A pedestrian hybrid beacon (PHB) is used to warn and control traffic at an unsignalized location to help pedestrians cross streets or highways at a marked crosswalk. Exhibit 22 shows the sequence of PHB displays.

In accordance with the MUTCD, a minimum number of 20 pedestrians per hour is needed to warrant installation. This is substantially less than the minimum needed for a full signal installation justified under the Pedestrian Warrant in the MUTCD.

If a PHB is used, it should be placed in conjunction with signs, crosswalks and advanced yield lines to warn and control traffic at locations where pedestrians enter or cross a street or highway. A pedestrian hybrid beacon should only be installed at a marked crosswalk. Installations should be done according to the MUTCD Chapter 4F, "Pedestrian Hybrid Beacons."

Exhibit 22: *Pedestrian hybrid beacon phases. (Credit: Michele Weisbart)*



Rectangular Rapid Flash Beacon (RRFB)

The RRFB uses rectangular-shaped high-intensity LED-based indications, flashes rapidly in a wig-wag "flickering" flash pattern and is mounted immediately between the crossing sign and the sign's supplemental arrow plaque.

According to the FHWA, RRFBs can reduce up to 47% of pedestrian crashes[1] and increase motorist yielding rates up to 98%[2]. RRFBs are especially effective at multilane crossings on roads with speed limits less than 40 miles per hour. Chapter 4L of the MUTCD provides guidance on the location and design of RRFBs.

1 (CMF ID: 9024) NCHRP Research Report 841 Development of Crash Modification Factors for Uncontrolled Pedestrian Crossing Treatments, (2017).
2 Fitzpatrick et al. "Will You Stop for Me? Roadway Design and Traffic Control Device Influences on Drivers Yielding to Pedestrians in a Crosswalk with a Rectangular Rapid-Flashing Beacon." Report No. TTI-CTS-0010. Texas A&M Transportation Institute, (2016).



Rectangular rapid-flash beacon in Broken Arrow, Oklahoma. (Credit: FNI)

8. Bikeway Design

PRINCIPLES OF BIKEWAY DESIGN

The following principles inform the recommendations made in this chapter:

- Bicyclists should have safe, convenient and comfortable access to all destinations.
- Every street is a bicycle street, regardless of bikeway designation.
- Street design should accommodate all types, levels and ages of bicyclists.
- Bicyclists should be separated from pedestrians.
- Bikeway facilities should take into account vehicle speeds and volumes, with
  - Shared use on low volume, low-speed roads.
  - Separation on higher volume, higher-speeds roads.
- Bikeway treatments should provide clear guidance to enhance safety for all users.
- Since most bicycle trips are short, a complete network of designated bikeways has a grid of roughly ½ mile.

Further information on the design of bicycle facilities can be found in the Urban Bikeway Design Guide published by the National Association of Transportation Officials (NACTO).

PLANNING FOR A RANGE OF BIKEWAY USERS

Many early bikeway designs assumed that bicyclists resemble pedestrians in their behavior. This led to undesirable situations: bicyclists being under-served by inadequate facilities, pedestrians resenting bicyclists in their space and motorists being confused by bicyclists entering and leaving the traffic stream in unpredictable ways. Only under special circumstances (e.g., on shared-use paths or shared-space streets) should bicyclists and pedestrians share the same space.

Bicyclists operate a vehicle and are legitimate road users, but they are slower and less visible than motor vehicles. Bicyclists are also more vulnerable in a crash than motorists. They need accommodation on busy, high-speed roads and at complex intersections. In congested urban areas, bicyclists provided with well-designed facilities can often proceed faster than motorists.



Plan bicycle facilities for various skill levels. (Credit: Dan Burden)

Exhibit 23: *Bicycling experience continuum.*



Bicyclists use their own power, must constantly maintain their balance and don't like to interrupt their momentum. Typical basic bicyclist speeds range from 10 to 15 mph, enabling them to make trips of up to 5 miles in urban areas in about 25 minutes, the equivalent of a typical suburban commuter trip time. Bicyclists may wish to ride side-by-side so they can interact socially with a riding companion.

Well-designed bicycle facilities guide cyclists to ride in a manner that generally conforms to the vehicle code: in the same direction as traffic and usually in a position 3 to 4 feet from the right edge of the traveled way or parked cars to avoid debris, drainage grates and other potential hazards. Cyclists should be able to proceed through intersections in a direct, predictable and safe manner.

Cyclist skill level also provides a wide variety of speeds and expected behaviors, influencing the characteristics and infrastructure preferences of different cyclists, as depicted in Exhibit 23. Bicycle infrastructure should be developed using planning and designing options, from shared roadways to separate facilities, to accommodate as many user types as possible and to provide a comfortable experience for the greatest number of cyclists.

BIKEWAY TYPES

A designated bikeway network provides a system of facilities that offers enhancement or priority to bicyclists over other roadways in the network. However, it is important to remember that all streets in a city should safely and comfortably accommodate bicyclists, regardless of whether the street is designated as a bikeway. Several general types of bikeways are listed below with no implied order of preference.

Bike Routes

A term used for planning purposes or to designate recommended bicycle touring routes, a bike route can be any bikeway type.

On-Street

Shared Roadways

A shared roadway is a street in which bicyclists ride in the same travel lanes as other traffic. There are no specific dimensions for shared roadways. On narrow travel lanes, motorists have to cross over into the adjacent travel lane to pass a cyclist. Shared roadways work well and are common on low-volume, low-speed neighborhood residential streets, rural roads and even many low-volume highways. In California shared roadways are known as Class III bikeways.

Bicycle Boulevards

A bicycle boulevard is a street that has been modified to prioritize through bicycle traffic but discourage through motor vehicle traffic. Traffic calming devices control traffic speeds and discourage through trips by automobiles. Traffic controls limit conflicts between automobiles and bicyclists and give priority to through bicycle movement at intersections.



Bicycle route. (Credit: Marty Bruinsma)



Bicycle boulevard: Swantner Drive, Corpus Christi. (Credit: FNI)

Shoulder Bikeways

This facility accommodates bicycle travel on rural highways and country roads by providing a suitable area for bicycling and reducing conflicts with faster moving motor vehicles.

Bike Lanes

Portions of the traveled way designated with striping, stencils and signs for preferential use by bicyclists, bike lanes are appropriate on avenues and boulevards. They may be used on other streets where bicycle travel and demand is substantial. Where on-street parking is provided, bike lanes are striped on the left side of the parking lane

Off-Street

Cycle Tracks

Cycle tracks are specially designed bikeways separated from the parallel motor vehicle travelway by a line of parked cars, landscaping, or a physical buffer that motor vehicles cannot cross. Cycle tracks are effective in attracting users who are concerned about conflicts with motorized traffic.

Shared Use Paths

Shared use paths (SUP) are facilities separated from motor vehicle traffic by an open space or barrier, either within the street right-of-way or within an independent right-of-way. Bicyclists, pedestrians, joggers and skaters often use these paths. Shared-use paths in long, relatively uninterrupted corridors like waterways, utility corridors and rail lines are often called hike and bike trails.



Buffered bike lane: Doddridge Street, Corpus Christi. (Credit: FNI)



Bike lane. (Credit: Marty Bruinsma)



Shared-use path: Burbank, CA. (Credit: Ryan Snyder)



Shared-use path. (Credit: Marty Bruinsma)

INTEGRATING WITH THE STREET SYSTEM

Most bikeways are part of the street; therefore, well-connected street systems are very conducive to bicycling, especially those with a fine-meshed network of low-volume, low-speed streets suitable for shared roadways. In less well-connected street systems, where wide streets carry the bulk of traffic, bicyclists need supplementary facilities, such as short sections of paths and bridges, to connect otherwise unconnected streets.

There are no hard and fast rules for when a specific type of bikeway should be used, but some general principles guide their selection. As a general rule, as traffic volumes and speeds increase, greater separation from motor vehicle traffic is desirable. Other factors to consider are users (more children or recreational cyclists may warrant greater separation), adjacent land uses (multiple driveways may cause conflicts with shared-use paths), available right-of-way (separated facilities require greater width), and costs.

As a general rule, designated bicycle facilities (e.g., bike lanes and cycle tracks) should be provided on all major streets (avenues and boulevards), as these roads generally offer the greatest level of directness and connectivity in the network, and are typically where destinations are located. There are occasions when it is infeasible or impractical to provide bikeways on a busy street, or the street does not serve the mobility and access needs of bicyclists.

The following guidelines should be used to determine if it is more appropriate to provide facilities on a parallel local street:

- Conditions exist such that it is not economically or environmentally feasible to provide adequate bicycle facilities on the street.
- The street does not provide adequate access to destination points within reasonable walking distances, or separated bikeways on the street would not be considered safe.
- The parallel route provides continuity and convenient access to destinations served by the street.
- Costs to improve the parallel route are no greater than costs to improve the street.
- If any of these factors are met, cyclists may actually prefer the parallel local street facility in that it may offer a higher level of comfort (bicycle boulevards are based on this approach).

Off-street paths can also be used to provide transportation in corridors otherwise not served by the street system, such as along rivers and canals, through parks, along utility corridors, on abandoned railroad tracks, or along active railroad rights-of-way. While paths offer the safety and scenic advantages of separation from traffic, they must also be designed to offer frequent connections to the street system and to destinations such as residential areas, employment sites, shopping and schools. Street crossings must be well designed with measures such as signals or median refuge islands.

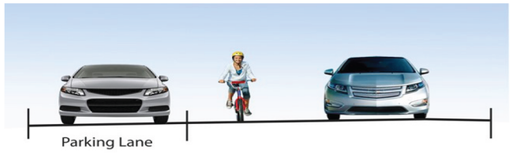
CHARACTERISTICS OF BIKEWAY TYPES

The following sections provide design guidance for each type of bikeway.

Shared Roadways

Shared roadways are the most common bikeway type. There are no specific width standards for shared roadways. Most are fairly narrow; they are simply the streets as constructed. Shared roadways are suitable on streets with low motor vehicle speeds or traffic volumes and on low-volume rural roads and highways. The suitability of a shared roadway decreases as motor vehicle traffic speeds and volumes increase, especially on rural roads with poor sight distance.

Many local streets carry excessive traffic volumes at speeds higher than they were designed to carry. These can function better as shared roadways if traffic speeds and volumes are reduced. For a local street to function acceptably as a shared roadway, traffic volumes should not be more than 3,000 to 5,000 vehicles per day, and speeds should be 25 mph or less. If traffic speeds and volumes exceed those thresholds, separated facilities (e.g., bike lanes) should be considered or traffic calming should be applied to reduce the vehicle speeds/volumes. Many traffic-calming techniques can make these streets more amenable to bicycling.

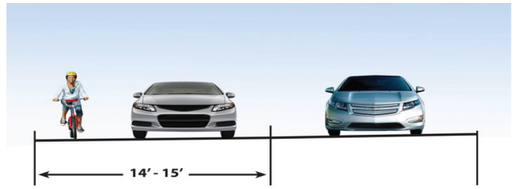


Shared roadway. (Credit: Michele Weisbart)

Wide Curb Lanes

On streets where bike lanes would be more appropriate but with insufficient width for bike lanes, wide curb lanes may be provided. This may occur on retrofit projects where there are physical constraints and all other options, such as narrowing travel lanes, have been pursued. Wide curb lanes are not particularly attractive to most cyclists; they simply allow a passenger vehicle to pass cyclists within a travel lane, if cyclists are riding far enough to the right.

Wide curb lanes may also encourage higher motor vehicle speeds, which is contrary to the design principles of this manual; wide lanes should never be used on local residential streets. A 14 to 15-foot wide lane allows a passenger car to pass a cyclist in the same lane. Widths 16 feet or greater encourage the undesirable operation of two motor vehicles in one lane. In this situation, a bike lane should be striped

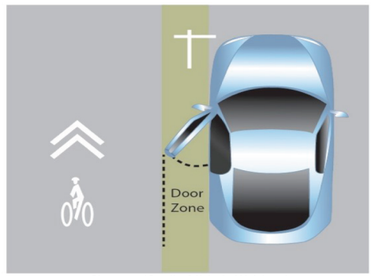


Wide curb lane. (Credit: Michele Weisbart)

Sharrows

Shared-lane marking stencils ("SLMs," also commonly called "sharrows") may be used as an additional treatment for shared roadways. The stencils can serve a number of purposes: they remind bicyclists to ride further from parked cars to prevent "dooring" collisions, they make motorists aware of bicycles potentially in the travel lane, and they show bicyclists the correct direction of travel.

Sharrows installed next to parallel parking should be a minimum distance of 11 feet from the curb. Installing farther than 11 feet from the curb may be desired in areas with wider parking lanes or in situations where the sharrow is best situated in the center of the shared travel lane to promote cyclists taking the lane. Placing the sharrow between vehicle tire tracks increases the life of the markings and decreases long-term maintenance costs.



Sharrow. (Credit: Michele Weisbart)



Example of a sharrow: Los Angeles, CA. (Credit: Ryan Snyder)

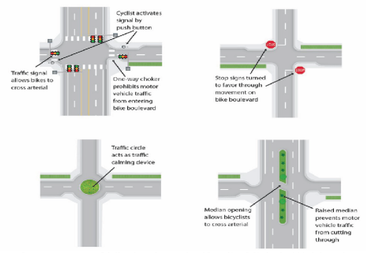
Bicycle Boulevards

A bicycle boulevard is an enhanced shared roadway; a local street is modified to function as a prioritized through street for bicyclists while maintaining local access for automobiles. This is done by adding traffic-calming devices to reduce motor vehicle speeds and through trips and installing traffic controls that limit conflicts between motorists and bicyclists and give priority to through bicyclist movement

One key advantage of bicycle boulevards is that they attract cyclists who do not feel comfortable on busy streets and prefer to ride on lower traffic streets. Bicycle travel on local streets is generally compatible with local land uses (e.g., residential and some retail). Residents who want slower traffic on neighborhood streets often like measures that support bicycle boulevards. By reducing traffic and improving crossings, bicycle boulevards also improve conditions for pedestrians. Successful bicycle boulevard implementation requires careful planning with residents and businesses to ensure acceptance.



Traffic circles allow for landscaping opportunities. (Credit: Ryan Snyder)



Components of bike boulevards. (Credit: Michele Weisbart)

Elements of Bicycle Boulevards

A successful bike boulevard includes the following design elements:

- Selecting a direct and continuous street, rather than a circuitous route that winds through neighborhoods. Bike boulevards work best on a street grid. If any traffic diversion will likely result from the bike boulevard, selecting streets that have parallel higher-level streets can prevent unpopular diversion to other residential streets.
- Placing motor vehicle traffic diverts at key intersections to reduce through motor vehicle traffic (diverters are designed to allow through bicyclist movement)
- Turning stop signs towards intersecting streets, so bicyclists can ride with few interruptions
- Replacing stop-controlled intersections with mini-circles and mini-roundabouts to reduce the number of stops cyclists have to make
- Placing traffic-calming devices to lower motor vehicle traffic speeds
- Placing wayfinding and other signs or markings to route cyclists to key destinations, to guide cyclists through difficult situations and to alert motorists of the presence of bicyclists
- Where the bike boulevard crosses high-speed or high-volume streets, providing crossing improvements such as
  - Signals, where a traffic study has shown that a signal will be safe and effective. To ensure that bicyclists can activate the signal, loop detection should be installed in the pavement where bicyclists ride.
  - Roundabouts where appropriate.
  - Median refuges wide enough to provide a refuge (8 feet minimum) and with an opening wide enough to allow bicyclists to pass through (6 feet). The design should allow bicyclists to see the travel lanes they must cross.

Shoulder Bikeways

Paved shoulders are provided on rural highways for a variety of safety, operational and maintenance reasons; they also provide a place for bicyclists to ride at their own pace, out of the stream of motorized traffic.

When providing shoulders for bicycle use, a minimum width of 6 feet is recommended. This allows a cyclist to ride far enough from the edge of pavement to avoid debris and far enough from passing vehicles to avoid conflicts. On roads with prevailing speeds over 45 mph, 8 feet is preferred. If there are physical width limitations, a minimum 4-foot shoulder may be used

Bike Lanes

Bike lanes are a portion of the traveled way designated for preferential use by bicyclists; they are most suitable on avenues and boulevards. Bike lanes may also be provided on rural roads where there is high bicycle use. Bike lanes are generally not recommended on local streets with relatively low traffic volumes and speeds, where a shared roadway is the appropriate facility. There are no hard and fast mandates for providing bike lanes, but as a general rule, most jurisdictions consider bike lanes on roads with traffic volumes in excess of 3,000-5,000 ADT or traffic speeds of 30 mph or greater.

Bike lanes have the following advantages:

- They enable cyclists to ride at a constant speed, especially when traffic in the adjacent travel lanes speeds up or slows down (stop-and-go).
- They enable bicyclists to position themselves where they will be visible to motorists.
- They encourage cyclists to ride on the traveled way rather than the sidewalk.

Bike lanes are created with a solid stripe and stencils. Motorists are prohibited from using bike lanes for driving and parking, but may use them for emergency avoidance maneuvers or breakdowns. Bike lanes are one-way facilities that carry bicycle traffic in the same direction as adjacent motor-vehicle traffic. Bike lanes should always be provided on both sides of a two-way street. One exception is on hills where topographical constraints limit the width to a bike lane on one side only; the bike lane should be provided in the uphill direction as cyclists ride slower uphill, and they can ride in a shared lane in the downhill direction.

The minimum bike lane width is 5 feet from the face of a curb, or 4 feet on open shoulders. If on-street parking is permitted, the bike lane should be placed between parking and the travel lane with a preferred width of 6 feet so cyclists can ride outside the door zone. Streets with high volumes of traffic and/or higher speeds need wider bike lanes (6 feet to 8 feet) than those with less traffic or slow speeds. On curbed sections, a 4-foot (minimum 3 feet) wide smooth surface should be provided between the gutter pan and stripe. This minimum width enables cyclists to ride far enough from the curb to avoid debris and drainage grates and far enough from other vehicles to avoid conflicts. By riding away from the curb, cyclists are more visible to motorists than when hugging the curb. Where on-street parking is permitted, delineating the bike lane with two stripes, one on the street side and one on the parking side, is preferable to a single stripe.

Bike Lanes on Two-Way Streets

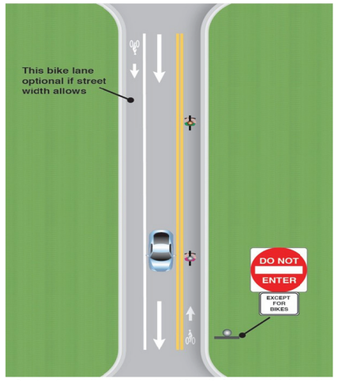
Basic bike lanes on two-way streets comprise the majority of bike lanes. They should follow the design guidelines for width with and without on-street parking.

Bike Lanes on One-Way Streets

Bike lanes on one-way streets should generally be on the right side of the traveled way and should always be provided on both legs of a one-way couplet. The bike lane may be placed on the left of a one-way street if it decreases the number of conflicts (e.g., those caused by heavy bus traffic or parking) and if cyclists can safely and conveniently transition in and out of the bike lane. If sufficient width exists, the bike lanes can be striped on both sides.

Contra-Flow Bike Lanes

Contra-flow bike lanes are provided to allow bicyclists to ride in the opposite direction of motor vehicle traffic. They convert a one-way traffic street into a two-way street: one direction for motor vehicles and bikes and the other for bikes only. Contra-flow lanes are separated with yellow center lane striping. Combining both directions of bicycle travel on one side of the street to accommodate contra-flow movement results in a two-way cycle track.



Contra-flow bike lane design. (Credit: Michele Weisbart)

Contra-flow bike lanes are useful where they provide a substantial savings in out-of-direction travel with direct access to high-use destinations, and safety is improved because of reduced conflicts compared to the longer route. The contra-flow design introduces new design challenges and may create additional conflict points as motorists may not expect on-coming bicyclists.

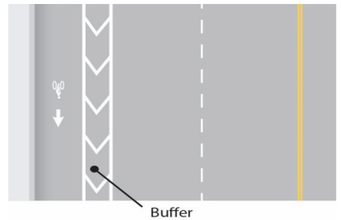
Bike Lanes and Bus Lanes

In most instances, bicycles and buses can share the available road space. On routes heavily traveled by both bicyclists and buses, separation can reduce conflicts (stopped buses hinder bicycle movement and slower moving bicycles hinder buses). Ideally, shared bicycle/bus lanes should be 13 feet to 15 feet wide to allow passing by both buses and bicyclists.

Separate bus lanes and bike lanes should be considered to reduce conflicts between passengers and bicyclists, with the bus lane at the curbside. Buses will be passing bicyclists on the right, but the fewer merging and turning movements reduce overall conflicts.

Buffered Bike Lanes

Buffered bike lanes provide a painted divider between the bike lane and the travel lanes. This additional space can improve the comfort of cyclists as they don't have to ride as close to motor vehicles. Buffered bike lanes can also be used to slow traffic as they narrow the travel lanes. An additional buffer may be used between parked cars and bike lanes to direct cyclists to ride outside of the door zone of the parked cars. Buffered bike lanes are most appropriate on wide, busy streets. They can be used on streets where physically separating the bike lanes with cycle tracks is undesirable for cost, operational, or maintenance reasons.



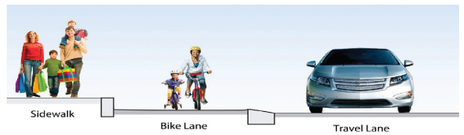
Painted buffer bike lanes. (Credit: Michele Weisbart)

Raised Bike Lanes

Bike lanes are typically an integral portion of the traveled way and are delineated from motor vehicle lanes with painted stripes. Though most bicyclists ride on these facilities comfortably, others prefer more separation. Raised bike lanes incorporate the convenience of riding on the street with some physical separation. This is done by elevating the bicycle lane surface 2 to 4 inches above street level, while providing a traversable curb to separate the bikeway from the motor vehicle travelway. This treatment offers the following advantages:

- Motorists know they are straying from the travel way when they feel the slight bump created by the curb.
- The mountable curb allows motorists to make turns into and out of driveways.
- The mountable curb allows cyclists to enter or leave the bike lane (e.g., for turning left or overtaking another cyclist).
- The raised bike lane drains towards the centerline, leaving it clear of debris and puddles.
- Novice bicyclists are more likely to ride in the bike lane, leaving the sidewalk for pedestrians.

Raised bike lanes can be constructed at little additional expense for new roads. Retrofitting streets with raised bike lanes is more costly; it is best to integrate raised bike lanes into a larger project to remodel the street due to drainage replacement. Special maintenance procedures may be needed to keep raised bike lanes swept.



Raised bike lanes. (Credit: Michele Weisbart)

Cycle Tracks

Cycle tracks, also known as protected bike lanes, are bikeways located on or adjacent to streets where bicycle traffic is separated from motor vehicle traffic by physical barriers, such as on-street parking, posts/bollards and landscaped islands. They can be well suited to downtown areas where they minimize traffic conflicts with pedestrians. Streets selected for cycle tracks should have minimal pedestrian crossings and driveways. They should also have minimal loading/unloading activity and other street activity. The cycle tracks should be designed to minimize conflicts with these activities as well as with pedestrians and driveways.

Cycle tracks can be provided on new facilities, but they require more width than other types of bikeways. They are best suited for existing streets where surplus width is available; the combined width of the cycle track and the barrier is more or less the width of a travel lane. The area to be used by bicycles should be designed with adequate width for street sweeping to ensure that debris will not accumulate. Cycle tracks tend to work most effectively where there are few uncontrolled crossing points with unexpected traffic conflicts.

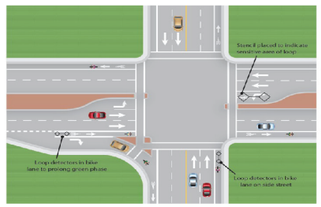
Cycle track concerns include treatment at intersections, uncontrolled midblock driveways and crossings, wrong-way bicycle traffic and difficulty accessing or exiting the facility at midblock locations. There is some controversy regarding the comparative safety of cycle tracks. Recent studies have concluded that cycle tracks are as safe as other treatments when high usage is expected and when measures such as separate signal phases for right-turning motor vehicle and through cyclists, and left-turning cyclists and through motor vehicles, are deployed to regulate crossing traffic.


Cycle track. (Credit: Dan Burden)

INTERSECTIONS

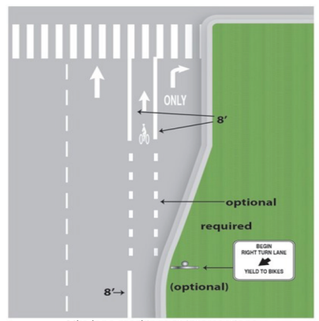
Intersections are junctions at which different modes of transportation meet and facilities overlap. A well-designed intersection facilitates the interchange between bicyclists, pedestrians, motorists and transit so traffic flows in a safe and efficient manner. Designs for intersections with bicycle facilities should reduce conflicts between bicyclists (and other vulnerable road users) and vehicles by heightening visibility, denoting a clear right of way and ensuring that the various users are aware of each other. Intersection treatments can resolve both queuing and merging maneuvers for bicyclists and are often coordinated with timed or specialized signals.

Chapter "5. Intersection Design" provides general principles of geometric design; all these recommendations will benefit cyclists. The configuration of a safe intersection for bicyclists may include additional elements such as color, signs, medians, signal detection and pavement markings. Intersection design should take into consideration existing and anticipated bicyclist, pedestrian and motorist movements. In all cases, the degree of mixing or separation between bicyclists and other modes is intended to reduce the risk of crashes and increase bicyclist comfort. The level of treatment required for bicyclists at an intersection will depend on the bicycle facility type used, whether bicycle facilities are intersecting, the adjacent street function and the adjacent land use.


Bikeway markings at intersections.
(Credit: Michele Weisbart)

Bikeway Markings at Intersections

Continuing marked bicycle facilities at intersections (up to the crosswalk) ensures that separation, guidance on proper positioning and awareness by motorists are maintained through these potential conflict areas. The appropriate treatment for right-turn only lanes is to place a bike lane pocket between the right-turn lane and the rightmost through lane. If a full bike lane pocket cannot be accommodated, a shared bicycle/right turn lane can be installed that places a standard-width bike lane on the left side of a dedicated right-turn lane. A dashed strip delineates the space for bicyclists and motorists within the shared lane. This treatment includes signs advising motorists and bicyclists of proper positioning within the lane. Sharrows are another option for marking a bikeway through an intersection where a bike lane pocket cannot be accommodated.



Bike lane markings at intersections with right-turn lanes. (Credit: Michele Weisbart)

Bike Signal Heads

Bicycle signal heads may be installed at signalized intersections to improve identified safety or operational problems for bicyclists; they provide guidance for bicyclists at intersections where bicyclists may have different needs from other road users (e.g., bicycle-only movements and leading bicycle intervals) or to indicate separate bicycle signal phases and other bicycle-specific timing strategies. A bicycle signal should only be used in combination with an existing conventional or hybrid beacon. In the United States, bicycle signal heads typically use standard three-lens signal heads in green, yellow and red with a stencil of a bicycle.

Bicycle Signal Detection

Bicycle detection is used at actuated traffic signals to alert the signal controller of bicycle crossing demand on a particular approach. Bicycle detection occurs either through the use of push buttons or by automated means (e.g., in-pavement loops, video and microwave). Inductive loop vehicle detection at many signalized intersections is calibrated to the size or metallic mass of a vehicle, meaning that bicycles may often go undetected. The result is that bicyclists must either wait for a vehicle to arrive, dismount and push the pedestrian button (if available), or cross illegally. Loop sensitivity can be increased to detect bicycles.

Proper bicycle detection must accurately detect bicyclists (be sensitive to the mass and volume of a bicycle and its rider); and provide clear guidance to bicyclists on how to actuate detection (e.g., what button to push or where to stand).



Bicycle signal head: Long Beach, CA. (Credit: Charlie Gandy)

Bike Boxes

A bike box is a designated area at the head of a traffic lane at a signalized intersection that provides bicyclists with a safe and visible way to get ahead of queuing traffic during the red signal phase. Appropriate locations include:

- At signalized intersections with high volumes of bicycles and/or motor vehicles, especially those with frequent bicyclist left-turns and/or motorist right-turns
- Where there may be right or left-turning conflicts between bicyclists and motorists
- Where there is a desire to better accommodate left-turning bicycle traffic
- Where a left turn is required to follow a designated bike route or boulevard or access a shared-use path, or when the bicycle lane moves to the left side of the street
- When the dominant motor vehicle traffic flows right and bicycle traffic continues through (such as at a Y intersection or access ramp)


Bicycle box: Portland, OR. (Credit: Ryan Snyder)

Bicycle Countdowns

Near-side bicycle signals may incorporate a "countdown to green" display to provide information about how long until the green bicycle indication is shown, enabling riders to push off as soon as the light turns green.

Leading Bicycle Intervals

Based on the Leading Pedestrian Interval, a Leading Bicycle Interval (LBI) can be implemented in conjunction with a bicycle signal head. Under an LBI, bicyclists are given a green signal while the vehicular traffic is held at all red for several seconds, providing a head start for bicyclists to advance through the intersection. This treatment is particularly effective in locations where bicyclists are required to make a challenging merge or lane change (e.g., to access a left turn pocket) shortly after the intersection, as the LBI would give them sufficient time to make the merge before being overtaken by vehicular traffic. This treatment can be used to enhance a bicycle box.

Two-Stage Turn Queue Boxes

On right side cycle tracks, bicyclists are often unable to merge into traffic to turn left due to physical separation. This makes the provision of two-stage left turns critical in ensuring these facilities are functional. The same principles for two-stage turns apply to both bike lanes and cycle tracks. While two-stage turns may increase bicyclist comfort in many locations, this configuration will typically result in higher average signal delay for bicyclists due to the need to receive two separate green signal indications (one for the through street, followed by one for the cross street) before proceeding.

Colored Pavement Treatments

Pavement coloring is useful for a variety of applications in conjunction with bicycle facilities. The primary goal of colored pavements is to differentiate specific portions of the traveled way, but colored pavements can also visibly reduce the perceived width of the street.

Colored pavements are used to highlight conflict areas between bicycle lanes and turn lanes, especially where bicycle lanes merge across motor vehicle turn lanes. Colored pavements can be used in conjunction with sharrows (shared lane markings) in heavily used commercial corridors where no other provisions for bicycle facilities are evident.

While a variety of colored treatments have been used, the trend is for spring green as the preferred color for bicycle facilities of this type, especially in areas where conflicts or shared use is intended. Maintenance of color and surface condition are considerations. Traditional traffic paints and coatings can become slippery. Long life surfaces with good wet skid resistance should be considered.


Colored bicycle lanes.
(Credit: Michele Weisbart)



Green-colored bicycle lanes:
San Francisco, CA.
(Credit: San Francisco Municipal Transportation Agency)

Wayfinding

The ability to navigate through a region is informed by landmarks, natural features, signs and other visual cues. Wayfinding is a cost-effective and highly visible way to improve the bicycling environment by familiarizing users with the bicycle network, helping users identify the best routes to destinations, addressing misconceptions about time and distance, and helping overcome a barrier to entry for infrequent cyclists (e.g., "interested but concerned" cyclists).

A bikeway wayfinding system is typically composed of signs indicating direction of travel, location of destinations and travel time/distance to those destinations; pavement markings indicating to bicyclists that they are on a designated route or bike boulevard and reminding motorists to drive courteously; and maps providing users with information regarding destinations, bicycle facilities and route options.



Wayfinding signs: Seattle, WA. (Credit: Ryan Snyder)

Bicycle Parking

Secure bicycle parking at likely destinations is an integral part of a bikeway network. Bicycle thefts are common and lack of secure parking is often cited as a reason people hesitate to ride a bicycle. The same consideration should be given to bicyclists as to motorists, who expect convenient and secure parking at all destinations. Bicycle parking should be located in well-lit, secure locations close to the main entrance of a building, no further from the entrance than the closest automobile parking space. Bike parking should not interfere with pedestrian movement.

Bike racks along sidewalks should support the bicycle well and make it easy to lock a U-shaped lock to the frame of the bike and the rack. The two samples below show an "inverted –U" rack and an art design rack: both meet these criteria. Refer to the APBP Bike Parking Guidelines for additional information.

Maintenance

Maintenance is a critical part of safe and comfortable bicycle access. Two areas that are of particular importance to bicyclists are pavement quality and drainage grates. Rough surfaces, potholes and imperfections, such as joints, can cause a rider to lose control and fall. Care must be taken to ensure that drainage grates are bicycle-safe; otherwise a bicycle wheel may fall into the slots of the grate, causing the cyclist to fall. The grate and inlet box must be flush with the adjacent surface. Inlets should be raised after a pavement overlay to the new surface. If this is not possible or practical, the new pavement should taper into drainage inlets so the inlet edge is not abrupt.

The most effective way to avoid drainage-grate problems is to eliminate them entirely with the use of inlets in the curb face. This may require more grates to handle bypass flow, but is the most bicycle-friendly design


Inverted U Bike Rack. (Credit: Sky Yim)


Bicycle racks can double as public art:
Los Angeles, CA. (Credit: Sky Yim)

IMPLEMENTATION

Implementation of a bikeway network often requires an implementation plan. Some bikeways, such as paths, bicycle boulevards and other innovative techniques described in this guide, will require a capital improvement project process, including identifying funding, a public and environmental review process, and plan preparation. Other bikeway improvements piggy-back onto planned construction, such as resurfacing, reconstruction, or utility work.

The majority of bikeway facilities are provided on streets in the form of shared roadways or bicycle lanes. Shared roadways usually require virtually no change to existing roadways, except for some directional signs, occasional markings and minor changes in traffic control devices; removing unnecessary centerline stripes is a strategy that can be implemented after resurfacing projects. Striped bike lanes are implemented on existing roads through use of the strategies below.

Resurfacing

The cost of striping bicycle lanes is negligible when incorporated with resurfacing, as this avoids the high cost of stripe removal; the fresh pavement provides a blank slate. Jurisdictions will need to anticipate opportunities and synchronize restriping plans with repaving and reconstruction plans. If new pavement is not anticipated in the near future, grinding out the old lane lines can still provide bike lanes. There are three basic techniques for finding room for bike lanes: lane narrowing, road diets and parking removal.

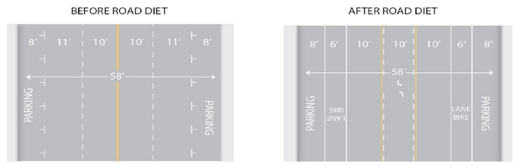
Lane narrowing

Where all existing or planned travel lanes must be retained, travel lanes can be narrowed to provide space for bike lanes. Recent studies have indicated that the use of 10-foot travel lanes does not result in decreased safety in comparison with wider lanes for vehicle speeds up to 35 mph. Eleven-foot lanes can be used satisfactorily at higher speeds especially where trucks and buses frequently run on these streets. However, where a choice between a 6-foot bike lane and an 11-foot travel lane must be made, it is usually preferable to have the 6-foot bike lane. Parking lanes can also be narrowed to 7 feet to create space for bike lanes.

Road diets

Reducing the number of travel lanes provides space for bicycle lanes. Many streets have more space for vehicular traffic than necessary. Some streets may require a traffic and/or environmental analysis to determine whether additional needs or impacts may be anticipated. The traditional road diet changes a four-lane undivided street to two travel lanes, a continuous left-turn lane (or median) and bike lanes. In other cases, a four-lane street can be reduced to a two-lane street without a center-turn lane if there are few left turns movements.

One-way couplets are good lane-reduction candidates if they have more travel lanes in one direction than necessary for the traffic volumes. For example, a four-lane one-way street can be reduced to three lanes and a bike lane. Since only one bike lane is needed on a one-way street, removing a travel lane can free enough room for other features, such as on-street parking or wider sidewalks. Both legs of a couplet must be treated equally, so there is a bike lane in each direction.



Fitting in bicycle lanes with road diets. (Credit: Michele Weisbart)

Parking Removal

On-street parking is vital on certain streets (such as residential or traditional central business districts with little or no off-street parking), but other streets have allowable parking without a significant visible demand. In these cases, parking prohibition can be used to provide bike lanes with minimal public inconvenience.

Utility Work

Utility work often requires reconstructing the street surface to complete restoration work. This provides opportunities to implement bike lanes and more complex bikeways such as bike boulevards, cycle tracks, or paths. It is necessary to provide plans for proper implementation and design of bikeway facilities prior to the utility work. It is equally necessary to ensure that existing bikeways are replaced where they exist prior to utility construction.

Redevelopment

When streets are slated for reconstruction in conjunction with redevelopment, opportunities exist to integrate bicycle lanes or other facilities into the redevelopment plans

Paved Shoulders

Adding paved shoulders to existing roads can be quite expensive if done as stand-alone, capital improvement projects, especially if ditch lines have to be moved, or if open drains are changed to enclosed drains. But paved shoulders can be added at little extra cost if they are incorporated into projects that already disturb the area beyond the pavement, such as laying utility lines or drainage work.

9. Transit Accommodations

INTRODUCTION

Public transit serves a vital transportation function for many people; it is their access to jobs, school, shopping, recreation, visitation, worship and other daily functions. For transit to provide optimal service, streets must accommodate transit vehicles, pedestrian access and the needs of the mobility challenged. Transit connects passengers to destinations and can play a key role in promoting placemaking and sustainable urban form.

This chapter provides design guidance for both transit stops and transit street operations, including bus stop layout, placement and transit lanes. The chapter ends with a discussion of ways to accommodate higher frequency transit services, such as light rail, street cars and Bus Rapid Transit (BRT).



Corpus Christi Regional Transportation Authority (CCRTA) provides transit services in the Corpus Christi MPO area. (Source: CCRTA)

ESSENTIAL PRINCIPLES OF TRANSIT ACCOMMODATIONS

Public transit should be planned and designed as part of the street system. It should interface seamlessly with walking, bicycling, car, taxi, or paratransit networks whenever possible. Transit should be planned on the following principles:

- That transit have the highest priority on city streets. On some streets transit may have a higher priority than private vehicles.
- That the busiest transit lines have designated bus lanes.
- That on selected streets where there is sufficient ridership, only buses and trains are permitted in the traveled way.
- That transit stops should be easily accessible, with safe and convenient crossing opportunities.
- That transit stops should be active and attractive public spaces that attract people on a regular basis, at various times of day, and all days of the week.
- That transit stops should include amenities for passengers waiting to board. In commercial areas, stops should provided space for a variety of amenities too.
- Serve residents, shoppers and commuters alike.
- That transit stops should be visible from a distance.
- That transit stop placement and design influences accessibility to transit and network operations and influences travel behavior/ mode choice.
- That zoning, land use and design guidelines around transit stations should encourage walking and a mixed use development.
- That streets connecting neighborhoods to transit facilities should be attractive, comfortable and safe for all users.

ACCESS TO TRANSIT

Transit services plays a key role in building and sustaining ridership; all transit trips require pedestrian or ADA transit access.

Where necessary, transit stops should have safe and convenient street crossings as transit users experience increased safety risks while crossing streets to access transit stops. Every transit stop should be evaluated for potential street crossings. If the crossing is deemed unsafe, mitigation can occur in several ways: a crossing can be provided at the existing stop, the stop can be moved to a location with a safer crossing, barriers can be placed to prevent street crossings, or the stop can be removed completely if the safety risk is too great. For street crossing measures, see Chapter "7. Pedestrian Crossings"

Eliminating or consolidating stops can be beneficial to transit operations and users by reducing the number of times a bus, streetcar, or light rail train has to stop. The trade offs are added walking time for users but quicker route times, resulting in a shorter journey overall. For example, this might mean a two to three minute longer walk for some passengers but an eight to 10 minute shorter bus ride for all.


Transit needs to serve people of all ages and abilities. (Source: CCRTA)

BUS STOPS

The following sections provide guidance for designing bus stops.

Layout

A well placed and configured transit stop offers the following characteristics:

- Clearly defines the stop as a special place
- Provides a visual cue on where to wait for a transit vehicle
- Does not block the path of travel on the adjacent sidewalk
- Allows for ease of access between the sidewalk, the transit stop and the transit vehicle
- Kept free of trash and debris and be well-maintained.

Layout guidelines include the following:

- Consolidate streetscape elements to create a clear waiting space and minimize obstructions between the sidewalk, waiting area and boarding area
- Consider the use of special paving treatments or curb extensions (where there is on-street parking) to distinguish transit stops from the adjacent sidewalks
- Integrate transit stops with adjacent activity centers whenever possible to create active and safe places
- Avoid locating bus stops adjacent to driveways, curb cuts and land uses that generate a large number of automobile trips (gas stations, drive-thru restaurants, etc.)

Transit stops are required by the ADA to be accessible. Specifically, the PROWAG requires a clear loading area (minimum 5 feet by 8 feet) perpendicular to the curb with a maximum 2.1 percent cross-slope to allow a transit vehicle to extend its lift to allow people with disabilities to board. The loading area should be located where the transit vehicle has its lift and be accessible directly from a transit shelter. The stop must also provide 30 by 48 inches of clear space within a shelter to accommodate wheelchairs.

Transit-Specific Streetscape Elements

The essential streetscape elements for transit include signs, shelters and benches.

Flag signs indicate where people are to wait and board a transit vehicle. The signs should clearly identify the transit operator, route number and schedule. Maps showing the transit lines servicing that stop, local destinations and additional transfer transit lines should also be provided. Flag signs should be located towards the front of the stop.

Benches should be provided at transit stops with headways longer than five minutes.

Shelters provide comfort and security for passengers by keeping them out of the rain, sun, heat, wind and rain. Shelters vary in size and design; standard shelters are 3 to 7 feet wide and 6 to 16 feet long. They include covered seating and sign panels that can be used for transit information. Shelters should:

- Be provided at transit stops with headways longer than 10 minutes.
- Have electrical connections to power lighting and/or real-time transit information, or accommodate solar power
- Should be located in a sidewalk's furniture zone so they don't conflict with the pedestrian zone. Shelters may be placed in the sidewalk's frontage zone provided that they do not block building entrances or the pedestrian zone.



CCRTA bus shelter. (Source: CCRTA)

Transit stops should also provide other amenities to make waiting for the next bus comfortable:

- Trash/recycling receptacles should be provided and maintained at most stops.
- Depending on service frequency and the number of passengers boarding and alighting, electronic "next bus" readouts can be used to inform passengers when to expect the next bus. Cell phone applications can also be used.
- High volume bus stops and stations should include space for vendors to sell goods and services.



CCRTA transit station. (Source: CCRTA)

Exhibit 24: *Bus Stop Placement Considerations* *Source: Federal Transit Administration, BRT Stops, Spacing, Location and Design*

Location	Advantage	Disadvantage
Near Side (immediately before an intersection)	» Minimizes interference when traffic is heavy on the far side of the intersection » Passengers access buses closest to crosswalk » Intersection available to assist in pulling away from curb » No double stopping » Buses can service passengers while stopped at a red light » Provides driver with opportunity to look for oncoming traffic including other buses with potential passengers	» Conflicts with right turning vehicles are increased » Stopped buses may obscure curbside traffic control devices and crossing pedestrians » Sight distance is obscured for crossing vehicles stopped to the right of the bus. » The through lane may be blocked during peak periods by queuing buses » Increases sight distance problems for crossing pedestrians
Far Side (immediately after an intersection)	» Minimizes conflicts between right turning vehicles and buses » Provides additional right turn capacity by making curb lane available for traffic » Minimizes sight distance problems on approaches to intersection » Encourages pedestrians to cross behind the bus » Requires shorter deceleration distances for buses » Gaps in traffic flow are created for buses re-entering the flow of traffic at signalized intersections	» Intersections may be blocked during peak periods by queuing buses » Sight distance may be obscured for crossing vehicles » Increases sight distance problems for crossing pedestrians » Stopping far side after stopping for a red light interferes with bus operations and all traffic in general » May increase number of rear-end accidents since drivers do not expect buses to stop again after stopping at a red light
Mid-Block (within a block)	» Minimizes sight distance problems for vehicles and pedestrians » Passenger waiting areas experience less pedestrian congestion	» Intersections may be blocked during peak periods by queuing buses » Sight distance may be obscured for crossing vehicles » Increases sight distance problems for crossing pedestrians » Stopping far side after stopping for a red light interferes with bus operations and all traffic in general » May increase number of rear-end accidents since drivers do not expect buses to stop again after stopping at a red light

BUS STOP PLACEMENT

A bus stop's optimal placement depends on the operational characteristics of both the roadway and the transit system. The placement of bus stops at the far side of signalized intersections is generally considered to be preferable to near side or mid-block locations. However, each location has its advantages and disadvantages, as shown in Exhibit 24 on page 91.

In general, bus stops should be located at the far side of a signalized intersection in order to enhance the effectiveness of traffic signal synchronization or bus signal priority projects. Near-side bus stops are appropriate for stop sign-controlled intersections. But in all cases priority should be given to the location that best serves the passengers, with passenger safety being the primary concern.

SIGNAL TREATMENT FOR TRANSIT SERVICES

Signal prioritization is a component of technology-based "intelligent transportation systems" (ITS). These systems are often used by roadway authorities in conjunction with transit agencies to help improve a roadway system's overall operations by: in the following ways:

- Reducing traffic signal delays for transit vehicles
- Improving intersection operational throughput
- Reducing the need for transit vehicles to stop for traffic at intersections
- Decreasing intersection wait times and increasing transit route frequency
- Improving transit system reliability and reducing waiting times

Signal prioritization projects include signal timing or phasing projects and transit signal priority projects.

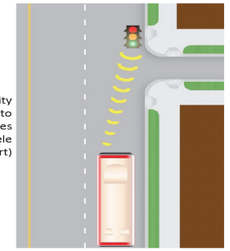
Signal timing projects optimize the traffic signals along a corridor to make better use of available green time capacity by favoring a peak directional traffic flow. These passive systems give priority to roadways with significant transit use within a district-wide traffic signal timing scheme. Transit signal prioritization can also be achieved by timing a corridor's traffic signals based on a bus's average operating speed instead of an automobile's average speed

Transit signal-priority projects alter a traffic signal's phasing as a transit vehicle approaches an intersection. This active system requires the installation of specialized equipment at an intersection's traffic signal controller and on the transit vehicle. It can either give an early green signal or hold a green signal that is already being displayed in order to allow buses that are operating behind schedule to get back on schedule. Signal-priority projects also help improve a transit system's schedule adherence, operating time and reliability.

Transit signal preemption projects provide a green light for emergency vehicles and transit vehicles.

Although they may use similar equipment, signal-priority and pre-emption are two different processes. Signal-priority modifies the normal signal operation process to better accommodate transit vehicles, while signal pre-emption interrupts the normal signal to favor transit or emergency vehicles. Preemption turns all other lights red and supersedes signal priority. This allows the bus to reduce travel times and improves safety by bringing all cross traffic, including cyclists and pedestrians, to a stop to allow the emergency or transit vehicle to pass.

The placement of a bus stop at the far side of a signalized intersection increases the effectiveness of transit signal-priority projects. Signal treatments should be used along streets with significant bus service.



Signal-priority technology can help to reduce delay for buses (Credit: Michele Weisbart)

BUS BULBS

Bus bulbs are curb extensions that extend the length of the transit stop on streets with on-street parking. They improve transit performance by eliminating the need for buses to merge into mixed traffic after every stop. They also facilitate passenger boarding by allowing the bus to align directly with the curb; waiting passengers can enter the bus immediately after it has stopped. They improve pedestrian conditions by providing additional space for people to wait for transit and by allowing the placement of bus shelters where they do not conflict with a sidewalk's pedestrian zone.

Bus bulbs also reduce the crossing distance of a street for pedestrians if they are located at a crossing. In most situations, buses picking up passengers at bus bulbs block the curbside travel lane; but this is mitigated by the reduced dwell time, as it takes less time for the bus driver to position the bus correctly and less time for passengers to board.

One major advantage of bus bulbs over pulling over to the curb is that they require less parking removal: typically two on-street parking spots for a bus bulb instead of four for pulling over.



Bus bulb. (Source: NACTO)

The following conditions should be given priority for the placement of transit bus bulbs:

- Where transit performance is significantly slowed by the transit vehicle's merging into a mixed-flow travel lane
- Roadways served by express or Bus Rapid Transit (BRT) lines
- Stops that serve as major transfer points
- Areas with heavy transit and pedestrian activity and where narrow sidewalks do not allow for the placement of a bus shelter without conflicting with the pedestrian zone

Bus bulbs should not be considered for stops with any of the following:

- A queue-jumping lane provided for buses
- On-street parking prohibited during peak travel periods
- Near-side stops located at intersections with heavy right-turn movements, except along streets with a "transit-first" policy

Characteristics

Bus bulbs should be long enough to accommodate all doors of a transit vehicle to allow for the boarding and alighting of all passengers, or be long enough to accommodate two or more buses (with a 5-foot clearance between buses and a 10-foot clearance behind a bus) where there is frequent service such as with BRT or other express lines. Bus bulbs located on the far side of a signalized intersection should be long enough to accommodate the complete length of a bus so that the rear of the bus does not intrude into the intersection.

Exhibit 25: *Standard Transit Vehicle and Transit Bus Bulb Dimensions*

Vehicle	Length (feet)	Number of Buses at Stops	Platform Length (feet)	
			Near Side	Far Side
Standard Bus	40	1	35	45
		2	55	65
Articulated Bus	60	1	80	90
		2	120	130

Source: Federal Transit Administration, August 2004. Characteristics of Bus Rapid Transit for Decision Making Project NO: FTA-VA-26-7222-2004.1

BICYCLE CONNECTIONS

Connecting bicycle facilities to transit stations promotes cycling and helps to reduce automobile use. Secure bicycle parking must be provided at or within close proximity to a bus stop and is preferably sheltered. Accommodations can be bike racks or lockers. Bike stations and automated bicycle parking are typically placed at transit locations with high levels of bicycle use.



CCRTA's Bike & Ride program offers buses with bicycle racks that ride along bicycle-friendly routes. (Source: CCRTA)

BUS LANES

Bus lanes provide exclusive or semi-exclusive use for transit vehicles to improve the transit system's travel time and operating efficiency by separating transit from congested travel lanes. They can be located in an exclusive right-of-way or share a roadway right-of-way. They can be physically separated from other travel lanes or differentiated by lane markings and signs.

Bus lanes can be located within a roadway median or along a curb-side lane and are identified by lane markings and signs. They should generally be at least 11 feet wide, but where bicycles share the lane with buses, 13 to 15 feet wide is preferred. When creating bus lanes, cities should consider the following:

- Exclusive transit use may be limited to peak travel periods or shared with high-occupancy or emergency service vehicles.
- On-street parking may be allowed depending on roadway design, especially with bus lanes located in the center of the street.
- A mixed-flow lane or on-street parking may be displaced; this is preferable to adding a lane to an already wide roadway, which increases the crossing distance for pedestrians and creates other problems discussed in other chapters.
- Within a mixed-flow lane, the roadway can be delineated by striping and signs.
- High-occupancy vehicles and/or bicycles may be permitted to use bus lanes.

Pedestrian access to stations becomes an issue when bus lanes are located in roadway medians.



Bus-only lane: Santa Monica, CA. (Credit: Sky Yim)

URBAN DESIGN

Bus stops and amenities vary in complexity and design from standardized off-the-shelf signs and furniture to specially designed elements. The design of the bus stop elements, location of the bus stop in relation to adjacent land uses or activities, and the quality of the roadway's pedestrian environment contribute to a bus stop's placemaking. Transit agencies prefer a branded look to their stops so they are easily identified, but often there is room for customized designs to fit in with the neighborhood, with at least some of the features and amenities.

ACCOMMODATING LIGHT RAIL, STREET CARS AND BRT

A growing number of streets have light rail lines, street cars, or BRT that serve as high-frequency transit. These services require careful considerations to incorporate their footprint into existing street design. The various options for accommodating light rail, street cars and BRT within streets include:

- Center-running
- Two-way split-side, with one direction of transit flow in each direction
- Two-way single-side, with both directions of transit flow on one side of the street right-of-way
- One-way single-side, with transit running one direction (either with or against the flow of vehicular traffic) and usually operating in a one-way couplet on parallel streets.

For each configuration, transit can operate in a reserved guideway or in mixed street traffic. When installing light rail or street cars within streets, the safety of pedestrians and bicyclists needs to be prioritized. If poorly designed, these transit lines introduce hazards and serve to divide neighborhoods where crossings are highly limited and/or difficult. In general, in areas of high pedestrian activity, the speed of the transit service should be compatible with the speed of pedestrians.

The potential for each configuration is influenced by the street type. Some transit configurations will not work effectively in combination with certain street types. Exhibit 26 below outlines the compatibility of each configuration with the four street types.



Street car trolley in Dallas, Texas.
(Source: McKinney Avenue Transit Authority)

Exhibit 26: *Street Types and Transit Configurations*

	Center Running		Two-Way Split Side		Two-Way Single Side		One-Way Single Side	
Street Type	**Reserved Guideway**	**In Street**	**Reserved Guideway**	**In Street**	**Reserved Guideway**	**In Street**	**Reserved Guideway**	**In Street**
Boulevard	Y	N	N	Y	Y	N	Y*	Y
Multi-way Boulevard	Y	N*	Y	Y	N	N	Y*	Y
Avenue	Y	Y	Y*	Y	Y*	N	Y	Y
Street	N	Y	Y	Y	N*	N	Y	Y

Notes
Y = Recommended street type/transit configuration combination
N = Not recommended/possible street type/transit configuration combination
**Denotes configurations that mat be possible under certain circumstances, but are not usually optimal*
Source: Integration of Transit into Urban Thoroughfare Design, DRAFT White Paper prepared by the Center for Transit-Oriented Development, updated: November 9, 2007.

10. Traffic Calming

INTRODUCTION

Traffic calming is the combination of mainly physical measures that (i) reduce the negative effects of motor vehicle use, (ii) alter driver behavior and (iii) improve conditions for non-motorized street users.

The phrase, "the combination of mainly physical measures," means physical measures plus a supportive policy environment such that traffic calming is permitted and encouraged.

"Reduce the negative effects of motor vehicle use" means changing the role and design of streets to accommodate motorists in ways that reduce the negative social and environmental effects on individuals, neighborhoods, districts, retail areas, corridors, downtowns and society in general (e.g., reduced speeds, reduced sense of intrusion/dominance, reduced energy consumption and pollution, reduced sprawl and reduced automobile dependence).

"Alter driver behavior" means that the street design helps drivers self-enforce lower speeds, resulting in less aggressive driving and increased respect for non-motorized users of the streets.

"Improve conditions for non-motorized street users" means promoting walking and cycling, changing expectations of all street users to support equitable use of the street, increasing safety and comfort (i.e., the feeling of safety), improving the aesthetics of the street and supporting the context of the street.

The definition of traffic calming is broad enough to apply to a myriad of contexts and situations but specific enough to have independent meaning so that it is not confused with other street design elements and design approaches.

Through design, traffic calming aims to slow the speeds of motorists to the "desired speed" (usually 20 mph or less for residential streets and 25 to 35 mph for boulevards and avenues) in a context-sensitive manner by working with the stakeholders (i.e., residents, business owners and agencies). Traffic calming is acceptable on all street types where pedestrians are allowed. Traffic calming is applicable to all sizes of towns and cities as well as rural villages and hamlets.

Traffic calming typically connotes a street or group of streets that employ traffic calming measures with a "self-enforcing" quality that physically encourages motorists to drive at the desired speed. When a group of streets are involved, it is normally referred to as "area-wide calming."

Traffic calming measures can also be designed to treat and manage street water.



Traffic calmed street. (Credit: Dan Burden)

CATEGORIES OF TRAFFIC CALMING

From a policy and design perspective, traffic calming measures fall into two broad categories: those that are appropriate for "framework" streets and those that are appropriate for both framework streets and "non-framework" streets.

Framework streets are streets that (i) connect places, neighborhoods, and districts (usually most boulevards and avenues) and/or (ii) serve as emergency vehicle routes. The sorts of traffic calming measures that are appropriate on framework streets include "cross-section measures" because emergency response times are generally unaffected by cross-section changes. Non-framework streets are all the other streets in the street network.

The majority of streets in cities are non-framework streets. Non-framework streets provide access to houses, businesses, offices, and parks, and are rarely used by emergency vehicles except for local calls. The sorts of traffic calming measures that are appropriate for non-framework streets include cross-section measures and "periodic measures." Periodic measures are spaced intermittently, rather than continuously. They are very popular on non-framework streets because they are inexpensive when compared to cross-section measures, which typically require construction along the entire length of the street. Examples of both types of measures and guidance for their use are shown in Exhibit 27 and Exhibit 28.

The correct terminology for traffic calming measures is "measures" not "devices." "Devices" implies a degree of portability that does not apply to most traffic calming measures. The use of "devices" also causes confusion with the contents of the Manual of Uniform Traffic Control Devices. Adding street trees and changing the paving material to provide texture or contrast, for example, are measures to alter behavior and perceptions but they are clearly not "devices."

"Route modifications modification measures" are not traffic calming measures. Examples of route modifications modification measures include street closures, partial closures, turn prohibitions, diverters and one-way streets. Route modifications effectively remove parts of the network. Route modifications result in circuitous and out-of-direction routing. The resulting trips are longer and burn more fuel; thus, circuitous routing can increase driver frustration and result in higher speeds. Route modification should be used sparingly and generally where traffic is diverted to boulevards to reduce cut-through traffic, or on bike boulevards to reduce their use by through motor vehicle traffic.

Lastly, signs and pavement markings are often used in conjunction with traffic calming measures, but they are traffic control devices, not traffic calming measures.

Exhibit 27: *Cross section traffic calming measure: Santa Monica, CA. (Credit: Ryan Snyder)*



Exhibit 28: *Periodic traffic calming measure: Raised crosswalk in Seattle, WA. (Credit: Ryan Snyder)*



BENEFITS OF TRAFFIC CALMING

The greatest benefit of traffic calming is increased safety. Compared with conventionally designed streets, traffic calmed streets typically have fewer collisions and even higher reductions in injuries and fatalities. These dramatic safety benefits are mostly the result of slower speeds for motorists that result in greater driver awareness, wider fields of vision, shorter stopping distances and less kinetic energy during a collision.

At 20 mph or less, chances are very high that a motorist will not kill or severely injure a pedestrian in a collision. Other contributing factors to these superior safety results include a more legible street environment and design advantages for pedestrians and cyclists. Bulb-outs on corners of intersections, for example, allow pedestrians to see past parked cars prior to crossing the street.

The accommodation and comfort of pedestrians increases greatly as speeds lower. For example, acceptable gaps (i.e., the space between moving vehicles) are better judged at slower speeds. Also, at 25 mph or less drivers are much more likely to yield to pedestrians and let them cross the street than at over 25 mph. The chart below shows that it takes a longer distance to react and a longer distance to brake and come to a full stop as speeds increase.


Peripheral vision at 15 mph


Peripheral vision at 30 mph

Peripheral vision decreases at higher speeds. (Credit: Michele Weisbart)

Exhibit 29: *Vehicle Travel Distance Post-Pedestrian Detection by Speed*



Source: FHWA, "Speed Management is Key to Road Safety", 2022.

TRAFFIC CALMING USAGE

For cities initiating a traffic calming policy, the most important items to include are the following:

- The correct definition of traffic calming
- General statements of support for traffic calming throughout the city and experimentation with traffic calming for a variety of rationales
- A chart of examples of acceptable measures on different categories of streets
- A reference to traffic calming practices and procedures that will be maintained at the staff level

The last item is important because cities need the flexibility to adapt their programs, include updated practices and measures as they are developed or discovered, and react to changing circumstances. If practices and procedures are adopted by ordinance or resolution, then the traffic calming policy will be out-of-date quickly or will hamper cities' ability to address unique contexts.

Tort Liability

The low speed environment of a traffic calmed street is a difficult place for someone to be "victimized" by a fault in the road design. Consequently, there are very few tort actions associated with traffic calming. Furthermore, there are fewer collisions and far fewer injuries and deaths on traffic calmed streets than streets with higher speeds. There is no exposure to liability if some simple and routine actions are followed:

- In cities' statements for supporting traffic calming, some broad rationale should be listed so that traffic calming cannot be considered "capricious." Examples should include to increase safety, increase walkability, increase community cohesion and increase business viability; historic preservation and environmental protection; and to further the goals and objectives of the community and city in a variety of contexts.
- Cities should conduct normal monitoring for maintenance, complaints, incidents and collisions. This need not be anything more than the normal reporting systems but with some additional attention paid to streets with new modifications.

Traffic Calming Contexts

Early traffic calming efforts in North America started as "programs" and often used a variety of warrants and petitions. However, traffic calming has evolved and there are many reasons to calm traffic; a city doesn't need special permission or warrants to increase the safety and comfort of its streets. In many ways, traffic calming is synonymous with other terms that are used to encourage better street designs. Depending on the term, the emphasis differs, but in all cases traffic calming measures play a role.

Context-Sensitive Design (CSD)

CSD implies that the context (i.e., the social, historical, physical, fiscal, political, environmental and policy contexts) drive drives the design as opposed to the conventional street hierarchy. Typically, conventional practices use general design guidelines that are indifferent to the context. Frequently, contexts along conventional streets in cities suffer from some combination of negative effects of motor vehicle use, poor driver behavior and poor conditions for non-motorized street users. Consequently, CSD often employs traffic calming measures to respect the context of the street and neighborhood.

Safe Routes to School

Safe Routes to School includes a series of operational and physical changes that help students walk and cycle to and from schools. Traffic calming measures are routinely employed with other strategies and changes to create safer walking and bicycling routes to school by slowing traffic.

EMERGENCY RESPONSE

It is important to have a network of framework streets so that emergency personnel can get to, or reasonably close to, calls without encountering too many periodic measures. In this way, all or most of the length of the responders' trips are on framework streets and, if any periodic measures are encountered, then they are encountered only towards the end of the trip.

From an emergency perspective and a public acceptability perspective, it is important to limit the number of periodic measures in a row on non-framework streets. The rule of thumb is, on the routes between two framework streets there should be no more than 8 to 12 periodic measures. If more than 8 to 12 periodic measures are used in a row, motorists who use the streets will become highly irritated with the measures and will have them removed. This rule of thumb effectively limits the length of single-street traffic calming projects. It also limits the size of the area for area-wide calming (i.e., the maximum limit is 8 to 12 multiplied by the spacing between the measures).

To achieve a desired speed of 20 mph using periodic measures, the spacing between the measures should be about 250 to 300 feet. Typically, measures are constructed at the obvious locations (i.e., pedestrian crossings, intersections and curves) and then subsequent measures are filled in to attain the correct spacing. In this way, a slow and steady speed profile is achieved; there is little opportunity or utility for motorists to speed up between the measures.

Exceptions

There are two general exceptions to the above recommendations:

- Some local streets should be classified as framework streets due to their long lengths and inability to be effectively calmed with no more than 8 to 12 periodic measures at the correct spacing.
- Periodic measures are appropriate on framework streets in some situations. Examples include locations with heavy pedestrian generators (e.g., at elementary schools, community centers, entertainment venues and key intersections along a main street or in a main street or in a downtown).



Designing traffic calming to accommodate emergency response. (Credit: Dan Burden)

Neighborhood Traffic Management

This term describes the combination of:

- Route modifications (e.g., turn prohibitions, closures, partial closures, diverters and one-way streets) to remove parts of the street network, sever linkages, create mazes, or reduce connectivity
- Unwarranted traffic control devices (e.g., stop signs and traffic signals) to annoy or delay motorists who cut through neighborhoods
- Traffic calming to reduce poor driver behavior (e.g., speeding and aggressive driving)

Please note that in most situations, diminishing the street network is not considered good practice. Bicycle boulevards are a primary exception to this rule; traffic control devices are desirable on bicycle boulevards to discourage through motor vehicle traffic. Route modification may also be used to reduce cut-through traffic where the traffic will be diverted to a boulevard.



Complete street. (Credit: Ryan Snyder)

Competent Street Design

Competent street design combines all of the above. There is little excuse any more to ignore the context or to build incomplete, dangerous, or poorly integrated streets. The issue for traffic calming is not justification but prioritization. If there are problems with a conventionally designed street, then traffic calming is warranted. The questions are how to calm, when to calm and how the project compares to other priorities in the city.

Obviously, an early priority for any city is to incorporate traffic calming measures into normal street design practices and procedures to help any new/future streets avoid the deficiencies of conventionally designed streets. The harder part is prioritizing the rebuilding or retrofitting of the myriad of already built conventionally design designed streets. Rebuilding or retrofitting these streets should be prioritized based on the context, in the broadest sense. Candidates for calming might include:

- Key shopping streets in the downtown area
- Waterfront streets, which commonly attract pedestrians who would benefit if the streets were calmed
- Neighborhood streets
- Large arterials (boulevards) that create barriers in the city

Planning and Design Processes

Traffic calming should be a normal part of any city's planning and design processes. The processes will vary dramatically depending on the context. For example, implementing a road diet in conjunction with a transit facility along a five-mile boulevard would require a different process than reverting one-way streets back to two-way operation in a downtown. Similarly, a neighborhood traffic calming plan would require a different process than designing a people-friendly Main Street. Also, identifying boulevard streets that are barriers in a city during comprehensive planning would require a different process than altering streets on a college campus or hospital campus.

The common threads that link all of the processes include the following:

- Gaining a good understanding of the context
- Involving the stakeholders in the definition of the problems to be solved and aspirations to be fulfilled
- Educating the stakeholders such that they can have meaningful involvement
- Aligning the project with a broader vision for the area
- Achieving an informed consent regarding the plan

Traffic calming is best done in conjunction with a development, revitalization, utility, or maintenance project; a downtown, corridor, or transit plan; a new street design; or other project. Then the traffic calming layer is simply incorporated into the larger project's processes.



Curb extensions enhance retail districts: Asheville, North Carolina. (Credit: Ryan Snyder)

Photo Examples of Traffic Calming Measures



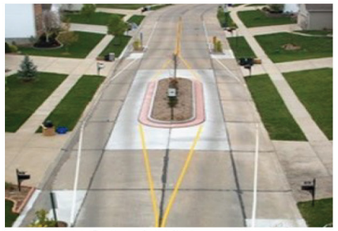
Long, continuous median.
(Credit: Ian Lockwood)



Short median on curve.
(Credit: Michael Wallwork)



Short median with refuge.
(Credit: Ian Lockwood)



Oval median with tree wells.
(Credit: Gary Crammer)



Mid-block curb extension with bioswale.
(Credit: Brad Lancaster



Lateral shifts.
(Credit: Ian Lockwood)



Roundabout.
(Credit: FNI)



Mini-roundabout.
(Credit: FNI)



Traffic circle with rain garden.
(Credit: Brad Lancaster)



Impeller T-intersection.
(Credit: Ian Lockwood)



Raised intersection.
(Credit: FNI)



Raised crosswalk.
(Credit: Ian Lockwood)



Chicane.
(Credit: NACTO)



One-lane chicane.
(Credit: Ian Lockwood)



Speed cushions with passage that straddles centerline.
(Credit: Jeff Gulden)



Valley gutter.
(Credit: Ian Lockwood)



Curbless, flush street.
(Credit: Ian Lockwood)



Textured pavement.
(Credit: Ian Lockwood)

11. Re-Placing Streets

INTRODUCTION

Most American cities have come to view streets primarily as conduits for moving vehicles from one place to another (from A to B is the common expression). While moving vehicles is one of their purposes, streets are spaces, even destinations in and of themselves. Conceiving of a street as a public space and establishing design guidelines that serve multiple social functions involves several fundamental steps. Behind them all is a redefinition of whom streets ought to serve. By approaching streets as public spaces, cities redirect their attention from creating traffic conduits to designing a place for the people who use the street.

People put the place back in streets. This chapter describes the need for cities to "re-place" their streets—make streets places and refocus their purpose on the people who use them—and how cities can do so. The chapter outlines the key features and functions of re-placed streets and the design elements used to achieve re-placed streets. The chapter concludes by describing the process cities can follow to ensure streets come to reflect a community's strengths, needs and aspirations.



Pavement to Parks program: San Francisco, CA. (Credit: Sky Yim)

PLACEMAKING FOR STREETS

In order to be places, streets must:

- Augment and complement surrounding destinations, including other public spaces such as parks and plazas
- Reflect a community's identity
- Invite physical activity through allowing and encouraging active transportation and recreation
- Support social connectivity
- Promote social and economic equity
- Be as pleasant and accessible for staying as for going
- Prioritize the slowest users over the fastest
- Balance mobility and public space functions

So that people can:

- Walk and stroll in comfort
- Sit down in nice, comfortable places, sheltered from the elements
- Meet and talk—by chance and by design
- Look at attractive things along the way
- See places that are interesting
- Feel safe in a public environment
- Enjoy other people around them
- And get where they need to go!

Re-placed streets must be slow streets that are inviting and filled with human activity. This is the most important distinction between streets designed for maximal car throughput and re-placed streets; it requires the necessary scalar adjustment from car to people-focused street planning. Streets designed for fast and far movement favor people moving by motor vehicles, not people moving under their own power. Human energy limits people to slow and local movement.

Because people, not motors, are essential to long-term growth in places of all kinds, human-scaled streets are an inducement to healthy lifestyles and economic resilience.



Good public space invites social interaction. (Credit: Dan Burden)



Public Art: Alhambra, CA. (Credit: Ryan Snyder)

PUBLIC SPACE AND THE NEED TO RE-PLACE STREETS

Public spaces are the stages for our public lives. They are the places shared by all members of a community, of any size. Quality public spaces are places where things happen and where people want to be, vital places that highlight local assets, spur rejuvenation and serve common needs.

Streets comprise a large portion of publicly owned land in cities and towns. Streets are a huge part of any community's public space network and historically served as meeting places, playgrounds for children, marketplaces and more. As populations spread out from city centers, streets lost many of these functions and were instead designed and planned for one use: mobility. At best, streets conceived as complete streets address the mobility needs of all street users (pedestrians, cyclists, drivers and transit riders). During the last century, however, automobiles have been prioritized over people as users of our streets.



Active public space. (Credit: Ryan Snyder)

As part of the public realm, successful streets have a variety of functions beyond allowing automobiles to travel rapidly. For this reason, placemaking, the process of creating high-quality destinations, must be at the core of the planning and design of our streets to meet the following challenges:

- **Population growth and urbanization.** People moving back into cities will need to be accommodated in limited space, putting greater demands on existing streets. If streets continue to largely function to move people traveling in motor vehicles, they will not be able to accommodate this growth. Streets will need to enable people to do more while traveling less and to travel more efficiently.
- **The need to maximize social and economic exchange**. Streets will need to serve the highest and best use for the land they are on, and mobility is only one among many possible uses. Streets need to be designed to maximize social value, which also spurs healthy economic exchange. In this way, streets become arteries distributing prosperity. Streets that invite social interaction are more likely to ensure healthy growth.
- **The need to reduce energy consumption and induce sustainable growth.** Streets that are places promote locality. They enable people to travel comfortably by non-motorized modes, which in turn shortens travel distance demand. With growing concerns regarding fuel resources and climate change, this shift will be critical. Because re-placed streets spur locality-serving commerce and social venues, they also set the stage for and enable healthy and environmentally sustainable practices/behaviors in the surrounding built environment.
- **A desire to create public space.** Beyond being the frames for other development, streets can be public spaces themselves. Access to public space is critical to safe, healthy and successful communities. When streets are designed as great spaces for people, they reinforce a sense of belonging and build on the strengths of the communities they host.

Design Techniques and Goals for Replaced Streets

A re-placed street balances the moving and staying needs of its users and has multiple, people-serving purposes. The design techniques and goals detailed below describe how to create re-placed streets.



Good sidewalk buffer: Glendale, CA. (Credit: Ryan Snyder)

Support and Encourage Activities and Destinations

- Widen sidewalks to accommodate multiple activities
- Open streets to multiple activities
- Encourage/provide active ground floor uses in adjacent buildings
- Cluster activities and amenities
- Allow street vendors and performers

Design Street Elements and Adjacent Buildings for the Human Scale

- Use amenities that are pedestrian-scaled including:
  - Signs
  - Lighting
  - Seating
- Encourage building design (e.g., through zoning regulations and design guidelines) that is scaled to the human body, such as
  - Frequent building entrances
  - Building transparency at street level
  - Interesting facades

Provide a Feeling of Safety and Security on Streets

- Keep streets well-maintained and both the street and surrounding buildings well-lit
- Select streets adjacent to round-the-clock-active buildings and public spaces
- Invite diverse people and uses throughout the day
- Slow traffic to a comfortable speed to mix with other travel modes through
  - Low speed design elements
  - Traffic calming techniques
  - Shared space
- Maintain a buffer between pedestrians and vehicles when there is fast moving traffic using
  - Planters
  - Bollards
  - Parked cars
  - Kiosks, newsstands, public toilets, lampposts

Connect Both Sides of the Street

- Shorten crossing distance through
  - Narrow travel lanes
  - Curb extensions and pedestrian islands
  - Building activities connected to the street
- Invite people to cross in more places by:
  - Slowing vehicular traffic
  - Establishing mid-block crossings
  - Making shared streets

Show a Sense of Ownership

- Provide for maintenance and cleanliness
- Engage community/local residents in maintenance
- Accommodate diverse programming appropriate for the season and time-of-day, such as:
  - Green markets/farmers' markets
  - Fairs and festivals
  - Ciclovía-style events
  - Volunteer events

Reflect Community Identity

Unique community identity draws from the natural setting and local history, as well as the cultural backgrounds of community residents and their architectural tastes.

- Showcase local assets including:
  - Monuments and building architecture
  - Views
  - Trees and other plants
  - Other natural features (water, topography)
  - Parks and plazas
  - History
  - People
  - Intersections transformed into meeting places
- Invite a diversity of users:
  - Reference or preserve continuity of local aesthetics

Move Community towards Resiliency

Utilize on-site and local resources where possible

- Use surface area for energy capture
- Use effective stormwater management techniques including:
  - Bioswales
  - Rain gardens
- Use open space for growing food (community gardens)



Ciclovía event: Los Angeles, CA. (Credit: Ryan Snyder)



Statue: Edmund, OK. (Credit: FNI)

THE PLACEMAKING PROCESS

The placemaking process should be fun, engaging and empowering for a community; build on existing human resources; and result in increased community social capital. Chapter 15, "Community Engagement," provides the details of the type of public process that should be used to ensure community involvement and place-based planning. Below are processes especially important to placemaking.

Establish a Community Vision of What the Street Is and Should Be

Infrastructure forecasts what later springs from the built environment: a street's public space functions can be an inducement to a community's growth aspirations and not just an accommodation of existing behavior. Determining the optimal uses and design for a given community's streets involves identifying the strengths and needs of its users. Because it involves a scalar adjustment, this is the most important distinction between a street designed to be a place, with many functions, and a street designed for the single function of maximizing car throughput. A process that allows the community of street users to define these strengths and needs and establish a vision for the street is critical.

Involve the Public in Assessing the Strength, Needs and Opportunities on the Street

The project must start by going directly to the residents and neighborhoods to evaluate and establish a vision for the street. A critical part of this will be an assessment of whether places on the street are performing well or need improvement. The assessment should include a grassroots identification of needs for enhancement of under-performing places and opportunities for the creation of new places so that the street can achieve the critical mass of places needed to function as a destination itself. In addition to places on the street, the community should be engaged in an on-site diagnosis of the street itself to determine how it is performing. A variety of tools and audits exist for such assessments, but at heart they should engage the community in assessing the characteristics, described in the previous section, that make a street a place.



Austin, Texas: Outdoor café seating creates a more activated street zone and encourages economic activity by pedestrians. (Source: City of Austin Great Streets Program)

Establish a Community Vision Based on This Assessment

The community process should result in a community-generated vision for what the street can and should be, including the things people should be able to do on the street and the way that people feel doing them. The vision should be generated by people who use the street. Such a vision is generally quite realistic and practical yet contains innovative ideas because the vision is grounded in reality but isn't generated by just one individual or group.

The vision should contain:

- A mission statement of goals
- A definition of how the street will be used and by whom
- A statement of the desired character of the street
- Suggestions and a conceptual idea of how the street could be designed
- Models or examples of places that community members would like the street to be like or elements they would like to use

Develop a Plan Based on This Vision

There will need to be a plan for realizing the vision. It might not include every step to realize the vision, but it should begin to lay out next steps and identify things that all partners, including the agencies, the professionals and the community, can do to move re-placing the street forward.

STRATEGIES TO RE-PLACE STREETS

Re-placing streets requires building streets around a community's vision that the street can support. Re-placing a street is an opportunity to open a process wherein communities remind themselves of their strengths and establish a shared and sustainable vision for their future. Before a city can proceed with street redesigns that create a sense of place, it must address the following issues.

The Street's Place in the Community

Streets, the built environments they connect, and the people who use them compose a community. Thus, it is important to situate the street in its spatial context and identify the places it connects. It is equally important to identify whose needs the street should serve. This may include tenants and property owners, students, employees, local civic associations and religious institutions.



Statue: Santa Fe, NM. (Credit: Ryan Snyder)

Placemaking Participants

At the heart of placemaking is the idea that each community has the means and the potential to create its own public spaces. Before a city can proceed with street redesigns that attend to the multiple functions of public space through placemaking, it is important to identify who needs to be involved to frame the meaning of place and the vision for that community and to provide the needed information, resources and expertise to realize that vision.

The Community

Since place is an outgrowth of community character, re-placing should invite the collective influence of a community's diverse residents and users. In re-placing a street, it is important to establish who has a stake in the neighborhood, and give all of these groups and individuals the opportunity to come to the table and contribute. As noted above, the groups may include tenants and property owners, students, employees and community-based groups like civic associations and religious institutions. The appropriate public space functions of streets should be defined by these multiple users, often referred to as "stakeholders."

Multiple Agencies

Within a city, multiple agencies should be included and engaged in re-placing a street. A department of transportation alone cannot create a street that is a place. Any agency with responsibility for the regulation, construction, operations, or maintenance on or adjacent to the street should be included in the project early in the process. In addition to the department of transportation, this might include public works, the parks department, utilities and the planning or zoning department. All agencies must bring their needs and constraints to the table, but more importantly they must understand the community's vision and goals for making the street a place. They can then begin considering what they need to do to carry out the will of their community.

A Multi-Disciplinary Team

A successful street is a complex place, and the information, insight and skills required to make it a successful place are many and diverse. It is beyond the experience of any one profession to deal with any of these issues. The role of professionals is as a resource for the community and to implement the community's vision.

Prioritize Interventions Based on This Vision

The vision will contain many ideas. However, some will be more important or more critical than others. Additionally, some will be easier to implement than others. The community will need to prioritize individual ideas and strategies in order to begin to take action in re-placing the street.

Select and Implement Short-Term/ Temporary/Pilot Projects

First on the action plan should be short-term or pilot projects. Such projects can be a way of testing ideas for long term change at a lower cost while providing flexibility for adaptation and change. Such projects also give people confidence that change is occurring and that the ideas they have contributed matter.

This is important because re-placing streets takes time, and smaller, simpler changes can provide small steps that keep people engaged in the process of placemaking. Short-term and pilot projects allow people to see how the street is working with changes introduced gradually over time, enabling people's perceptions of how the street functions and what it should be to change and reducing resistance to change.

New York, San Francisco, Portland and other cities have quickly transformed streets into vibrant public space with such techniques as

- Establishing non-vehicular space with planter boxes, temporary curbs and wooden platforms
- Painting the pavement under the newly repurposed space
- Bringing in portable tables, chairs and awnings
- Incorporating decorative street painting projects

Establish a Maintenance and Management Plan

Maintenance and management is critical because streets are not static—they change daily, weekly and seasonally—and streets must adapt and be flexible to this change. Thus, public space management may be required. Management becomes especially critical where events, such as farmers' markets, fairs, festivals and ciclovías, are programmed. Great streets are also well loved and well used. To sustain a quality street environment, the community must commit to long-term investment in the re-placed street.



Examples of low-cost, short-term devices that transform streets. (Credit: Paul Zykofsky)

12. Retrofitting Suburbia

INTRODUCTION

Much of suburbia will have to change in order to thrive and meet the health, environmental and economic challenges of the coming decades. Because of their form, widely separated land uses and disconnected street networks, most suburban areas lack walkability and require that people travel by car for most of their needs. This has serious environmental consequences (poor air quality, climate change and high energy consumption) as well as health consequences as suburbanites live in environments that discourage active transportation and favor driving. Residents in these neighborhoods tend to become isolated due to the lack of walkable streets and walkable destinations. Rising fuel costs pinch both family budgets and local economies as people have less discretionary income.

Changing demographics also present challenges. Suburban homes have been built to accommodate young families with children, but fewer households now fit that profile. More and more households are comprised of empty nesters, young singles, divorced adults and other non-nuclear families, and this trend is expected to grow in the future.

As fuel prices continue to rise and as residents age, suburbs will need to serve more of their residents' needs closer to home, and serve those needs in places that can be reached other than by driving. Suburban areas can be retrofitted to accommodate a new reality that rewards places that are close to more people and reachable in many ways.

This chapter describes how streets can support retrofitting suburbia, provides strategies for retrofitting streets and recommends priorities and phasing.



Suburban development (Credit: Ryan Snyder)

SUBURBAN STREETS TO LIVING STREETS

Streets play an enormous role in determining a place's quality of life.

Retrofitting Existing Streets

By definition, a retrofit occurs on an existing street. This manual gives design guidance for all streets, existing and new. The following section recommends how to accommodate those design recommendations on existing streets. Many aspects of living streets actually take less space than typical suburban design.

To create a living street in the right-of-way of an existing street, cities should do the following (LaPlante, J., "Retrofitting Urban Arterials Into Complete Streets," 3rd Urban Street Symposium, June 24-27, 2007, Seattle, Washington):

- Narrow travel lanes. Ten or 11-foot lanes are acceptable for most urban boulevards. They are just as safe as 12-foot lanes for posted speeds of 35 mph or less (Dumbaugh, E., "Safe Streets, Livable Streets," Journal of the American Planning Association 71[3] 283-300).
- Seek opportunities to put streets on a road diet; this involves eliminating superfluous travel lanes. Common scenarios include
- Convert a four-lane undivided road to a center turn lane, two travel lanes and two bike lanes. This can handle up to 20,000 ADT and improves safety and access to adjacent destinations; the center turn lane can be replaced with short sections of medians and pedestrian crossing islands in selected locations. On-street parking can be substituted for bike lanes where the context and conditions warrant it.
- Reduce seven-lane roads to five lanes for ADTs of up to 35,000
- Remove a travel lane from three- and four-lane one-way streets
- Tighten corner curb radii to the minimum needed to provide a usable turning radius for an appropriately selected design vehicle. Occasional encroachment by larger vehicles into other travel lanes is acceptable; intersections should not be designed for the largest occasional vehicle.



Suburban street (Credit: Ryan Snyder)

- Eliminate unnecessary turn lanes at intersections, such as right-turn lanes with very few right turning vehicles. Free-flow right-turn lanes, including freeway entry and exit ramp connections to surface streets, should be replaced with yield control.
- Replace painted channelization islands at intersections with raised islands, to give pedestrians a true refuge and to break up a long crossing of many lanes into smaller discrete steps.

All of these changes can free up space, which can be used for additional elements. To improve street quality, cities can

- Paint bike lanes
- Add sidewalks
- Add raised medians, which visually narrow the roadway and provide a median refuge for midblock crossings
- Provide median and parkway landscaping, which further visually narrows the roadway and provides a calming effect
- Add or retain curb parking, which improves community access, calms traffic and buffers pedestrians.
- Add bulb-outs, which shorten pedestrian crossing distances and improve sight lines

Non-Physical Changes

In addition to physical retrofits, cities can and should adapt existing street management and operations to

- Adjust signal timing for slower speeds and to ensure comfortable crossing times for appropriate populations. In areas with aging populations, for example, crossing times may need to be lengthened.
- Work with transit agencies to improve bus operations
- Work with schools to develop a Safe Routes to School Program
- Reexamine the parking code (for example, off-street parking requirements may be reduced, especially in coordination with additional on-street parking)

Street Crossings

A connected sidewalk network includes street crossings. To improve street crossings, jurisdictions can consider the following:

- Make pedestrian crossing locations safe, comfortable and more frequent (LaPlante, J., "Retrofitting Urban Arterials Into Complete Streets," 3rd Urban Street Symposium, June 24-27, 2007 Seattle, Washington.)
- Allow crossing at every corner of all intersections
- On streets with a bus route, make provisions for pedestrians to cross the street at all bus stops. Bus riders need to cross the street either coming or going.
- Provide midblock crossings. Pedestrians should not be expected to travel to the closest intersection to cross the street. Signalized intersections in suburban areas are often spaced ¼ mile, ½ mile, or even further apart; it is unreasonable to expect people to walk that far to cross the street. Nor do signalized intersections offer safety benefits to pedestrians, due to the many added turning conflicts at large suburban intersections.

Many of these changes can be made through spot improvement programs. Many are relatively inexpensive; it is not necessary to wait for a reconstruction to create a living street. More substantial retrofits may require reconstruction. A planned surface repaving project is an excellent time to retrofit the corridor to add comfort, convenience, safety, aesthetics and economic value.

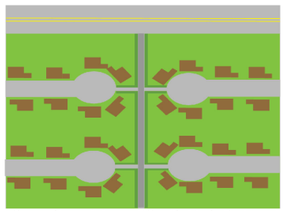


Midblock crosswalk (Credit: Dan Burden)

RE-ESTABLISHING STREET NETWORKS

Much of today's suburban landscape was built in isolated pods: residential subdivisions, business parks, shopping centers and schools that are poorly connected to neighboring properties. These pods create barriers to getting around other than in a car, because they create long distances between destinations and because the pods are often surrounded by sound walls, fences or berms, literally blocking potential bicycle and walking routes. These pods don't work well for auto traffic either, since they force all traffic onto busy streets rather than allowing connection and local circulation through local streets.

To create a vibrant suburb that will thrive in new conditions, direct connections must be created or re-created to enable efficient, direct travel by everyone. That means establishing or re-establishing street and sidewalk networks.



Connecting cul-de-sacs (Credit: Marty Bruinsma)

Re/establishing a street network can be more challenging, particularly when right-of-way has not been preserved. Some cities have purchased homes at the end of cul-de-sacs, put the connectors in, and then sold the homes. In cases where a city is still developing suburbs, it should make connectivity a fundamental priority by following the principles in Chapter 3, "Street Networks and Classifications."

LAND USE ALONG TRANSFORMED STREETS

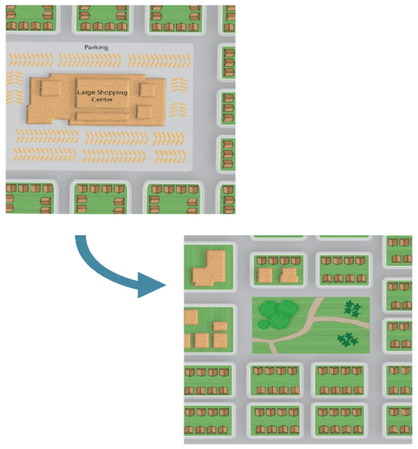


Exhibit 30: *Conversion of shopping center to a neighborhood Credit: Michele Weisbart)*

Not only streets will need to change in suburbia; many land uses are obsolete and/or no longer economically viable. However, street improvements generally should come before land use change in suburban retrofitting. This is because high-quality land uses tend to come to high-quality streets.

The street and the land use work together and determine whether a place is attractive and draws people and investment. To that end, communities retrofitting older suburban areas should use the following three principles:

1. Focus new investment in nodes on streets

In most of suburbia, there will not be enough investment all at once to transform whole corridors. Identify and focus investment at individual nodes.

2. Focus revitalization efforts on creating genuine places in those nodes: compact, mixed-use and at least internally walkable

Plan for and enable neighborhood-serving commercial districts Where necessary, rezone from automobile-oriented commercial sites (gas stations, convenience stores and fast food outlets). These car plazas are designed for, and dependent on, vehicular access and offer no relationships with the nearby residential areas. They absorb retail potential and will tend to discourage development of neighborhood-serving commercial districts.

3. Carefully detail the desired outcomes

It is vital that retrofit efforts pay attention to the details described in the individual chapters of this manual. Adopting well-intentioned policy goals is not enough. There must be follow through by incorporating the vision's details in the design and construction of the project. Infill development between nodes that follows the principles of this manual will help to connect the nodes into livable neighborhoods.

SETTING PRIORITIES AND PHASING

The primary challenge in retrofitting suburbia is less fixing the infrastructure and more creating economically sustainable places, with the emphasis on place.

The priority should be to begin by creating vibrant nodes. Cities should not allow themselves to be daunted by the scale of the retrofit challenge. As with street retrofits, creating places can be done incrementally. The images to the right show such an incremental process.



Exhibit 31: *Example of a transformed suburban street (Credit: Urban Advantage, Inc.)*

13. Best Practices

INTRODUCTION

A list of eight Complete Streets best practices are recommended based on reports and guidelines published by national and local organizations. Additionally, a review of current policies and standards for municipalities within the Corpus Christi MPO was conducted to inform recommendations related to each best practice. Resources reviewed for this Best Practices Review include:

- National Complete Streets Coalition – Best Complete Streets Policy 2023
- National Association of City Transportation Officials – Designing for Small Things with Wheels
- National Cooperative Highway Research Program – Research Report 855: An expanded functional classification system for highways and streets
- City of Austin – Complete Streets Guide, Sidewalk Program
- City of Galveston
- City of El Paso Complete Streets

Exhibit 32: *El Paso Complete Streets Policy Vision Statement (Source: City of El Paso)*



1. Develop a Clear Vision and Guiding Principles

All Complete Streets programs should start with a clear vision statement to define program goals and expected outcomes. A clear vision ensures the public understands the intentions of the program so that they can provide accountability. With a vision, cities can also formulate guiding principles, which provide guidelines in formulating policies and action items to implement Complete Streets. A clear vision and list of guiding principles create a strong foundation for the rest of the Complete Streets program.

El Paso's Complete Street program, which has been chosen as one of the top 10 programs in 2022 in the nation, has a clear vision statement outlining the purpose and goals of the program. The statement helped guide the city in planning for implementing the Complete Streets approach with various policies and initiatives. Similarly, Austin's Complete Streets program consists of a resolution and an ordinance that provides clear directions for the city to achieve its initial goals.

Currently, the City of Corpus Christi and the City of Portland do not have a Complete Streets resolution or policy. Both Corpus Christi's (Plan CC) and Portland's Comprehensive Plan (Plan Portland 2040) briefly mention goals and strategies that relate to bicycle and pedestrian networks.

Recommendations for Local Application

- Draft and adopt a Complete Streets Policy using the National Complete Streets Coalition Policy Framework
- Incorporate Complete Streets and active transportation goals into future plans

2. Create Street Design Standards that Encourage and Protect Active Transportation Users

Existing street design standards are often designed primarily for motorized traffic mobility, without considering the needs of active transportation users. Existing roadway designs generally focus on maintaining the flow of traffic, which results in the widening of lanes and an increase in speed limits. With such standards, these users are generally more at risk than motorized users. The needs of active transportation users also differ from those of motorized users and, therefore, are frequently overlooked by agencies. For instance, pedestrians need benches or resting amenities along streets and cyclists need bicycle parking stations at their destinations. Future design standards should not only protect the safety of all users, but they should also ensure roadways are inviting to all users and further encourage residents to travel using active transportation modes.

A great diversity of street design elements can be incorporated into the design standard to protect active transportation users. One of the key components is the separation of pedestrians and cyclists from motorized users.



Road diet project in Piedras Street, El Paso (Credit: National Complete Street Coalition)

The National Cooperative Highway Research Program (NCHRP) emphasizes the need to separate pedestrians and cyclists from vehicle traffic to ensure all users can travel safely at the same time. Implementing a road diet is also a common way to address the needs of active transportation users. For example, El Paso implemented a road diet in the Complete Streets program on Piedras Street. The road diet successfully improved roadway safety and reduced pedestrian injuries, which in turn enhanced pedestrian safety and encouraged them to work and shop along the street more frequently.

Existing support for active transportation is found in both Corpus Christi and Portland's codes and ordinances. Both cities require standards that include provisions for safe travel for non-motorized users. These requirements are seen in subdivision design, parking requirements, zoning regulations and street standards. By creating enforceable regulations that encourage active transportation, both cities foster an environment that includes all roadway users.

Regulations that reduce the number of required off-street parking spaces in exchange for developing facilities for bicyclists, using bike trails or other trails as buffer areas, and requiring ADA-compliant sidewalks are in Corpus Christi's Unified Development Code that supports active transportation. Portland also complies with ADA standards in its sidewalk design regulations and requires street segments, other than a Minor Street, that are within a 2-mile radius of a public schools to have bicycle paths. Please see Chapter 2: Existing Plans and Codes for more information.

Recommendations for Local Application

- Update codes and design standards to prioritize active transportation
- Implement road diets on roadways with high rates of injuries and fatalities
- Consider road diets as part of active transportation plan facilities development

3. Create Community Buy-in for Complete Streets

Support from community members is essential for implementing Complete Streets and Active Transportation projects. In the Active Transportation Plan, Chapter 4: Public Involvement outlines Corpus Christi and Portland residents' involvement in this program and serves as an example for similar projects in the future. Residents in the Corpus Christi MPO, including disadvantaged communities, are actively engaged in the process. This approach is commonly adopted by other cities across the country. For instance, El Paso prioritized historically marginalized groups in its engagement process to ensure the voices of these communities are incorporated into the plan. It set up various engagement events in places where these communities frequently gather so that the City can receive adequate input from such a population.

Municipalities can also organize various community events to promote Complete Streets and raise awareness among the public. These events aim to encourage existing active transportation users to maintain their lifestyles, as well as to encourage other residents to participate. Cities can organize a wide range of events that target various groups in the population, such as bike to work or school day, walkathon and open street festivals.



Conquer the Coast (Source: Corpus Christi MPO)

Austin has held Viva! Streets Austin which is an open-street, car-free event to encourage walking and biking in the city. Parts of the city's streets are closed off to vehicles to allow pedestrians to use the space freely and safely. This event successfully gathered large crowds of pedestrians and cyclists on the streets. In Galveston, organizations hold a Bike Around the Bay fundraiser every year to promote biking and support local non-profits. Such an event can provide residents with a safe environment to bike and explore their community.

Different activities are organized in cities in the Corpus Christi MPO that encourage public participation in walking and biking. In Corpus Christi, bike events such as Conquer the Coast, National Bike to Work/ School Day and Corpus Christi Bike Rodeo are organized throughout the year to promote biking as a convenient mode to commute to work as well as for leisure. Other events including Harbor Half and Beach to Bay Relay also encourage residents to walk in the city. Local bicycle and pedestrian advocates or "champions" are needed on the local level to plan, coordinate and execute community events related to Complete Streets and active transportation.

Recommendations for Local Application

- Identify and uplift local active transportation and Complete Streets champions
- Coordinate with local organizations to encourage participation in state and national events such as Bike to Work Day
- Promote local active transportation advocacy groups and leaders

Beach to Bay
47TH ANNUAL RELAY MARATHON
ARMED FORCES DAY • MAY 18, 2024

4. Incorporate Context-Sensitive Designs

Streets and land use are inextricably connected, and land use planning can help to uphold Complete Streets principles. For example, future developments featuring new or reconfigured roads should be required to incorporate a Complete Streets approach appropriate to the planned future land use and road users. Because land use plans are often long-term visions for the community, they should be utilized to further active transportation goals.

Street designs should also reflect local context to ensure they take residents' needs into consideration. Balancing the land use types, density, capacity, environmental concerns and building setbacks affect the level of safety measures required to ensure streets are welcoming for all users. As the NCSC suggests, cities should plan their streets in harmony with the adjacent land uses and neighborhoods. It is equally important to consider the anticipated future context, such as planned transportation and land use developments.

In El Paso's Complete Streets policy, the city reviewed relevant documents, such as the thoroughfare plan and Resilient El Paso plan, to understand the commonalities and gaps with the vision of the Complete Streets policy. With such information, the city identified reports that require amendments and established a timeline to make these changes.

Currently, the City of Corpus Christi and the City of Portland do not have any program or policies that require land use plans to incorporate Complete Streets principles.



Street design should maintain good harmony with surrounding land uses. (Credit: FNI)

Recommendations for Local Application

- Require consideration of Complete Streets principles in all future land use plans
- Conduct robust public engagement for future street projects to understand and consider the context of the projects

5. Design for All Physical Abilities

Street designs should consider the needs of residents with disabilities to ensure roadways are safe and welcoming to everyone. All sidewalks must comply with the American Disabilities Act (ADA), but cities are encouraged to create standards that go beyond these requirements to create a safer street environment for different types of users. Sidewalks should be wide enough to accommodate multiple people, including those with disabilities, using the space at the same time. Municipalities can conduct an Accessibility Impact Assessment as part of their Complete Streets program to evaluate how existing land uses affect accessibility, with sidewalks as a main component of the report. Such an analysis is helpful in identifying sidewalks that require repairs or upgrades, as well as locations for new sidewalks. Agencies should evaluate sidewalk conditions periodically and engage people with disabilities to have their input in the process.

The City of Austin has a Sidewalk Program that ensures ADA standards are being followed for sidewalks, crossings and shared streets. This plan prioritizes the inclusion of pedestrians, especially those who are disadvantaged. With equity in mind the plan sets measurable targets that include safety, use and funding.

Corpus Christi's ADA Master Plan covers how pedestrian facilities should be developed to be compliant with the City's ADA codes. In addition to long-range planning, Corpus Christi has codes throughout their Unified Development Code that go into detail about ADA compliance. The City of Portland's Unified Development Ordinance also includes requirements that must meet ADA standards.

Recommendations for Local Application

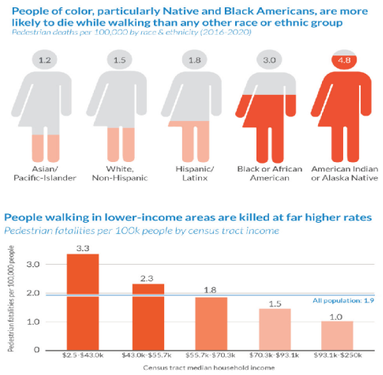
- Conduct a full inventory of sidewalk conditions and create a plan to systematically repair inaccessible sidewalks, prioritizing issues in areas with high concentrations of disadvantaged communities
- Identify gaps in the sidewalk network and create a plan to systematically add sidewalks to fill these gaps, prioritizing gaps in areas with high concentrations of disadvantaged communities



Ensure streets are designed to accommodate users with disabilities. (Credit: FNI)

6. Design For All Users, Especially Disadvantaged Communities

Vulnerable communities, including people of color, low-income residents and older adults, are often excluded from previous planning process and their needs are neglected. The Complete Streets approach emphasizes addressing the needs of all residents and mitigating the disproportionate impacts experienced by vulnerable groups. Taking their needs into consideration when designing streets can improve the overall safety conditions for all residents and will show significant positive impacts on these historically marginalized groups.



Credit: National Complete Street Coalition

The National Association of City Transportation Officials (NACTO) has stressed the importance of identifying all potential users when creating Complete Streets programs. When municipalities consider the needs of bike lane users, they should not only focus on confident cyclists, but also should consider the needs of vulnerable groups, including people of color, low-income residents and seniors, as well as the needs of other often-overlooked groups, including people with disabilities, people moving goods and children. It is important for municipalities to consider the diverse needs of cyclists comprehensively, as each group has its unique needs and requires various planning initiatives or interventions to protect their safety.

Corpus Christi MPO's 2023 Program for Addressing Discrimination (PAD) outlines the responsibilities and actions of the MPO in promoting equity and mitigating adverse impacts that disproportionately affect certain communities.



Exhibit 33: *Corpus Christi 2023 Program for Addressing Discrimination (PAD)*

Recommendations for Local Application

- Identify and engage disadvantaged groups in transportation and land use planning and invite them to develop recommendations
- At the conclusion of planning activities, continually engage disadvantaged groups to ensure they have access to up-to-date information on projects and performance measures

7. Foster Department Coordination

Complete Streets is an interdisciplinary program that requires the involvement of different departments. As various agencies may have competing priorities, they should have good coordination and frequent communication to ensure the Complete Streets program can be successfully implemented. Good coordination helps clearly outline the responsibilities and priorities of each department, which facilitates program implementation and public accountability.

El Paso created a Technical Review Committee for its Complete Streets Plan, which is a working group that consists of representatives from multiple city departments. The committee worked frequently with the Mobility Advisory Committee to coordinate resources and discuss action plans to achieve the initial vision and goals. The two groups worked collaboratively and resulted in great success in implementing Complete Streets initiatives.

Currently, the Cities of Corpus Christi and Portland do not have a committee designated for planning and implementing Complete Streets in the cities. Corpus Christi has a Transportation Advisory Commission composed of nine community members, including at least one from the bicycling community. It is tasked with providing recommendations on transportation-related issues. Portland does not have any board or commission that is dedicated to transportation issues.

Recommendations for Local Application

- For each street project, identify the specific responsibilities of each agency and department involved
- Have consistent communication with state, county and MPO representatives to stay up to date with funding opportunities and identified needs

8. Create Detailed And Transparent Performance Measures

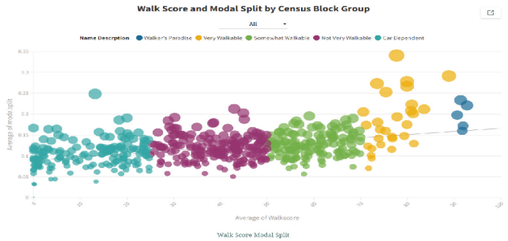
Each Complete Street policy should include measurable indicators to evaluate the effectiveness of the program. Unlike traditional street design that primarily focuses on the Level of Service (LOS) as the indicator, Complete Streets focuses on a broader range of performance measures, such as a reduction in injuries and fatalities, an increase in active transportation trips and pedestrian or cyclist facilities, as well as user experiences and perceptions. Meanwhile, agencies should continually monitor the progress of the program and publish results to the public. This allows the public to stay informed about the progress of the program and provides accountability.

El Paso's Complete Streets policy used multiple pilot programs to evaluate its progress and refine policy initiatives. The city evaluated a number of indicators, such as changes in speed limits and the number of vehicle and walking trips. These measures have helped the city understand areas that can be improved when implementing the Complete Streets program on a larger scale. The information was also published online to allow El Paso residents to understand program outcomes and progress.

Recommendations for Local Application

- Track and report on the trends in fatal and serious injury crashes involving bicyclists and pedestrians
- Track and report on the miles of on-street bicycle facilities by type, the miles of shared use paths and trails, and the miles of ADA-compliant sidewalks
- Track and report on the number of occasions or events promoted by the MPO or its member cities and the estimated number of participants
- Track and report on the walking and bicycling mode share data from the US Census American Community Survey

Exhibit 34: *Walkability data published on the City of El Paso's website as performance measurement*



Credit: City of El Paso

Additional Resources

Universal Pedestrian Access

- Primary: ADAAG/PROWAG
- Secondary:
  - MUTCD
  - AASHTO "Green Book"
  - FHWA's Designing Sidewalks and Trails for Access
  - NCHRP Project 20-7 (232) ADA Transition Plans: Guide to Best Management Practices
  - NCHRP Project 3-62, Guidelines for Accessible Pedestrian Signals

Bikeway Design

- National Association of City Transportation Officials, Urban Bikeway Design Guide, 2011
- AASHTO Guide for the Development of Bicycle Facilities

Retrofitting Suburbia

- ICF International with Nelson\Nygaard Consulting Associates and Reid Ewing. Transportation Study of the U.S. Route 1 College Park Corridor, July 14, 2008.
- PB Americas, EWA Connectivity Study, May 2009.
- Dunham-Jones, E. and Williamson, J., Retrofitting Suburbia: Urban Design Solutions for Redesigning Suburbs, John Wiley & Sons, 2009. This book focuses more on retrofitting parcels of land, rather than on the streets between them. Nonetheless, it is an excellent resource.



LOCAL AND FEDERAL FUNDING

Funding sources for active transportation, complete streets and micro-mobility projects that the Corpus Christi MPO and cities may leverage to enhance their active transportation efforts are available at the local, state and federal level.

Local Funding Opportunities

SOURCE	DESCRIPTION
Crowd Funding	Through crowd funding, community members raise money to fund certain projects. This approach can raise awareness of community needs on pedestrian and bicycle infrastructures, which may help gather public support on future projects. It may also help attract potential donors for future projects.
Impact/Developer Fee	Impact/Developer fees can be used to fund infrastructure improvement projects such as pedestrian and bicycle amenities. Cities charge such fees to ensure the costs of maintaining the local transportation system are shared by developers who bring new growth into the area.
Local Capital Improvement Programs (CIPs)	Capital Improvement Programs (CIPs) outline upcoming capital projects, including streets and pedestrian and cyclist infrastructures. These projects are funded using local sources including property and sales taxes.
Municipal Bonds	A city is able to finance a project by acquiring debt that must be paid with interest over a specified amount of time.
Park Land Dedication Ordinances	Park Land Dedication Ordinances consist of park land dedication and development fees. This funding source can be used to acquire new park land and construct walking and biking trails.
Partnership	Cities can partner with local and regional businesses, non-profits and other public agencies to acquire additional funding sources. These partnerships may be able to receive funds from development grants targeting pedestrian and bicycle improvements.
Private Donations	A donation program is established to receive contributions from the community.
Property Taxes	Cities can use property taxes to help fund infrastructure improvements if their policies permit. It is generally the major source of local revenue and can be increased with voter approval.
Revenue Bonds	Financed debt to fund a project that is paid for by the revenue of the project.
Sales Taxes	Sales taxes consist of both local and statewide sales taxes. Cities can use sales taxes to fund pedestrian and bicycle infrastructure improvements. Sales taxes can be increased with voter approval.
Special Assessments	Cities can use special assessments to fund infrastructure improvements when the cost is directly controlled by people who benefit from the project. Neighborhoods can coordinate to use their property taxes to fund pedestrian or bicycle improvements in their area. Tax-increment financing districts and public improvement districts are common examples of special assessments.
User Fees	User fees are paid by people who use certain public utilities or services, such as water and sewer facilities, parks and transportation systems. Cities can charger user fees for people who use off-road facilities and recreational trails.
Utility Bill Contributions	To help fund projects small contributions can be made via a utility bill.

State Funding Opportunities

SOURCE	DESCRIPTION
Transportation Alternatives Set-aside (TA) Program	TxDOT administers TA funds for locally sponsored bicycle and pedestrian infrastructure projects in communities across the state. In large urbanized areas with populations over 200,000, TA funds are also distributed directly to Metropolitan Planning Organizations (MPO) to administer according to their needs. MPOs and TxDOT are responsible for selecting projects independently of one another. Includes Safe Routes to Schools.
Subrecipient Monitoring and Compliance Program	The FHWA requires TxDOT requires to monitor their Subrecipients for compliance with Title VI and the ADA. TxDOT recently developed an online Subrecipient Compliance Assessment Tool. Upon completion, Subrecipients will be identified as having a satisfactory or unsatisfactory status. This assessment is a first step for TxDOT to determine Subrecipient compliance, help Subrecipients understand their ADA/504 and Title VI responsibilities and assist TxDOT in planning future training and technical assistance.
Traffic Safety Grants	Traffic Safety Grants are funded by the NHTSA and administered through TxDOT. Educational institutions, local governments, nonprofit organizations, and state agencies can submit traffic safety proposals for funding consideration with TxDOT. Projects can include increased enforcement, traffic safety training, driver behavior education, and outreach programs to reduce fatalities, injuries and crashes on Texas roadways.
Local Government Assistance Program (LGAP)	Section 201.706, Transportation Code, requires TxDOT to provide a minimum amount of materials to assist counties with the repair and maintenance of county roads and bridges. Materials may include surplus materials already possessed by TxDOT or new materials.
Recreational Trails Grants	Texas Parks and Wildlife Department (TPWD) administers the National Recreational Trails Fund in Texas. Funds can be spent on both motorized and non-motorized recreational trail projects such as the construction of new recreational trails, to improve existing trails, to develop trailheads or trailside facilities, and to acquire trail corridors.
Local Parks Grant Program (LPGP)	LPGP consists of 5 individual programs that assist local units of government with the acquisition and/or development of public recreation areas and facilities throughout the State of Texas. The Program provides 50% matching grants on a reimbursement basis to eligible applicants. All grant assisted sites must be dedicated as parkland in perpetuity, properly maintained and open to the public.

Federal Funding Opportunities

SOURCE	DESCRIPTION
Active Transportation Infrastructure Investment Program (ATIIP)	A competitive federal grant to provide safe access to active transportation facilities with an emphasis on connecting the community.
Community Development Block Grant Program (CDBG)	CDBG funds can be used to support projects that improve and revitalize streetscape, such as constructing and repairing sidewalks and bike lanes.
Section 108 – Loan Guarantee Program	Section 108 provides CDBG recipients with the ability to leverage their annual grant allocation to access low-cost, flexible financing for economic development, housing, public facility, and infrastructure projects.
Disaster Relief Fund	FEMA can authorize direction, coordination, management, and provide funds to help with eligible emergencies.
Highway Safety Improvement Program (HSIP)	HSIP aims to support projects that reduce conflicts between vehicles and pedestrians or cyclists. Section 405 (National Priority Safety Program) of HSIP specifically provide funds for safety enhancement and education programs related to pedestrians and bicycles.
Land and Water Conservation Fund (LWCF)	LWCF aims to support projects that create and maintain high-quality recreation resources. Projects that improve trail networks may be eligible for this funding.
National Highway Performance Program (NHPP)	The NHPP funding, which is administrated by TxDOT, can fund projects that construct new facilities on the National Highway System (NHS). This includes bicycle lanes, bicycle parking and shared use paths.
Surface Transportation Block Grant Program (STPBG)	STPBG funding can be used for nearly all types of transportation projects. Local, regional, and state governments can use this funding source to pay for pedestrian and bicycle improvement projects.
Surface Transportation Block Grant Program Set-aside (STPBG Set-aside)	STPBG Set-aside funding replaces the Transportation Alternative Program (TAP) and includes the Recreation Trails Program (RTP). This source can fund projects that promote alternative transportation modes as well as trail constructions and improvements. Previously TAP-eligible pedestrian and bicycle projects remain eligible in the STPBG Set-aside. The Texas Parks & Wildlife Department (TPWD) administrates the RTP funding for trail-related projects.
TIGER Discretionary Grants Program	This program provides fundings for road, rail, transit and port projects that achieve critical national objectives such as environmental sustainability and livability. Projects with an active transportation focus are eligible for the fund.
Urban Park and Recreation Recovery Grant (UPARR)	URAPP fund helps economically distraught communities to restore desired recreation facilities. Projects that repair and upgrade park and trail may be eligible for the grant.
Federal Transit Administration Programs (FTA)	FTA provides annual formula grants to transit agencies nationwide as well as discretionary funding in competitive processes. Currently there are 13 formula and 37 competitive grants available.
Safe Streets for All (SS4A)	USDOT appropriated $1 Billion nationwide for each year, 2022 through 2026. Funding is available for planning, demonstration and implementation projects to fulfill needs identified in a Safety Action Plan. Bicyclists and pedestrians are identified as vulnerable road users and improvements for their safety are fundable.

Pedestrian and Bicycle Funding Opportunities: U.S. Department of Transportation Highway, Transit, and Safety Funds

November 16, 2023

This table indicates likely eligibility for pedestrian and bicycle activities and projects under U.S. Department of Transportation surface transportation funding programs. Activities and projects need to meet program eligibility requirements. See notes and basic program requirements below, with links to program information. Project sponsors should integrate the safety, accessibility, equity, and convenience of walking and bicycling into surface transportation projects.

Pedestrian and Bicycle Funding Opportunities: Highway, Transit, and Safety Funds

Key: $ = Activity likely eligible. Restrictions may apply, see program notes and guidance. ~$ = Eligible, but not competitive unless part of a larger project.

	Federal Highway Administration														Federal Lands						OST Grant										OST Loan		FTA				NHTSA	
Activity or Project Type	ATIIP	BRI	CRP	CMAQ	HSIP	BRIC	NSHIP	PROTECT	STBG	TASA	RTP	SRTS	PLAN	NSBP	FLTTP	ITTP	TTP	SFTS	NFEA	RAISE	RCN	SS4A	SMART	Thrive	RRIP	TIFIA	CFTAP	5307	5310	5311	5339	402	405
Access enhancements to public transportation (benches, bus pads, lighting)	$		$	$				$	$		$				$		$			$	$	~$			~$	~$	$										
Americans with Disabilities Act (ADA)/504 Self Evaluation / Transition Plan	$		$						$	$	$		$		$	$					$			TA				$	~$								
Barrier removal for ADA compliance	$	$	$					$	$	$	$		$		$	$			$	$	$	~$			~$	~$	$										
Bicycle plans	$		$						$	$		$			$	$					~$	$					$		$	~$							
Bicycle helmets (project or training related)	~$				$				$	$SRTS		$				$															$						
Bicycle helmets (safety promotion)	~$				$				$	$SRTS		$				$																					
Bicycle lanes on road	$		$	$	$	$	$	$	$	$		$		$	$	$	$		$	$	$	~$	$		~$	~$	$										
Bicycle parking (see Bicycle Parking Solutions)	$		$	$			$		$	$	$	$			$	$			~$	~$	$	~$			~$	$	$										
Bike racks on transit	$		$	$					$	$					$	$				~$	$	~$					$										
Bicycle repair station (air pump, simple tools, electric outlets)	$		$						$	$					$	$				~$	$	~$			~$	~$	$										
Bicycle share (capital and equipment including charging stations and outlets; not operations)	$		$	$				$	$						$	$			~$	~$	$	~$			~$	~$	$										
Bicycle storage or service centers (e.g. at transit hubs) including charging stations and outlets; not operations)	$		$	$					$	$					$	$				~$	$	~$			~$	$	$										
Bridges / overcrossings for pedestrians and/or bicyclists	$	$	$	$	$	$	$	$	$	$	$	$			$	$	$	$	$	$	$	~$			~$	$	$										
Bus shelters and benches	$		$	$				$	$	$					$	$			$	$	$	~$			~$	$											
Charging stations for electric bicycles and scooters NEW	$		$	$					$	$	$				$	$					~$	~$			~$	~$											
Coordinator positions: State/local (CMAQ/STBG limited)				$					$	$SRTS		$				$						~$															
Community Capacity Building (develop organizational skills and processes)	~$												$			$					NAE	~$		TA						~$	~$					
Crosswalks for pedestrians, pedestrian refuge islands (new or retrofit)	$		$	~$	$	$	$	$	$	$	$	$			$	$	$	$	$	$	$	~$	~$	$												
Curb ramps	$	$	$	~$	$	$	$	$	$	$	$	$			$	$	$	$	$	$	$	~$	~$	$												
Counting equipment	$				$	$	$		$	$	$	$	$		$	$	$		$	$	$		~$	$												
Data collection and monitoring for pedestrians and/or bicyclists	$		$		$	$	$		$	$	$	$			$	$	$		$	$	$		~$	$	~$	~$										
Emergency and evacuation routes for pedestrians and/or bicyclists	$		$				$	$	$	$	$	$			$	$			$	$	$		$	$	~$	~$										
Encouragement and education activities related to safe access for bicyclists and pedestrians NEW	~$			$	$				$	$SRTS	$	$	$		$							~$	~$													
History preservation (pedestrian, bicycle, transit facilities)	~$		$						$	$					$	$					~$	~$	~$		~$	~$	$										
Landscaping, streetscaping (pedestrian/bicycle route; transit access); related amenities (benches, lighting, shade, trees, water fountains); usually part of larger project	$		$					~$	$	$					$	$			~$	~$	~$	~$			~$	~$	$										
Lighting (pedestrian and bicyclist scale associated with pedestrian/bicyclist project)	$		$	~$	$	$	$	$	$	$	$	$			$	$	$	$	$	$	$	~$	~$	$												
Maps (for pedestrians and/or bicyclists) (see Idea Book)	$		$	$					$	$		$	$	$	$					$							$									
Micromobility projects, including scooter share (capital and equipment, including charging stations and outlets; not operations)	$		$	$					$	$					$	$					$	~$	~$		~$	~$											
Paved shoulders for pedestrian and/or bicyclist use	$	$	$	$	$	$	$	$	$	$		$		$	$	$	$	$	~$	$	$				~$	~$											
Pedestrian plans	$		$					$	$	$		$	$		$	$	$	$	~$	$	~$	$															
Public education and awareness programs to inform motorists and nonmotorized road users on nonmotorized road user safety NEW	~$				$				$	$SRTS		$				$																			$	$	

Pedestrian and Bicycle Funding Opportunities: Highway, Transit, and Safety Funds

Key: $ = Activity likely eligible. Restrictions may apply, see program notes and guidance. ~$ = Eligible, but not competitive unless part of a larger project.

	Federal Highway Administration														Federal Lands						OST Grant										OST Loan		FTA				NHTSA	
Activity or Project Type	ATIIP	BRI	CRP	CMAQ	HSIP	BRIC	NSHIP	PROTECT	STBG	TASA	RTP	SRTS	PLAN	NSBP	FLTTP	ITTP	TTP	SFTS	NFEA	RAISE	RCN	SS4A	SMART	Thrive	RRIP	TIFIA	CFTAP	5307	5310	5311	5339	402	405
Rail at-grade crossings	$			$			$		$	$	$	$									$	$	$	~$							$	$	$					
Recreational trails	$								$		$	$										$	$	~$														
Resilience improvements to pedestrian and bicycle facilities or to protect or enhance use. REVISED	$	~$	~$	~$					$	$	$	$	$	note	$	$	$				$	$	$	~$	~$			~$	~$									
Road Diets (pedestrian and bicycle portions)	$			$	$				$	$		$				$					$	$	$					$	$									
Road Safety Assessment for pedestrians and bicyclists	$						$	$		$				$							$	$	$		TA			~$										
Safety education and awareness activities and programs to inform pedestrians, bicyclists, and motorists on ped/bike traffic safety laws	~$				$					$	$SRTS		$	$								$															
Safety education positions					$					$	$SRTS	$SRTS			$																							
Safety enforcement (including police patrols)					$					$	$SRTS	$SRTS		$																							
Safety program technical assessment (for peds/bicyclists)	~$				$					$	$SRTS	$SRTS		$																							
Separated bicycle lanes	$	$	$	$	$	$	$	$	$	$	$		$								$	$	$														
Shared use paths / transportation trails	$			$	$	$	$	$	$	$	$		$								$	$	$														
Sidewalks (new or retrofit)	$	$		$	$	$	$	$	$	$	$		$								$	$	$														
Signs, signals, signal improvements (incl accessible pedestrian signals) see note	$			$	$	$	$	$	$	$			$								$	$	$														
Signing for pedestrian or bicycle routes	$			$	$	$			$	$	$										$	$	$														
Spot improvement programs (programs of small projects to enhance pedestrian and bicycle use) REVISED	$			$	~$	$	$	$		$	$	$	$								$	$	$	~$	~$			~$	~$								
Stormwater mitigation related to pedestrian and bicycle project impacts REVISED	$					$	$	$	$	$	$	$	$	note							$	$	$	~$				~$	~$	$	$	note	note				
Technical Assistance (see Cross-cutting notes) NEW	~$				~$	$				$	$	$	$	note							$	$		~$	~$	~$	TA									
Traffic calming	$			$			$	$		$		$	$									$	$	~$					~$	~$	$						
Trail bridges	$			$	~$	$	$	$	$	$	$	$									$	$	$					~$	$							
Trail construction and maintenance equipment	$			$						$	$	$	$								~$	~$	~$					~$	~$							
Trail/highway crossings and intersections	$	$	$	~$	$	$	$	$	$	$	$	$	$								$	$	$					~$	~$							
Trailside/trailhead facilities (restrooms, water, but not general park amenities)	$		~$						$	$	$											~$						~$	~$							
Training	~$				$		$	$		$	$	$													TA				~$	~$	$					
Training for law enforcement on ped/bicyclist safety laws	~$			~$	$				$	$SRTS	$SRTS		$																~$	~$	$	$				
Tunnels / underpasses for pedestrians and/or bicyclists	$		$	$	$	$	$	$	$	$	$		$								$	$	$									$	$			
Vulnerable Road User Safety Assessment	$				$				$	$			$												TA			~$	~$							

Abbreviations (alphabetical order)

ADA/504: Americans with Disabilities Act of 1990 / Section 504 of the Rehabilitation Act of 1973
AoPP: Areas of Persistent Poverty Program
ATIIP: Active Transportation Infrastructure Investment Program [web link under development]
BIL: Bipartisan Infrastructure Law (Infrastructure Investment and Jobs Act (Pub. L. 117-58)
BRI: Bridge Programs, including: BFP: Bridge Formula Program; BIP: Bridge Investment Program; BRR: Bridge Replacement and Rehabilitation Program
CMAQ: Congestion Mitigation and Air Quality Improvement Program
CRP: Carbon Reduction Program
FLTTP: Federal Lands and Tribal Transportation Programs: Federal Lands Access Program, Federal Lands Transportation Program, Tribal Transportation Program, Federal Lands Planning Program and related programs for Federal and Tribal lands such as the Nationally Significant Federal Lands and Tribal Projects program
FTA: Federal Transit Administration Capital Funds
PLAN: Statewide Planning and Research (SPR) or Metropolitan Planning funds (FHWA and/or FTA funding)
PROTECT: Promoting Resilient Operations for Transformative, Efficient, and Cost Saving Transportation
RAISE: Rebuilding American Infrastructure with Sustainability and Equity
RCN: Reconnecting Communities and Neighborhoods Grant Program (includes Reconnecting Communities Pilot Program (RCP) and Neighborhood Access and Equity programs)
RHCP: Railway-Highway Crossings (Section 130) Program
RRIP: Railroad Rehabilitation and Improvement Financing (loans)
RTP: Recreational Trails Program
SMART: Strengthening Mobility and Revolutionizing Transportation (SMART) Grants Program
SRTS: Safe Routes to School Program (and related activities)
SS4A: Safe Streets and Roads for All
STBG: Surface Transportation Block Grant Program

HSIP: Highway Safety Improvement Program	TASA: Transportation Alternatives Set-Aside (formerly Transportation Alternatives Program, Transportation Enhancements)
IIJA: Infrastructure Investment and Jobs Act (Pub. L. 117-58), also known as the Bipartisan Infrastructure Law	Thrive: Thriving Communities Initiative (TA: Technical Assistance)
INFRA: Infrastructure for Rebuilding America Discretionary Grant Program	TIFIA: Transportation Infrastructure Finance and Innovation Act (loans)
NAE: Neighborhood Access and Equity Program	TOD: Transit-Oriented Development
NHPP: National Highway Performance Program	TTP: Tribal Transportation Program
NHTSA 402: National Highway Traffic Safety Administration State and Community Highway Safety Grant Program	TTPSF: Tribal Transportation Program Safety Fund
NHTSA 405(g): National Highway Traffic Safety Administration National Priority Safety Programs (Nonmotorized safety)	
NSBP: National Scenic Byways Program	

Cross-cutting notes

This table indicates likely eligibility for pedestrian, bicycle, and micromobility activities and projects under U.S. Department of Transportation surface transportation funding programs. Activities and projects must meet program eligibility requirements. See notes and links to program information below. Although the primary focus of this table is stand-alone activities and projects, programs can also fund pedestrian and bicycle facilities as part of larger projects. Project sponsors are encouraged to consider Complete Streets and Networks that routinely integrate the safety, accessibility, equity, and convenience of walking and bicycling into surface transportation projects. The Federal-aid eligibility of the pedestrian and bicycle elements are considered under the eligibility criteria applicable to the larger highway project. Pedestrian and bicycle activities also may be characterized as environmental mitigation for larger highway projects, especially in response to impacts to a Section 4(f) property or work zone safety, mobility, and accessibility impacts on bicyclists and pedestrians.

- See FHWA's Policy on Using Bipartisan Infrastructure Law Resources to Build a Better America.
- See FHWA Bicycle and Pedestrian Planning, Program, and Project Development (Guidance), Publications, Pedestrian and Bicyclist Safety, and Bicycle transportation and pedestrian walkways statute at 23 U.S.C. 217.
- Bicycle Project Purpose: 23 U.S.C. 217(i) requires that bicycle facilities "be principally for transportation, rather than recreation, purposes". However, 23 U.S.C. 133(b)(7) and 133(h) authorize recreational trails under STBG and TASA, therefore, 23 U.S.C. 217(i) does not apply to trail projects (including for bicycle use) using STBG or TASA funds. Section 217(i) applies to bicycle facilities other than trail-related projects, and section 217(i) applies to bicycle facilities using other programs (NHPP, HSIP, CMAQ). The transportation requirement under section 217(i) only applies to bicycle projects, not to any other trail use or transportation mode.
- Signs, signals, signal improvements includes ensuring accessibility for persons with disabilities. See Accessible Pedestrian Signals. See also Proven Safety Countermeasures, such as Crosswalk Visibility Enhancements, Leading Pedestrian Interval signals, Lighting, Pedestrian Hybrid Beacons, and Rectangular Rapid Flashing Beacons.
- Technical Assistance includes assisting local agencies and other potential grantees to identify pedestrian and bicycle safety and infrastructure issues, and to help them develop and implement successful projects. Technical assistance may be authorized under a program or sometimes as a limited portion of a program. See FHWA links to Technical Assistance and Local Support.
- The DOT Navigator is a resource to help communities understand the best ways to apply for grants, and to plan for and deliver transformative infrastructure projects and services.
- Aspects of DOT initiatives may be eligible as individual projects. Activities above may benefit safe, comfortable, multimodal networks; environmental justice; and equity.
- Occasional DOT or agency incentive grants may be available for specific research or technical assistance purposes.
- Operation costs: In general, ongoing and routine operation costs (such as ongoing costs for bike sharing or scooter sharing) are not eligible unless specified within program legislation. See links to program guidance for more information.

Program-specific notes

DOT funding programs have specific requirements that activities and projects must meet. Eligibility must be determined on a case-by-case basis. See links to program guidance for more information.

FHWA Programs

- ATTIP (IIJA § 11529): Subject to appropriations. Projects costing at least $15,000,000 to develop or complete active transportation networks and spines, or at least $100,000 to plan or design for active transportation networks and spines.
- BRI; BFP, (IIJA, Div. J, title VIII, para. (1)), BIP (23 U.S.C. 124), BRR (Department of Transportation Appropriations Act, 2022): For specific highway bridge projects and highway bridge projects that will replace or rehabilitate a bridge; project must consider pedestrian and bicycle access as part of the project and costs related to their inclusion are eligible under these programs.
- CRP (23 U.S.C. 175): Projects should support the reduction of carbon dioxide emissions from on-road highway sources.
- CMAQ (23 U.S.C. 149): Projects must demonstrate emissions reduction and benefit air quality. See the CMAQ guidance for a list of projects that may be eligible for CMAQ funds. CMAQ funds may be used for shared use paths, but not for trails that are primarily for recreational use.
- HSIP (23 U.S.C. 148): Projects must be consistent with a State's Strategic Highway Safety Plan and (1) correct or improve a hazardous road location or feature, or (2) address a highway safety problem. Certain noninfrastructure safety projects can also be funded using HSIP funds as specified safety projects.
- RHCP (23 U.S.C. 130): Projects at all public railroad crossings including roadways, bike trails, and pedestrian paths.
- NHPP (23 U.S.C. 119): Projects must benefit National Highway System (NHS) corridors and must be located on land adjacent to any highway on the National Highway System (23 U.S.C. 217(b)).
- PROTECT (23 U.S.C. 176): Funds can only be used for activities that are primarily for the purpose of resilience or inherently resilience related. With certain exceptions, the focus must be on supporting the incremental cost of making assets more resilient.
- STBG (23 U.S.C. 133): Broad eligibility for pedestrian, bicycle, and micromobility projects under 23 U.S.C. 206, 208, and 217 (23 U.S.C. 133(b)(7)). Activities marked "$SRTS" means eligible only as an SRTS project benefiting schools for kindergarten through 12th grade. Nonconstruction projects related to safe access for bicyclists and pedestrians (such as bicycle and pedestrian education) are eligible under STBG (23 U.S.C. 217(a)).

- TASA (23 U.S.C. 133(h)): Broad eligibility for pedestrian, bicycle, and micromobility projects. Activities marked "$SRTS" means eligible only as an SRTS project benefiting schools for kindergarten through 12th grade.
- RTP (23 U.S.C. 206): Projects for trails and trailside and trailhead facilities for any recreational trail use. RTP projects are eligible under TA Set-Aside and STBG.
- SRTS (23 U.S.C. 208): Projects for any SRTS activity. FY 2012 was the last year for dedicated - funds, but funds are available until expended. SRTS projects are eligible under TA Set-Aside and STBG.
- PLAN (23 U.S.C. 134 and 135): Funds must be used for planning purposes, for example: Maps: System maps and GIS; Safety education and awareness: for transportation safety planning; Safety program technical assessment: for transportation safety planning; Training: bicycle and pedestrian system planning training. Transportation planning associated with activities would be eligible, SPR and PL funds are not available for project implementation or construction.
- NSBP (23 U.S.C. 162): Discretionary program subject to annual appropriations. Projects must directly benefit and be located on or near an eligible designated scenic byway.

FHWA Federal Lands Programs

- FLTTP (23 U.S.C. 201-204): Projects must provide access to or within Federal or Tribal lands. Programs include: Federal Lands and Tribal Transportation Programs (Federal Lands Access Program, Federal Lands Transportation Program, Federal Lands Planning Program) and related programs for Federal and Tribal lands such as the Nationally Significant Federal Lands and Tribal Projects (NSFLTP) program.
  - Federal Lands Transportation Program (23 U.S.C. 203): For Federal agencies for projects that provide access within Federal lands.
  - Federal Lands Access Program (FLAP) (23 U.S.C. 204): For State and local entities for projects that provide access to or within Federal or Tribal lands.
- TTP (23 U.S.C. 202): For federally recognized Tribal governments for projects within Tribal boundaries and public roads that access Tribal lands.
- TTPSF (23 U.S.C. 202(e)(1) and 23 U.S.C. 148(a)(4)): Grants available to federally recognized Indian Tribes through a competitive, discretionary program to plan and implement transportation safety projects.

OST Grant Programs

- INFRA (IIJA § 11110): Funds projects that improve safety, generate economic benefits, reduce congestion, enhance resiliency, and hold the greatest promise to eliminate freight bottlenecks and improve critical freight movements.
- RAISE (IIJA § 21202): Funds capital and planning grants to help communities build transportation projects that have significant local or regional impact and improve safety and equity.
- RCN: Combines RCP (IIJA § 11509 and div. J, title VIII, Highway Infrastructure Programs, para. (7)), which provides funds for planning grants and capital construction grants that relate to a transportation facility that creates a barrier to community connectivity and Neighborhood Access and Equity Grant Program, Inflation Reduction Act (IRA) § 60501; enacted as Pub. L. 117-169, 23 U.S.C. 177, which provides funds for projects that improve walkability, safety, and affordable transportation access and funding for planning and capacity building activities in disadvantaged or underserved communities.
- SMART (IIJA § 25005): Provides grants to eligible public sector agencies to conduct demonstration projects focused on advanced smart community technologies and systems in order to improve transportation efficiency and safety.
- SS4A (IIJA § 24112): Discretionary program funds regional, local, and Tribal initiatives through grants to prevent roadway deaths and serious injuries. Projects must be identified in a comprehensive safety action plan (§ 24112(a)(3)).
- Thrive (Department of Transportation Appropriations Act, 2022 (Pub. L. 117-103, div. L, title I): Technical assistance, planning, and capacity-building support in selected communities.

OST Loan Programs

- RRIF (Chapter 224 of title 49 U.S.C.): Program offers direct loans and loan guarantees for capital projects related to rail facilities, stations, or crossings. Pedestrian and bicycle infrastructure components of "economic development" projects located within ½-mile of qualifying rail stations may be eligible. May be combined with other grant sources.
- TIFIA (Chapter 6 of title 23 U.S.C.): Program offers secured loans, loan guarantees, or standby lines of credit for capital projects. Minimum total project size is $10 million; multiple surface transportation projects may be bundled to meet cost threshold, under the condition that all projects have a common repayment pledge. May be combined with other grant sources, subject to total Federal assistance limitations.

FTA Programs

- FTA (49 U.S.C. 5307): Multimodal projects funded with FTA transit funds must provide access to transit. See Bicycles and Transit, Flex Funding for Transit Access, the FTA Final Policy Statement on the Eligibility of Pedestrian and Bicycle Improvements Under Federal Transit Law, and FTA Program & Bicycle Related Funding Opportunities.
  - Bicycle infrastructure plans and projects must be within a 3-mile radius of a transit stop or station. If more than 3 miles, within a distance that people could be expected to safely and conveniently bike to the particular stop or station.
  - Pedestrian infrastructure plans and projects must be within a ½ mile radius of a transit stop or station. If more than ½ mile, within a distance that people could be expected to safely and conveniently walk to the particular stop or station.
  - FTA funds cannot be used to purchase bicycles for bike share systems.
- FTA AoPP (Further Consolidated Appropriations Act, 2020 (Pub. L. 116-94); Consolidated Appropriations Act, 2021 (Pub. L. 116-260)): Promotes multimodal planning, engineering, and technical studies, or financial planning to improve transit services, facilities, and access in areas experiencing long-term economic distress, not for capital purchases.
- FTA TOD: Provides planning grants to support community efforts to improve safe access to public transportation, services, and facilities, including for pedestrians and cyclists. The grants help organizations plan for transportation projects that connect communities and improve access to transit and affordable housing, not for capital purchases.

NHTSA Programs

- NHTSA 402 (23 U.S.C. 402): Project activity must be included in the State's Highway Safety Plan. Contact the State Highway Safety Office for details.
- NHTSA 405 (23 U.S.C. 405): Funds are subject to eligibility, application, and award. Project activity must be included in the State's Highway Safety Plan. Contact the State Highway Safety Office for details. The Bipartisan Infrastructure Law expanded the eligible use of funds for a Section 405 Nonmotorized Safety grant beginning in FY 2024. See 23 U.S.C. 1300.26. For prior year grant awards, FAST Act eligible uses remain in place.
- Project agreements involving safety education, or any other positions must specify hours of eligible activity required to perform the project. Project agreements may not be expressed in terms of full or part time positions.



MICRO-MOBILITY DEFINED

The Federal Highway Administration (FHWA) defines micro-mobility as:

> Any small, low-speed, human or electric-powered transportation device, including bicycles, scooters, electric-assist bicycles (e-bikes), electric scooters (e-scooters), and other small, lightweight, wheeled conveyances.

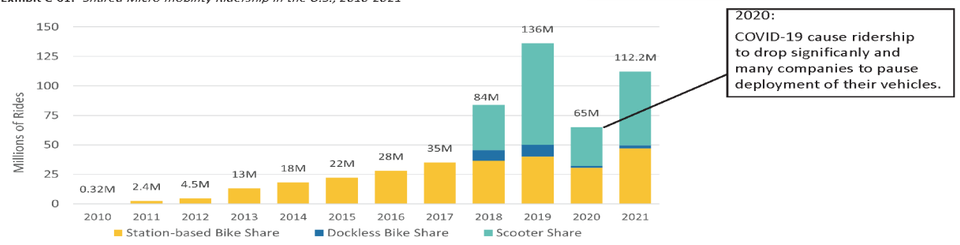
Micro-mobility is one part of a complete active transportation system that is especially helpful for first- and last-mile trips. Micro-mobility ridership is growing rapidly, especially on college campuses and in cities with a large population of young adults. While bicycles have been a reliable mode of transportation, electric micro-mobility vehicles (such as e-bikes and e-scooters) and shared micro-mobility systems have led to an increase in micro-mobility ridership. According to the National Association of City Transportation Officials (NACTO), even during the Covid-19 pandemic, when almost all established mobility patterns were broken, people continued to ride bikes at comparable levels.

Shared micro-mobility vehicles include bikes, e-bikes, and e-scooters. Ridership has increased steadily in recent years, with 112.2 million shared micro-mobility rides taken in the U.S. in 2021 alone (Exhibit C-01). The addition of shared e-scooters has created additional demand for shared micro-mobility.

What is Shared Micro-Mobility?

Shared micro-mobility entails various forms of micro-mobility that are shared between more than one person. This is often done either through a public bike or scooter-share system, like MetroBike in Austin, or a private company, like Bird or Lime. Shared micro-mobility allows the user to forgo the costs associated with owning, maintaining, and storing a micro-mobility vehicle and instead pay only for operating the vehicle. Shared micro-mobility often requires the use of a smartphone app to "unlock" vehicles.

Exhibit C-01: *Shared Micro-mobility Ridership in the U.S., 2010-2021*



Source: NACTO, "Shared Micro-mobility Snapshot"

Micro-mobility is suitable for communities that:

- Have the administrative capabilities to continually monitor shared micro-mobility companies, including data analysis
- Are able to make necessary infrastructure changes including establishing/expanding bike lanes, widening sidewalks, or introducing traffic-calming measures
- Have had community engagement efforts which revealed the desire for expanded transportation options or decreased congestion
- Want to increase the connectivity of their active transportation system
- Have a heavily young, educated population

These shared micro-mobility systems can be docked, meaning they are taken from and returned to a designated station. Alternatively, some systems are dockless, meaning there is no designated station, and they are stored on streets or sidewalks when not in use.

Exhibit C-03: *Shared bike parking dock in Vancouver, Canada*



What is a Dockless Vehicle?

A "dock" in the context of micro-mobility is a place where shared bikes (or, less often, scooters) are stored when not in use. Users begin and end their journeys at these docks. Docks allow the bike-share operators to maintain organization and minimize disturbances to the public right-of-way. Conversely, a dockless vehicle is one without a designated place from which it is rented and returned. Whether a micro-mobility vehicle is docked or not has large implications for its impact on the public right-of-way and the fabric of a community.

Exhibit C-02: *Shared e-scooters from Lime on Ocean Blvd in Corpus Christi*



Overview of Existing Technologies

The discussion around micro-mobility is complicated by the ever-changing scope of what micro-mobility is and the various vehicles. To properly discuss micro-mobility, it is important to explicitly define each different mode and some important terms. The classification of micro-mobility vehicles is a necessary first step which enables effective micro-mobility regulation. Exhibit C-05 summarizes each vehicle type's identifying characteristics.

What is a PEV?

A personal electric vehicle (PEV) is a form of micro-mobility that includes small, short-distance, single-passenger vehicles that are electrically powered. Examples of this include e-bikes, e-scooters, Segways, and electric skateboards. PEVs offer a low-cost way to travel short distances with minimal effort without access to a motor vehicle. Opposed to non-motorized transportation (NMT) like pedal bikes or kick scooters, PEVs involve little physical exertion.

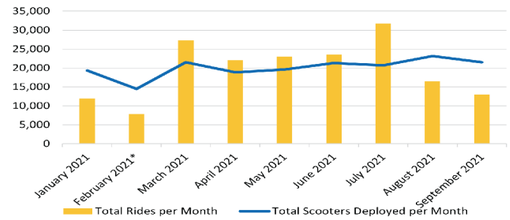
Exhibit C-05: *Micro-Mobility Vehicles Snapshot, adapted from Pedestrian and Bicycle Information Center, http://pedbikeinfo.org/*

Vehicle	e-Bike			Pedal bike	e-Scooter	Kick scooter	Other - Skateboard, e-Skateboard, Onewheel, Hoverboard, Segway
	Class 1	Class 2	Class 3				
Defining Features	Pedal assist	Throttle assist	High-speed pedal assist	User is seated	Motor, deck for standing	Deck for standing	Small, lightweight, single-user
Propelled by	Pedals, motor when pedaling	Pedals, motor even when not pedaling	Pedals, motor when pedaling	Pedals only	Motor or user kicking the ground	User kicking the ground	Motor or user kicking the ground
Typical Speed	20 mph or less	20 mph or less	28 mph or less	15 mph	15-20 mph	10 mph	Typically 20 mph or less
Weight	Typically <100 lbs	Typically <100 lbs	Typically <100 lbs	Typically <50 lbs	Typically <50 lbs	Typically <15 lbs	<50 lbs

Micro-Mobility in Corpus Christi

Currently, there is one shared e-scooter system within the Corpus Christi MPO Planning Area, exclusively operating within the City of Corpus Christi. This provider, Lime, places around 800 vehicles in the City. This private company operates under a license agreement administered by the City of Corpus Christi in accordance with its ordinances. In 2022, the ordinance was amended to update the fee structure, limit the number of scooters allowed to be deployed, and implement a speed limit on the Seawall. Previously, Blue Duck Express also provided shared e-scooters within Corpus Christi.

Exhibit C-04: *e-Scooter Ridership and Deployment in Corpus Christi*



*Scooters were removed for over a week due to the winter event in February 2021.

Source: City of Corpus Christi

Exhibit C-04 shows the monthly e-scooter ridership and deployment in Corpus Christi in 2020. Ridership generally increased during the spring and summer months and decreased during the fall and winter. The average number of scooters deployed each day in FY 2021 ranged between 518 in February 2021 and 728 in November 2020.

Based on a community survey concerning dockless vehicles conducted in 2018, around 70% of Corpus Christi respondents say they are supportive of dockless scooters, with many participants noting low cost and being fun to ride as things they like about dockless scooters[1].

Blue Duck Express e-Scooter in Corpus Christi, 2018
(Source: Courtney Sacco/Caller-TimesFile)



1 City of Corpus Christi, "Dockless Vehicles Survey Results" (2019) https://www.cctexas.com/sites/default/files/econdev-scooter-survey-data-revised.pdf

Pedal Bike

A pedal bike (or "traditional" bike) is a form of Non-Motorized Transportation (NMT) on which a rider sits on a seat, pushes two pedals with his feet, and steers using a handlebar. Pedal bikes are a common mode of transportation and continue to grow in ridership due to many cities' efforts to expand bicycle infrastructure. Safety issues can arise when proper bike infrastructure is not in place such as protected bike lanes and traffic-calming measures.

Electric-Assist Bike

Electric-assist bikes (e-bikes) are motorized versions of pedal bikes. These have a similar look but allow the user to travel faster and for longer distances due to the assistance of the motor. e-Bikes can be individually owned or accessed via shared mobility. Many bike-share programs utilize "docks" where bikes are rented and returned at the start and end of a trip. There are some vehicles that blur the lines between e-bikes and entirely new devices, such as sitting scooters or mopeds. For the purposes of this plan, an e-bike must provide the user the ability to pedal.



Source: PBIC

Kick Scooter

A kick scooter (or push scooter) is a two-wheeled, manual, single-rider vehicle that is operated by kicking the ground as one stands on a deck. It is a form of non-motorized travel (NMT) and is steered using a handlebar. Kick scooters are smaller and more maneuverable than bicycles but similarly offer the opportunity for physical activity while in use. Kick scooters are often used by children as a form of recreation and short-distance travel but are increasingly used by adults as well[1].

Electric Scooter

An electric scooter (e-scooter) is a motorized version of a kick scooter. Modern e-scooters can travel around 15 miles before requiring recharging and are typically recharged once a day. These PEVs can be purchased and privately-owned or rented from shared micro-mobility companies such as Bird, Lime, or Lyft. They are typically dockless, meaning trips on e-scooters don't have to start and end in a certain place. Range and speed vary by model and load, but e-scooters can typically travel up to 15-20 miles per hour. Since 2017, e-scooters have grown in popularity due to their deployment in many major cities by private shared micro-mobility companies.



Source: PBIC

1 Małgorzata Kostrzewska and Bartosz Macikowski, "Towards Hybrid Urban Mobility: Kick Scooter as a Means of Individual Transport in the City" (2017) https://iopscience.iop.org/article/10.1088/1757-899X/245/5/052073

Other small, lightweight, wheeled conveyances

Other, less used micro-mobility vehicles include skateboards, Onewheels, hoverboards, Segways, and electric unicycles. These vehicles are usually less than 50 lbs and individually owned.

Skateboard

A skateboard is a small board on which the user stands and has four wheels on 2 axles. It is powered by the user kicking the ground and does not involve any handlebars for steering. Electric skateboards (e-skateboards) are skateboards with electric motors, controlled by a wireless remote control. Skateboards are a low-cost, very portable transportation option.

Onewheel

A Onewheel consists of a single wheel with two platforms on either side for the user's feet. It is powered by an electric motor and controlled by shifting one's weight onto their front or back foot. A Onewheel does not have a handlebar.

Hoverboard

Hoverboards (or self-balancing boards) are two-wheeled vehicles with electric motors and no handlebars. They are operated by leaning forwards or backwards to control speed and twisting to control direction.

Segway

A Segway is a two-wheeled vehicle with a handlebar which is used to both steer and accelerate/decelerate.

Electric Unicycle

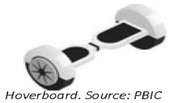
Electric unicycles are similar to Onewheels but differ in their orientation. The user faces completely forward and leans forward or back to control the vehicle.



Skateboard. Source: PBIC



Onewheel. Source: Floatwheel



Hoverboard. Source: PBIC



Segway. Source: PBIC



Electric unicycle. Source: InMotion

MICRO-MOBILITY BENEFITS

First- and Last-Mile Connections

One of the most significant benefits of micro-mobility is its role in facilitating first- and last-mile connections to and from transit services. Micro-mobility vehicles can provide a faster, lower-effort mode choice. This can make transit a more attractive choice for the public and increases transit accessibility.

Intermodal mobility, or the use of more than one transportation mode in a single journey, helps reduce time traveling by car. Micro-mobility can be a key component of an intermodal commute. Shared micro-mobility can be an important step in bridging the gap between complete car dependence and other modes. Many private e-scooter users purchased their vehicle after test-driving on a shared e-scooter because of the relatively low commitment of rental[1]

Transit users can change their typical routes with the incorporation of scooters into their travel routine. For example, a bus rider could take a faster train that leaves from a station that is too far to walk but is accessible by scooter, ultimately reaching their destination faster. Additionally, people in areas which are not served by transit can have another, more affordable option besides private automobiles. This broadens the "pedestrian shed", or the area that pedestrians can access in a reasonable distance. Bike sharing systems have been proven to reduce car trips, so much so that they can influence peak-time congestion[2].

1 Sylvaine Tuncer and Barry Brown, "E-scooters on the Ground: Lessons for Redesigning Urban Micro-Mobility" (2020) https://dl.acm.org/doi/10.1145/3313831.3376499
2 Stefan Gössling, "Integrating e-scooters in urban transportation: Problems, policies, and the prospect of system change" (2020) https://doi.org/10.1016/j.trd.2020.102230

Alternative Mode Choice

Micro-mobility provides an easy and convenient option for transportation besides automobiles, transit, and walking. This allows people to travel by car less, which has many benefits for the community:

- Relieves pressure on the road system, helping to alleviate congestion
- Decreased need for road maintenance
- Decreased noise pollution
- Contributes to the "safety in numbers" effect wherein the presence of other pedestrians creates a safer street for all

Micro-mobility vehicles also provide some intangible benefits; riding an e-scooter is perceived as a fun activity; scooters are open-air, unlike cars, buses, or rail, but take you farther than walking. Additionally, scooter rides are less subject to traffic or congestion, which makes them a more enticing option.

Transportation Equity

According to the FHWA, an equitable transportation system seeks to provide equitable levels of access to affordable and reliable transportation options based on the needs of the populations being served, particularly populations that are traditionally underserved and disadvantaged. Micro-mobility can be useful for increasing connectivity for disadvantaged populations, increasing access to essential services like grocery stores, job opportunities, and health/social services.

According to the Bureau of Transportation Statistics, in 2022 the average yearly cost to own and operate a car was $10,729. The cost of car ownership continues to rise, increasing the financial burden on those in low-income households[1].

Exhibit C-06: *Graphic illustrating the diference between transportation equality and transportation equity.*



Source: Robert Wood Johnson Foundation, 2017

People of low income are proven to experience a disproportionate amount of the negative effects of automobile dependency like decreased air quality and noise pollution[2]. Therefore, any reduction in car trips is especially important for these populations. Additionally, pedestrian-automobile crashes are more likely to occur in neighborhoods with higher minority and low-income populations[3]. The shift away from automobile dependency through the introduction and inclusion of alternative transportation options would be beneficial to all, especially to these populations.

Sustainability

Research shows that micro-mobility vehicles reduce carbon emissions and decrease reliance on fossil fuels[4]. While the production of PEVs requires precious resources for battery production, the adoption of micro-mobility options reduces the use of personal automobiles on short distance trips and assists in first- and last-mile travel, allowing for increased reliance on public transportation. National Renewable Energy Laboratory (NREL) reported that high adoption of shared micro-mobility can save 2.3 billion gasoline-equivalent gallons per year nationwide, and that increasing access to transit is micro-mobility's largest contribution to reducing energy consumption in cities[5]. Bicycles are an especially sustainable form of transportation that creates positive health and environmental outcomes. Electric micro-mobility vehicles are considered a more environmentally friendly choice than cars for short trips and for longer trips when used in conjunction with existing public transit systems. Personal scooters have been proven to replace more car trips than rental scooters[6].

1 FHWA, "Shared Micro-mobility and Equity"
2 Shunhua Bai and Junfeng Jiao "Toward Equitable Micro-mobility: Lessons from Austin E-Scooter Sharing Program" (2021) https://journals.sagepub.com/doi/10.1177/0739456X211057196
3 Anastasia Loukaitou-Sideris, Robin Liggett, and Hyun-Gun Sung "Death on the Crosswalk: A Study of Pedestrian-Automobile Collisions in Los Angeles" https://doi.org/10.1177/0739456X06297008
4 Rusul L. Abduljabbar, Sohani Liyanage, and Hussein Dia "The role of micro-mobility in shaping sustainable cities: A systematic literature review" (2021) https://www.sciencedirect.com/science/article/abs/pii/S1361920921003897via%3Dihub
5 NREL, "Data-Informed Analysis Reveals Energy Impacts of Shared Micro-mobility" (2021) https://www.nrel.gov/news/program/2021/data-informed-analysis-reveals-energy-impacts-of-shared-micro-mobility.html
6 Sylvaine Tuncer and Barry Brown, "E-scooters on the Ground: Lessons for Redesigning Urban Micro-Mobility" (2020) https://dl.acm.org/doi/10.1145/3313831.3376499

AREAS OF CONCERN

Safety

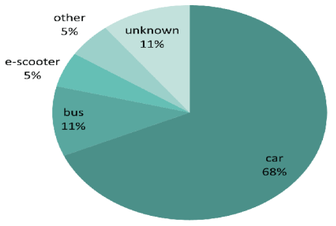
Micro-mobility users are considered "vulnerable road users" by the FHWA due to the lack of protection of an enclosed vehicle. Interactions between micro-mobility and users of more established modes like drivers and pedestrians can be dangerous[1]. Misuse while operating the vehicles, as well as the improper placement of the vehicles after use, are of concern.

In its first 100 million e-scooter rides, Lime reported nine fatalities of riders. In the first 50 million rides on Bird scooters, there were five reported fatalities. This puts the fatality rates for Lime and Bird riders at about one in 10 million rides. From May 2018 to October 2019, there were 19 fatalities on e-scooters. Of these, 15 involved a motor vehicle (Exhibit C-07). e-Scooters and bikes have similar fatality rates[2]. In comparison, the 2021 fatality rate for automobiles in the U.S. was 1.37 deaths per 100 million miles traveled[3].

Existing EMS and hospital visit data estimates that injuries due to e-scooter crashes occur at a rate of 87-251 emergency room visits per million trips and 29-62 hospital admissions per million trips. Comparatively, bicycles are safer, with 110-180 emergency room visits per million trips and 5-10 hospital admissions per million trips[4]. Further research on injury rates is needed to make definitive conclusions on the safety of the various micro-mobility vehicles.

1 Hong Yang a, Qingyu Ma a, Zhenyu Wang a, Qing Cai b, Kun Xie c, and Di Yang "Safety of micro-mobility: Analysis of E-Scooter crashes by mining news reports" (2020) https://doi.org/10.1016/j.aap.2020.105608
2 International Transport Forum "Safe Micro-mobility" (2020) https://www.itf-oecd.org/safe-micro-mobility
3 Insurance Institute for Highway Safety (IIHS) "Fatality Facts 2021" https://www.iihs.org/topics/fatality-statistics/detail/state-by-state
4 International Transport Forum "Safe Micro-mobility" (2020) https://www.itf-oecd.org/safe-micro-mobility

Exhibit C-07: *Object with which the Rider Collided in Fatal e-Scooter Crashes in the U.S., May 2018 to October 2019.*



Source: International Transport Forum, "Safe Micro-mobility"

Micro-mobility safety data is currently not robust due to under-reporting and the lack of standardization in micro-mobility incident reporting. Current practices for collecting injury data include:

- Police reports – not a consistent method for tracking injuries. People are not motivated to file police reports because insurance claims in the case of scooter, which are often motivation for filing in car crashes, are infrequent and do not require police reports.
- Emergency medical services (EMS) and hospital records – the best method available. However, this is still an incomplete data set because it excludes injuries which weren't treated by EMS or in a hospital. Additionally, the lack of standardization in coding for micro-mobility incidents causes some injuries to be missed.
- Community surveys - the least reliable but can provide interesting qualitative information.

To mitigate safety issues, communities can employ several tactics:

- Guidelines for proper use – Local governments can create and enforce guidelines for proper use of micro-mobility through the passage of ordinances which cater to the specific needs of the community. Speed, helmet use, parking, and operation zones are examples of guidelines for the operation of a micro-mobility vehicle. A dual strategy of education and enforcement should be employed for the most effective strategy for creating behavioral changes.
- Require safe vehicles – Standing e-scooter injuries are mostly due to falling[1]. Various aspects of vehicle design can have large effects on the stability of a ride including wheel size and weight distribution. Shared-use micro-mobility permits can restrict permitted vehicles to only those that are proven to have more stability and require them to be regularly inspected and maintained.
- Geofencing – Geofencing is an effective tool in controlling the operation of e-bikes and e-scooters. These virtual boundaries can restrict both where and how fast users are riding. Shared micro-mobility providers and municipalities can impose speed limits and even prevent their use entirely in certain areas, such as those with high pedestrian traffic.
- Road conditions – Half of all EMS visits due to e-scooter injuries in Austin were attributed to poor road surface conditions[2]. Cities should prioritize high-quality roads, sidewalks, and bicycle lanes as well as regular maintenance.

1 International Transport Forum "Safe Micro-mobility" (2020) https://www.itf-oecd.org/safe-micro-mobility
2 City of Austin "Dockless Mobility Community Survey Report" (2019) https://www.austintexas.gov/sites/default/files/files/Transportation/Dockless_Mobility_Community_Survey_Report_2-28-19.pdf

Tension Between Stakeholders

Users of micro-mobility depend on bicycle and pedestrian paths and sidewalks for safe travel. New forms of mobility can compete with the automobile for right-of-way. Non-users of micro-mobility may resent this reallocation of right-of-way as it reduces capacity for autos and potentially increases congestion. Misuse of micro-mobility vehicles creates negative consequences for public space[3].

Two major infrastructure challenges face micro-mobility users: parking and operation in high-traffic corridors. Municipalities can create designated parking areas for dockless micro-mobility to lower the likelihood that these vehicles clutter the public right-of-way and create tension between varying stakeholders. The locations of these designated parking areas can be reinforced with geofencing. Physical design of these parking zones can include bike/scooter racks, bollards, and/or paint to indicate the appropriate placement and orientation of the vehicles (see examples on page 24 for more information). This infrastructure change is relatively inexpensive and easy to implement.

Exhibit C-08: *Improper scooter parking causes disruption on sidewalks.*



Source: CNN

3 Sylvaine Tuncer and Barry Brown, "E-scooters on the Ground: Lessons for Redesigning Urban Micro-Mobility" (2020) https://dl.acm.org/doi/10.1145/3313831.3376499

Equity

While micro-mobility can help counter equity issues caused by cars and increase connectivity for disadvantaged populations, it can also create its own equity issues. When prices are not regulated by the municipality, prices of shared micro-mobility continue to increase - average e-scooter and e-bike trip costs doubled from 2018 ($3.50) to 2021 (around $7)[1]. Requirements for equity efforts should be established in the permitting program. Discounted fare structures, equitable distribution of micro-mobility devices, and connection to public transportation can help advance transportation equity via micro-mobility.

Dockless micro-mobility can be an unreliable form of transportation for someone going to work or necessary appointments. The decision to purchase an e-bike or e-scooter translates into a more reliable, long-term solution for their transportation needs. Another equity issue arises with respect to shared micro-mobility: rental companies' business models rely on on-demand workers who are needed daily to collect, re-charge, and replace shared scooters from the streets.

Additionally, some people may be physically unable to ride traditional standing scooters or bikes and may require adaptive devices. These can include seated scooters, Segways with handles, powered cycles that attach to wheelchairs, or others. Shared micro-mobility permits can include requirements for a certain number of vehicles deployed to cater to these populations and expand ridership.

1 NACTO, "Shared Micro-mobility Snapshot" (2022) https://nacto.org/wp-content/uploads/2022/12/2020-2021_shared_micro_snapshot_Dec7_2022.pdf

PEER REVIEW OF POLICIES AND PROGRAMS FOR MICRO-MOBILITY

Kansas City, Missouri

Kansas City, Missouri, on the border of Missouri and Kansas, has a population of 505,958[1]. The Kansas City Chamber of Commerce's main initiative is "Making Kansas City America's Most Entrepreneurial City". Since 2011, this goal has been embraced by the community and is a point of pride for Kansas City residents. The city's response to incoming shared micro-mobility is reflective of this shared goal and can serve as an example for other communities who wish to use shared micro-mobility as a source of economic development.

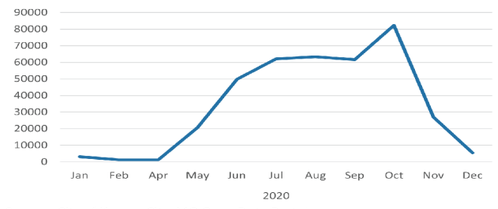
In 2018, Kansas City and Bird negotiated an interim operating agreement, where 100 e-scooters were deployed within the city. The agreement required Bird to revenue share (to benefit the city's Bike Plan), to distribute the scooters equitably, and to share their data with the city so they could monitor e-scooter operations.

Exhibit C-09: *Innovative shared miromobility policies helped futher Kansas City's high-level goal of being an entrepreneurial city.*



Source: VisitKC

Exhibit C-10: *e-Scooter and e-Bike Trips in Kansas City, 2020*



Source: City of Kansas City, MO Open Data Portal

In 2020, there were 377,875 total rides on shared e-scooters and e-bikes within Kansas City (Exhibit C-10).

The City's openness to innovation in the way of shared micro-mobility allowed Kansas City residents access to the new form of transportation while maintaining some control over the operations and gaining more information. The slow, controlled growth of scooter-share in the city meant that residents could become familiar with the vehicles, increase proficiency, and provide feedback before there was an all-out implementation of the technology.

1 American Community Survey 2022 5-Year Estimate, Table S0101

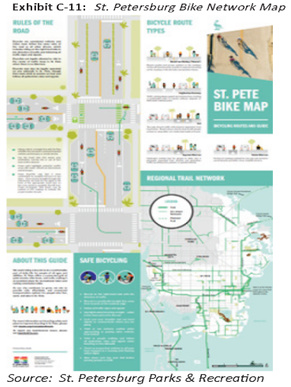
St. Petersburg, Florida

Known as "The Sunshine City," St. Petersburg is home to 258,308 people, with a 5.5% growth in population from 244,769 in 2010. The city's micro-mobility services are currently emerging and growing, with partnerships from micro-mobility companies like Lime and Veo providing hundreds of e-bikes and e-scooters across the city. This move toward clean alternatives to car ownership will increase equity and provide access to a wider range of user groups since it is also more affordable.

Partnering with the City of St. Pete Beach, Lime, a leading company in the micro-mobility industry, has released a fleet of 300 e-bikes for use across the city, hoping to promote residents and visitors to use micro-mobility to conveniently access the city. St. Pete Beach boasts a rich network of Lime bikeshare locations and a connected web of bike trails and lanes (Exhibit C-11), giving users more incentive to employ micro-mobility.

St. Petersburg Ordinance 2021-24 proposes a set of boundaries and regulations that the micro-mobility network and its users must follow. The ordinance lists definitions, general provisions, and requirements that micro-mobility devices must abide by to ensure safety for all transportation types and users. The initiative taken by implementing these measures intended to improve facilities for micro-mobility shows acceptance and the important role that micro-mobility plays in today's transportation network.

Exhibit C-11: *St. Petersburg Bike Network Map*



Source: St. Petersburg Parks & Recreation

San Antonio, Texas

San Antonio, home of the Alamo and the second-largest city in Texas, with a population of 1,434,625 people, is facing a challenge as it experiences a growing population of residents and visitors while trying to implement more "complete streets." The city is currently met with a noticeable increase in trail users and recreational and commuting bicyclists. As cities plan and design their urban cores centered around people rather than vehicles, policies must also be updated to address the growing population of users.

Exhibit C-12: *Cosmo seated e-scooter by Veo*



Source: Veo

One of the micro-mobility companies contracted by San Antonio, Veo, supplies improved seated scooters that provide riders with more comfort over longer rides versus a standing scooter. In efforts to appeal to more users, a model that has been specifically designed for seated use was released (Exhibit C-12); average rides on the new model measured twice as long as average rides on typical upright scooters. Because of the improved performance and ease of use of the seated scooter, it opens up micro-mobility to a wider range of users including those with an accessibility impairment which may make them reluctant to ride a stand-up scooter.

To address this growing network, San Antonio Code of Ordinances (Chapter 19) explains the definitions, limitations, and exclusions surrounding dockless vehicle transportation. There are also agreements in place with the contracting companies which may limit access areas that these vehicles have available, such as restricted access near the River Walk or weakened throttle response near large crowds of people. Also, restrictions exist that control where e-scooters may be parked while not in use, so that they are not interfering with fellow pedestrian and micro-mobility traffic on the sidewalks/roadways. Current policies are more effective at reducing e-scooters and other micro-mobility means from becoming a nuisance compared to previous policies in place.

Austin, Texas

Austin is the capital city of Texas and has experienced rapid growth since 2010; its population has grown by 23% (from 782,149 to 958,202 persons)[1]. Residents of Austin are more likely to travel using alternative modes of transportation than people in other areas; just 57% of workers in Austin drive to work alone in a car, compared to 71% of workers in the state of Texas[2].

As a part of the continual implementation of their mobility plans, the City of Austin regularly administers surveys for micro-mobility users. In their 2019 Dockless Mobility Community Survey Report, the City of Austin reported that the top 5 reasons someone might be more likely to use dockless micro-mobility were:

1. More infrastructure, such as a connected bicycle facility or shared use pathway to where they need to go
2. Expanded service areas where dockless mobility provideres can operate
3. Clear delineations on where bikes and scooters should be parked
4. Easier and more reliable connections to public transit
5. More available electric scooters

An interesting business model for shared e-scooters is being tested by FlashParking and Bird in Austin. FlashParking, an Austin-based private mobility company, provides docked Bird e-scooters at select parking garages for round-trip use. This helps people with first- and last-mile trips and allows for easy access to micro-mobility right where they parked. The goal of this model is to create a complete and connected mobility system, from home to destination and back. Because the scooters are rented and returned in the same place, an organized charging dock in a parking garage, they do not negatively impact walkways or bike lanes when not in use. This also eliminates the need for vans or trucks to collect, charge, and return the scooters. However, this does little toward the goal of reducing car dependency, as the business model is targeted to car drivers.

1 American Community Survey 2022 5-Year Estimate, Table S0101: Age and Sex
2 American Community Survey 2022 5-Year Estimate, Table S0802: Means of Transportation to Work by Selected Characteristics

Peer Review Evaluation Matrix

City	Population (2021)	Shared Micro-mobility Providers	Key Takeaway
Kansas City, MO	508,090	RideKC Bird Spin	Interim operating agreements can allow for controlled deployment of shared micro-mobility. A slow introduction of the new service allows users to gain familiarity with the vehicles before they are all-out launched.
Austin, TX	965,872	Bird Lime LINK Wheels MetroBike Austin Spin	Various networks supporting micro-mobility along with an accommodating infrastructure offer a plentiful selection of shared e-scooters and micro-mobility with ample space for them to be used within the city. However, micro-mobility users are still competing with motorists.
St. Petersburg, FL	258,354	Lime Veo	Pilot programs and pre-existing network facilities allow for smooth integration of micro-mobility networks. Strategic positioning of Lime hubs and a fairly connected existing micro-mobility network provides a good basis for introducing these new modes of transport.
San Antonio, TX	1,434,625	Bird Veo	The City of San Antonio partnered with Bird and Veo to bring shared micro-mobility to the area with easy-to-use services. Veo offers a more accessible micro-mobility vehicle which can accommodate longer rides; partnered with policy, these micro-mobility networks are helping to turn more users away from cars while not interrupting existing bike/pedestrian networks.

RECOMMENDATIONS

1. Create a dedicated Active Transportation Committee

It is crucial to be proactive about deployment of micro-mobility systems. Historically, because of the rapid adoption of micro-mobility, new and established companies are eager to employ their vehicles onto the streets without proper regulation. Cities should anticipate this and have the policies in place to ensure a proactive response when considering adoption of micro-mobility services. The Active Transportation Committee could meet regularly to discuss issues related to micro-mobility. Among the responsibilities of this committee would be to:

- Collect and review ridership data
- Make recommendations to municipalities
- Ensure that accommodations for micro-mobility are included in future transportation projects
- Assist in the pursuit of funding for micro-mobility infrastructure and services
- Regularly review the status of permits and Micro-mobility Program
- Facilitate coordination between municipalities in and around the Corpus Christi Metropolitan Planning Organization service area
- Create and distribute information materials on micro-mobility operation best practices

2. Update permitting requirements for shared micro-mobility providers.

Permits allow municipalities to regulate the deployment of shared e-scooters and e-bikes and outline clear performance standards. Permits should be relatively short term (6-12 months) to ensure continued compliance and should require providers to re-apply at the end of each term. All requirements should be clear and measurable. Best practices for permitting requirements:

- Deployment location - When providers collect, charge, and redistribute vehicles, where they are placed has significant ripple effects. Vehicles should be evenly distributed throughout the service area to avoid both cluttering the public right-of-way and having gaps in their service area. Cities can help mitigate transportation equity issues by requiring providers to place vehicles in underserved areas (if demand exists).
- Mandated response time to requests - Providers must be reachable by both users and local officials when action is required, like when vehicles are improperly parked or broken. Users should be provided with contact information in the case of vehicle issues including misplacement or failure to operate.
- Maintenance protocols and production standards - Safety issues are of utmost importance. Without regular maintenance, shared bikes and scooters can become hazardous. According to the Consumer Product Safety Commission, there were at least 208 fire or overheating incidents with micro-mobility vehicles between January 1, 2021 and November 28, 2022, resulting in at least 19 fatal injuries. Both private and shared micro-mobility users must only operate vehicles with up-to-standard production. Longer lasting vehicles also reduce environmental waste caused by retired scooters and bikes. NACTO (National Association of City Transportation Officials) suggests that each vehicle should be inspected at least once a month.
- Fleet size and redistribution - Creating this cap on fleet size is important for managing the amount of space allocated toward shared micro-mobility and helps avoid crowding on streets or sidewalks.
- Data sharing – Data collected by shared micro-mobility providers is invaluable to decision makers because it indicates who, what, when, how, and where people are using micro-mobility. This has obvious implications for micro-mobility decision making, but it can also reveal things about the transportation system as a whole. Additionally, because there are often conflicting interests among stakeholders, using data to support your decisions helps stakeholders reach consensus and leverage support.
- User education - The online interfaces from which users rent micro-mobility vehicles are a critical space for user education.
- Fee structures - Through the permitting process, cities can require shared micro-mobility companies to pay various fees, the revenue from which can be allocated to programs that contribute to the city's goals, such as plan implementation or sustainability programs. This money can serve to counter the negative effects of the new mode of transportation through implementation of any local bike/pedestrian plan or sustainability programs. Examples of fees can include removal, impoundment, or relocation fees; fees for misuse; permit application fees; permit renewal fees; abandonment fees; and fees for each vehicle on the street.
- Affordability programs - To increase accessibility and promote equity, cities can require providers to offer a reduced fee payment plan, non-smartphone plan, and/or a cash option. Many established companies already have similar programs (see Exhibit C-13 on page C-18).
- Miscellaneous:
  - Vendor must have the appropriate up-to-date insurance
  - Vendor must incur costs associated with complying with the permit, including recovering lost or broken vehicles and repair of damage to the public right of way caused by the vehicles
  - Vendor must have the appropriate staffing for the region. This includes, at a minimum, an area manager and several employees who collect, charge, and redistribute the fleet daily.

Exhibit C-13: *Affordability Programs for Common Micro-mobility Providers*

Provider	Affordability Program	Eligibility	Details
Bird	Bird Access	Enrollment in or eligibility for a state-sponsored program for low-income individuals including, but not limited to, CalFresh, Medicaid, SNAP or discounted utility bills	Five 30-minute rides per day for $5 a month. After your fifth ride in a single day, standard pricing will apply.
Lime	Lime Access	Reasons for eligibility may include, though are not limited to, being unemployed, or receiving support from the government, such as a discounted public transport pass, or universal credit	Lime-S (e-scooters) and Lime-E (e-bikes): 50 cents to unlock, 7 cents per minute (50% discount) LimeBike: 5 cents for every 30 minutes (95% discount)
LINK	LINK-Up	Enrollment in an income-based government assistance program	Discount varies by location. Most riders receive a discount of 70% or more.
Wheels	Wheels for All	Enrollment in a city, state, or federal assistance program such as Medicaid, EBT, SNAP, or a discounted utility bill	Discount varies by location. Most riders receive a discount of 50%.
Blue Duck	Access Program	Individuals who qualify for local, state, or federal assistance programs. Examples of eligible documents to prove enrollment: a photo or scan of your card, proof of secondary education financial aid, discounted utility bill, insurance or reduced fare card (including Medicaid, LIHEAP, SNAP, WIC, EBT, etc..)	50% discount

3. Work with municipalities to create and modify ordinances concerning the proper use of micro-mobility vehicles.

One tool that local governments can use to create and enforce guidelines for proper use of micro-mobility is the passage of ordinances. The following are several recommendations for guidelines to ensure the safe and effective operation of micro-mobility in your city. Exhibit C-15 on page C-20 shows suggested guidelines for proper operation of various micro-mobility vehicles. A sample ordinance for the Corpus Christi region is included on page 28.

- Speed - Micro-mobility vehicles should generally go with the flow of traffic where they are being ridden. Higher speeds are associated with more frequent and severe injuries to users[1]. High-speed micro-mobility, like throttle e-bikes, should be operated slower than their maximum speed. A speed limit of 15 miles per hour should be in place.
- Helmet laws – It is recommended that helmets be required only for users below 16 or below 18 years old or if operating a Class 3 e-bike due to their higher speeds.
- Where to ride – Most classes of micro-mobility should be operated in dedicated bicycle lanes when possible. Otherwise, most micro-mobility should be operated on-street where the speed limit for all vehicles doesn't exceed 25-35 miles per hour and ridden as far right on the street as reasonable.
- Parking - Scooters or bikes left in streets, in bike lanes, or blocking sidewalks can create safety and accessibility issues and creates a negative image of micro-mobility for non-users. Many cities have adopted parking zones to limit this issue, which should be outlined on the Preferred Micro-mobility Network Map and communicated to the user via the app. In the absence of dedicated parking zones, micro-mobility should be parked in or around bike racks only in an effort to consolidate the vehicles and utilize existing bicycle infrastructure.

Exhibit C-14: *Scooter Parking Zones Installation in Austin, TX*



Source: City of Austin Transportation Department

1 International Transport Forum "Safe Micro-mobility" (2020) https://www.itf-oecd.org/safe-micro-mobility

Exhibit C-15: *Suggested Guidelines for Micro-mobility Operation*

Vehicle	e-Bike			Pedal bike	e-Scooter	Kick scooter	Other - Skateboard, e-Skateboard, Onewheel, Hoverboard, Segway
	Class 1	Class 2	Class 3				
Operational Speed	20 mph or less	20 mph or less	28 mph or less	15 mph	15-20 mph	10 mph	Typically 20 mph or less
Speed Limit	15 mph	15 mph	15 mph	15 mph	15 mph	15 mph	15 mph
Helmet Use	Only for users age <16	Only for users age <16	Always	Only for users age <16	Only for users age <16	Only for users age <16	Only for users age <16
Where to ride	Roads with a speed limit of 30 mph or less, or bike lane (where available)	Roads with a speed limit of 30 mph or less, or bike lane (where available)	Roads with a speed limit of 35 mph or less, or bike lane (where available)	Roads with a speed limit of 35 mph or less, or bike lane (where available)	Roads with a speed limit of 30 mph or less, or bike lane (where available)	Sidewalk	Sidewalk or bike lane (where available)

Adapted from Pedestrian and Bicycle Information Center, "E-Scooter Management in Midsized Cities in the United States"; NACTO "Guidelines for Regulating Shared Micro-mobility"; Transportation for America, "Shared Micro-mobility Playbook"; Kevin Fang, Asha Weinstein Agrawal, and Ashley M. Hooper, "How and Where Should I Ride This Thing? 'Rules Of The Road' for Personal Transportation Devices"

4. Use the Preferred Micro-Mobility Network Map to encourage locationally appropriate shared micro-mobility use.

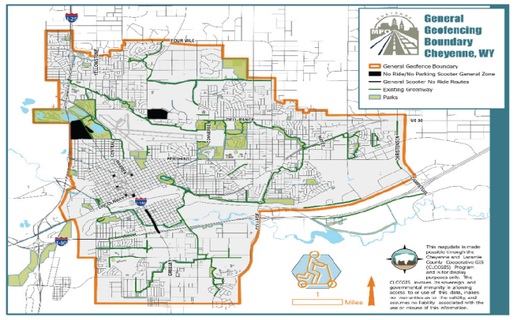
Geofencing is an emerging but valuable technology for policymakers attempting to control where and how users operate the vehicles. Scooters can be remotely slowed or even stopped remotely based on their location if they cross invisible boundaries set by the service provider. Preferred Micro-mobility Network Maps outline various zones to be used as a guide for shared e-scooter companies to set geofencing boundaries within the area. This ensures that all providers are held to the same requirements and that vehicles are operated safely. The geofenced zones can also be altered for special events if needed.

Micro-Mobility Zones:

- No ride – Areas with high car traffic and a lack of micro-mobility infrastructure such as bike lanes or sufficiently wide sidewalks should be prohibited. Users must walk their vehicle in these spaces.
- No park – Users should not be able to park their vehicles in crowded areas wherein they will encroach on the public right-of-way.
- Slow zone – Slow zones should be enacted in certain areas where e-scooter or e-bike operation is safe only at slow speeds and where conflicts between micro-mobility users and cyclists or pedestrians is likely. A speed limit of 8-12 mph is recommended.
- Preferred parking – Preferred parking areas (typically around 25 square feet) are usually on sidewalks and give the user a pre-approved place to leave their scooter or bike. These parking areas can be created and designated using only paint or with cones, bollards, etc.

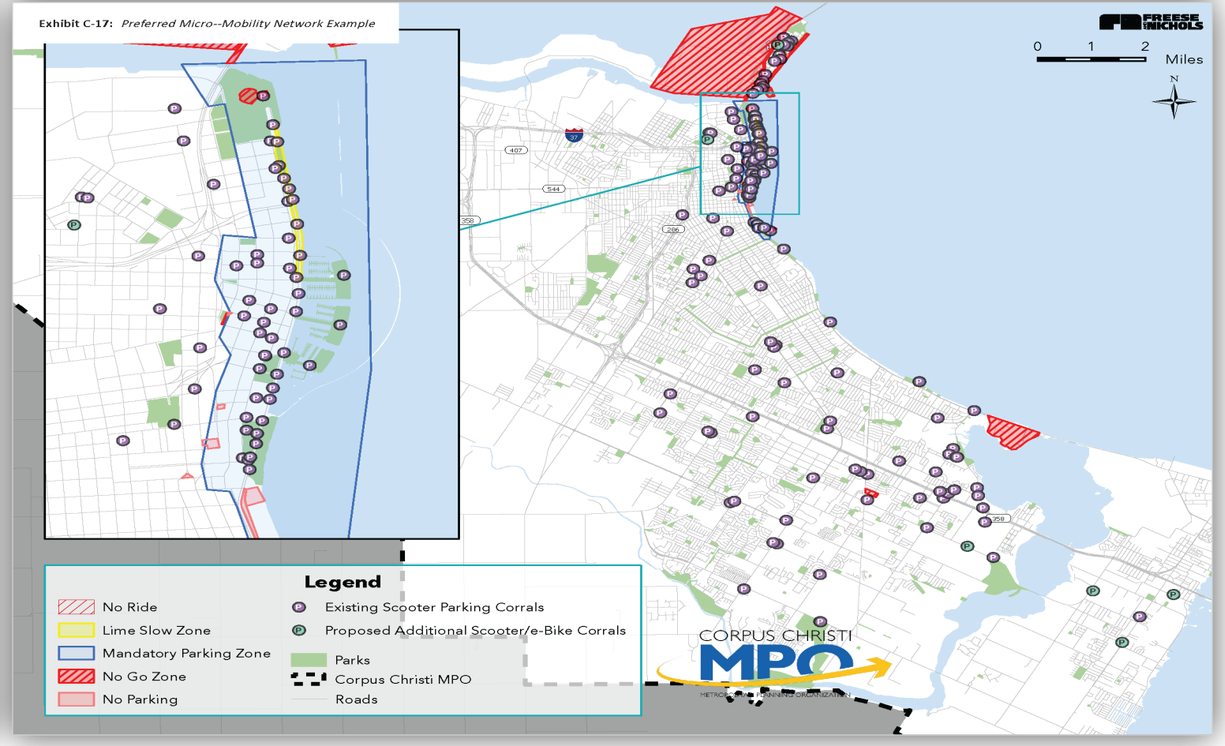
Exhibit C-17 shows the Preferred Micro-Mobility Network for the Corpus Christi MPO. Existing zones and scooter parking corrals are supplemented with proposed corrals for scooters and/or shared e-bikes around key areas. Notably, at the start and end of the New Harbor Bridge, corrals have been proposed to supplement the planned

Exhibit C-16: *Example of a Geofencing Map, Cheyenne, WY*



shared-use path along the bridge. Access to Flour Bluff via micro-mobility is being expanded by the Holly Road Trestle Train to Tourism Trail project. This is an opportunity for an expansion of micro-mobility in the area; key locations near popular destinations have been identified.

Exhibit C-17: *Preferred Micro--Mobility Network Example*



Suggested Guidelines for the Placement of Scooter Corrals

When adding or moving shared scooter corrals, several factors must be considered to ensure the vehicles do not encroach on the public right-of-way negatively. Below are considerations for the placement of e-scooter corrals.

- **The safety of all users should be the primary concern for corral placement.**
- Corrals should be demarcated with signage, planters, flexible delineators, and/or pavement markings to increase visibility and safety.
- Corrals must be on a level, well-marked, paved surface with sufficient drainage to prevent pooling/flooding. Where heat is a concern for users, shade structures may be used.
- Parking lanes or street/curb extensions are the preferred locations for corrals. Parking lanes should be at least 8' to accommodate corrals.
- Corrals must be in a well-lighted location that is highly visible.
- Corrals must be connected to existing bicycle and pedestrian networks.
- Corrals must be easily visible and accessible from the street so operators may collect them for recharging and redistribution. Operator parking must be permitted adjacent to Corrals.
- There should be no more than 50-80 corrals per square mile.
- Corrals should be spaced no more than 200 meters apart.
- A minimum 6' clear path for pedestrians is required for all sidewalk corral locations.
- Corrals should be placed 5'-15' away from fire hydrants, mailboxes, bus stops, ticketing stations, and driveways for emergency service vehicles.
- Corrals must not interfere with parking for personal bicycles and e-scooters.
- Corrals should not impede curbside delivery for adjacent businesses.
- Avoid placing corrals in areas with high pedestrian access/egress or near splash pads, pools, fountains, and bridges.
- Micro-mobility parking restrictions may be supplemented with geofencing.



Examples of Dockless e-Scooter Parking

Exhibit C-18: *Scooter Parking Racks, Nottingham*



Source: BBC News

Exhibit C-19: *Marked Location on Sidewalk, Atlanta, GA*



Source: NACTO

Exhibit C-20: *Scooter and Bike Combined Parking in the National Mall, Washington, D.C.*



Source: DC Department of Transportation

Exhibit C-21: *Scooter Corral with Bollards in On-Street Car Parking Space, Santa Monica, CA*



Source: Santa Monica Daily Press

Understanding Micro-Mobility Ordinances

Municipalities have the authority to adopt ordinances for proper operation of micro-mobility vehicles and ordinances for shared micro-mobility providers. Both are important for a successful, safe transportation system with micro-mobility. Ordinances allow cities to create and enforce restrictions and to continually monitor and update them.

In 2022, Corpus Christi City Council passed its Dockless Vehicle Ordinance which authorized license agreements for shared dockless vehicle providers. The ordinance outlined where the vehicles should be parked, set a cap on fleet size, and updated the fee structure, among other things.

Suggested improvements to the current City of Corpus Christi Dockless Vehicle License Agreement:

- Addition of an equity requirement which requires operators to place 20% of its vehicles in low-income areas and have an affordability program for qualifying riders
- Specify the responsibility of operators to relocate misplaced vehicles in a timely manner and to incur the cost of compliance
- Update to geofenced areas where users cannot ride, cannot park, or must ride at a reduced speed
- Update to micro-mobility user guidelines

A model Micro-Mobility Ordinance is shown in Exhibit 2-16. This model ordinance was adapted from ordinances of other peer cities referenced in this appendix.

Exhibit C-22: *Model Micro-Mobility Ordinance*

ARTICLE x. SHARED DOCKLESS VEHICLE OPERATING PERMIT

Section A. DEFINITIONS

The following definitions apply to the terms used in this Article:

(A) *Applicant* means the person who submits for a permit or license with the City, who will own, control, or operate the proposed shared dockless vehicle service.

(B) *City* means the City of Corpus Christi, Texas, together with all its governing and operating bodies.

(C) *City Manager* means the person authorized to operate and manage the daily functions, services, and departments of the City. The City Manager may delegate tasks and as such, the term includes the City Manager's designee.

(D) *Director* means the director of the department designated by the City Manager to enforce and administer this Article and includes representatives, agents, or department employees designated by the Director.

(E) *License* means a license granted by the City under the terms and provisions of this Article authorizing the licensee to obtain a permit to operate a shared dockless vehicle.

(F) *License Holder* means a person that has been authorized by the City to operate a shared dockless vehicle and maintain any necessary shared dockless vehicle services.

(G) *Operator* means an individual or company that has been issued an operating authority permit under this Article.

(H) *Rebalance* means moving shared dockless vehicles from an area of low demand to an area of high demand.

(I) *Right-Of-Way* means the surface of, and the space above and below, any street, road, highway, freeway, lane, path, trail, drainage way, channel, bridge, tunnel, fee interest, public way or place, sidewalk, alley, boulevard, parkway, drive, or other easement now or hereafter held by the City or over which the City exercises any rights of management or control and shall include, but not be limited to, all easements now held, or hereafter held, by the City. The public right-of-way includes the entire area between the boundary lines of every right-of-way.

(J) *Shared Dockless Vehicle* means a bicycle, an electric bicycle pursuant to the definition set forth in Texas Transportation Code Section 664.001, as amended, or a motor-assisted scooter, pursuant to the definition set forth in Texas Transportation Code, Section 551.351, that is intended to be rented or leased to different users.

(K) *Shared Dockless Vehicle Service* means a service to rent, lease, or sell shared dockless vehicles in the public right-of-way for the purpose of transportation or conveyance.

(L) *Traffic Engineer* means the person authorized to oversee the City's engineering functions, programs, and services pertaining to traffic, vehicular circulation, and pedestrian safety.

(M) *Vendor* means any person who engages in the business of selling, offering for sale, renting or offering for rent and delivering from stock at or near the time of sale or rental any goods or services from any vehicle, cart, stand, or other equipment or electronic device or from their person, from, in or upon any public street, alley, sidewalk, park, beach or any other public way or premises or from, in or upon any private premises; and outside a permanent, established structure.

The following rules of construction apply to this Article:

(A) The term "shall" is mandatory.

(B) The term "may" is discretionary.

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(C) The singular includes the plural and the plural includes the singular where indicated by the context.

Section B. GENERAL AUTHORITY AND DUTY OF DIRECTOR

(A) The Director may issue an operating authority permit to a shared dockless vehicle service for use of the public right-of-way to sell, rent, lease, or exchange, offer to sell, rent, lease, or exchange, or take order for the use of shared dockless vehicles.

(B) The Director shall implement and enforce this Article and may by written order establish rules or regulations, consistent with this Article and state or federal law, as the Director determines necessary to discharge their duty under, or to affect the policy of this Article to achieve a safe, orderly, equitable, and multi-modal transportation system.

(C) The Director may include rules or regulations regarding:

(1) The hours of operation;

(2) The appropriate number of Operators to be permitted;

(3) The number of shared dockless vehicles that may be placed in the public right-of-way;

(4) Rebalancing requirements; and

(5) Data-sharing requirements.

(D) The Director may contract with vendors to assist with data collection and analysis and to collect and store shared dockless vehicles deployed or parked in violation of this Article.

(E) The Director shall review the license request and determine that the following criteria have been met in addition to other criteria as established by this Article that:

(1) A unit placement plan (Section 0 City-Wide Placement Plan) has been submitted;

(2) The submitted unit placement plan complies with the provisions of Texas Transportation Code Section 552.007 (*Solicitation by Pedestrians*) and Section 42.03 (*Obstructing Highway or Other Passageway*) of the Texas Penal Code;

(3) Activity is not expected to cause or significantly contribute to sidewalk congestion or to make access to abutting private property hazardous;

(4) Activity is not expected to impede the flow of pedestrian traffic or to make the use of a sidewalk unreasonably inconvenient or hazardous;

(5) The License Holder provides anonymized data reporting as required to ensure best management of public right-of-way and improve associated infrastructure, safety, and associated planning;

(6) The Vendor meets determined minimum liability insurance, both per occurrence and in the aggregate, as well as providing a performance bond per unit (to serve as security deposit); and

(7) Units physically display contact information of vendors to provide people ability to call with complaints;

(F) The Director may modify a license or reduce the number of authorized units placed in the right-of-way, based on the total number of units concentrated within a specific area.

(G) Each license shall be valid for no more than twelve (12) months from date of issuance.

(H) The Director shall ensure that license applications are approved only for Operators in compliance with City laws and in good financial standing with the City once an Operator files a permit application and pays the permit fee. Companies can restore good standing if they take the following actions:

(1) Remove dockless devices from the public right-of-way;

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(2) Cease operations until they secure a license;

(3) Reimburse the City for any and all costs associated with the company's noncompliance; and

(4) Other requirements as determined by the Director.

Section C. CONDITIONS OF LICENSE

A person who applies for a license under this Article must:

(A) Agree to comply with the terms of the license agreement;

(B) Pay the annual ground rent fee prescribed by ordinance, based on the Traffic Engineer's determination of the vendor's square-foot encroachment on the right-of-way; and

(C) Carry and display a right-of-way license verification card.

Section D. CITY-WIDE DOCKLESS TRANSPORTATION UNIT PLACEMENT PLAN

(A) An Applicant for a city-wide dockless transportation license shall provide the Director a plan that shows the number of units to be deployed in specific areas of the City.

(B) The Director may reduce the number of authorized units placed in the right-of-way, based on the number of units concentrated within a specific area.

Section E. APPLICATION FOR OPERATING AUTHORITY PERMIT

(A) To obtain an operating authority permit, an Applicant shall submit an application on the form and in the manner prescribed by the Director.

(B) An Applicant shall file with the Director a verified application statement, to be accompanied by a non-refundable application fee, containing the following, in addition to the information needed under Subsection (C):

(1) The form of business of the Applicant and, if the business is a corporation or association, a copy of the documents establishing the business and the name and address of each person with a twenty percent (20%) or greater ownership interest in the business;

(2) The verified signature of the Applicant;

(3) The address of the fixed facilities to be used in the operation, if any, and the address of the Applicant's corporate headquarters, if different from the address of the fixed facilities;

(4) The name of the person designated by the Applicant to receive on behalf of the Applicant any future notices sent by the City to the Operator, and that person's contact information, including a mailing address, telephone number, and email or other electronic address;

(5) Documentary evidence from an insurance company indicating that such insurance company has bound itself to provide the Applicant with the liability insurance required by this Article;

(6) Documentary evidence of payment of ad valorem taxes on property within the city, if any, to be used in connection with the operation of the proposed shared dockless vehicle service;

(7) Documentary evidence from a bonding or insurance company or a bank indicating that the bonding or insurance company or bank has bound itself to provide the Applicant with the performance bond or irrevocable letter of credit required by this article;

(8) The number and types of shared dockless vehicles to be operated;

(9) An agreement to indemnify the City; and

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(10) Three references from North American municipal bodies where the Applicant is currently operating.

(C) The Director shall review the application for an operating authority permit and determine if the following criteria have been met, in addition to other criteria that the Director may establish by rule or regulation the Operator's:

(1) Effort to educate users and ensure compliance by its users with applicable laws;

(2) Capacity to comply with this article, rules and regulations issued by the director, and all other state or federal laws or regulations;

(3) Experience operating shared dockless vehicle services, including the operator's compliance with applicable laws; and

(4) Efforts to increase access to shared dockless vehicle service to low-income and non-English speaking users.

(D) An operating authority permit may be renewed following the process in this Section.

(E) The initial application for an operating authority permit must be accompanied by an application fee of $1,000 and the appropriate vehicle fee as specified in Section I. VEHICLE FEE AND RIDE FEE. Applications to renew an operating authority permit must be accompanied by an application fee of $500 and the appropriate vehicle fee as specified in Section I. VEHICLE FEE AND RIDE FEE.

Section F. LICENSE AMENDMENT, SUSPENSION, OR REVOCATION.

(A) The Director may suspend, amend, or revoke a license for a violation of federal, state, or local law, or if the License Holder does not meet the requirements under this Section.

(B) In addition to the grounds described in Subsection (A) above, the Director may also suspend or revoke a license if the:

(1) License Holder fails to maintain correct and current information with the City regarding the information or operations in the right-of-way required by the license;

(2) License Holder provides false or misleading information to the director or any officer, employee, or contractor of the City;

(3) License Holder neglects to relocate a shared dockless vehicle in a restricted area within 24 hours;

(4) License Holder files bankruptcy, is insolvent, or fails to meet financial obligations on a timely basis (30 days late of posted payment date), or is unable to obtain or maintain the financial resources needed to properly maintain facilities or provide adequate service;

(5) License Holder fails to provide the Director regular reports (at least weekly);

(6) License Holder engages in fraudulent, unfair, misleading, deceptive, or anti-competitive practices or unlawful discrimination;

(7) License Holder is operating more shared dockless vehicles than is authorized by the operating authority permit;

(8) License Holder operates a shared dockless vehicle service with a suspended operating authority permit;

(9) After consultation with the City Manager, the Director determines that the Operator's shared dockless vehicle service constitutes an imminent threat to public safety;

(10) License Holder shows a pattern of not responding to inquiries by the Director or customer complaints in a timely fashion (less than 1 week);

(11) A federal, state, or local registration, certification, or license of the License Holder is suspended; or

(12) License Holder, a person controlling the license, or principal employed by the License Holder, is convicted of a felony or any crime involving theft, fraud, or deceit related to the License Holder's service.

(C) The cease of operations by suspension or revocation notice shall meet the conditions below.

(1) Upon receiving an emailed notice by the Director that its operating authority permit has been suspended or revoked, an Operator must stop providing shared dockless vehicle services within 12 hours and must remove its shared dockless vehicles from the public right-of-way within 24 hours.

(2) If the Operator fails to retrieve all its shared dockless vehicles within 24 hours of receipt of notice the Director may remove the shared dockless vehicles from the public right-of-way without notice or consent of the Operator.

(3) The Operator is responsible for the cost of removal and storage of its shared dockless vehicles, and the Operator will be assessed a fee to retrieve any of its shared dockless vehicles that are removed and stored.

(4) The Director shall provide notice via email and certified mail to the addresses provided under Section 0.

Section G. REFUSAL TO ISSUE OR RENEW OPERATING AUTHORITY PERMIT.

(A) The Director shall refuse to issue or renew an operating authority permit if:

(1) The License Holder intentionally or knowingly makes a false statement as to a material matter in an application for a permit or permit renewal;

(2) Issuance would result in activity that is expected to cause significant sidewalk congestion or make accessing abutting property hazardous;

(3) Issuance would result in activity that is expected to impede the flow of pedestrian traffic or make the use of sidewalks hazardous.

(4) The License Holder has had an operating authority permit revoked within two (2) years of the application date; or

(5) License Holder is providing shared dockless vehicles services without an operating authority permit.

(B) If the Director recommends permit denial, then the Director shall notify the Applicant or Operator in writing that the application is denied, and include in The notice shall include the specific reason(s) for denial and a statement informing the Applicant or Operator of the right to appeal the decision.

Section H. INSURANCE REQUIREMENTS

(A) An Operator shall procure and keep in full force and effect no less than the insurance coverage required by this Section through a policy or policies written by an insurance company that:

(1) Is authorized to do business in the state of Texas;

(2) Acceptable to the City; and

(3) Does not violate the ownership or operational control prohibition described in Subsection (E) of this Section.

(A) The insured provisions of the policy must name the City and its officers and employees as additional insureds, and the coverage provisions must provide coverage for any loss or damage that may arise to any person or property by reason of the operation of a shared dockless vehicle.

(B) An Operator shall maintain the following insurance coverages:

(1) The commercial general liability insurance must provide single limits of liability for bodily injury (including death) and property damage of $1 million for each occurrence, with a $2 million annual aggregate.

(2) If an Operator will utilize motor vehicles in its operations, the business automotive liability insurance must cover owned, hired, and non-owned vehicles, with a combined single limit for bodily injury (including death) and property damage of $500,000 per occurrence.

(3) Worker's compensation insurance with statutory limits.

(4) Employer's liability insurance with the following minimum limits for bodily injury by:

(A) Accident, $500,000 per each accident; and

(B) Disease, $500,000 per employee with a per policy aggregate of $500,000.

(5) Cyber/technology network liability and risk insurance, inclusive of information security and privacy with minimum limits of $1 million per claim.

(D) Insurance required under this Section must:

(1) Include a cancellation provision in which the insurance company is required to notify the director in writing not fewer than 30 days before cancelling the insurance policy (for a reason other than non-payment) or before making a reduction in coverage;

(2) Include a cancellation provision in which the insurance company is required to notify the director in writing not fewer than 10 days before cancelling for non-payment;

(3) Include an endorsement to waive subrogation in favor of the City and its officers and employees for bodily injury (including death), property damage, or any other loss.

(4) Cover all shared dockless vehicles during the times that the vehicles are deployed or operating in furtherance of the Operator's business;

(5) Include a provision requiring the insurance company to pay every covered claim on a first-dollar basis;

(6) Require notice to the Director if the policy is cancelled or if there is a reduction in coverage; and

(7) Comply with all applicable federal, state, and local laws.

(E) No person who has a twenty percent (20%) or greater ownership interest in the Operator shall have an interest in the insurance company.

(F) An Operator shall not be self-insured.

(G) Any insurance policy required by this Section must be on file with the City within 45 days of the issuance of the initial operating authority permit, and thereafter within 45 days of the expiration or termination of a previously issued policy.

Section I. VEHICLE FEE AND RIDE FEE.

(A) An Operator shall pay an annual vehicle fee of $35 for each permitted shared dockless vehicle with $5 from the annual vehicle fee dedicated to equity programs.

(B) An Operator shall pay a right-of-way rental fee of $0.20 for each ride a customer takes on a shared dockless vehicle.

(C) The Director may establish a program, subject to City Council approval, to rebate or waive fees under this Section to encourage equity in the distribution of shared dockless vehicles throughout the city.

(D) City Council must review the fees in this Section each year.

Section J. PERFORMANCE BOND OR IRREVOCABLE LETTER OF CREDIT.

Before issuance of an operating authority permit, the Operator shall provide the Director a performance bond or irrevocable letter of credit approved by the City Attorney.

(A) A bonding or insurance company authorized to do business in the State of Texas and acceptable to the City must issue the performance bond.

(B) A bank authorized to do business in the State of Texas and acceptable to the City must issue the irrevocable letter of credit.

(C) The performance bond or irrevocable letter of credit must list the Operator as principal and be payable to the City.

(D) The performance bond or irrevocable letter of credit must remain in effect for the duration of the operating authority permit.

(E) The amount of the performance bond or irrevocable letter of credit must be at least $10,000.

(F) Cancellation of the performance bond or irrevocable letter of credit does not release the Operator from the obligation to meet all requirements of this Section and the operating authority permit. If the performance bond or irrevocable letter of credit is cancelled, the operating authority permit shall be suspended on the cancellation date and the Operator shall immediately cease operations until the Operator provides the Director with a replacement performance bond or irrevocable letter of credit that meets the requirements of this Section.

The City may draw against the performance bond or irrevocable letter of credit or pursue any other available remedy to recover damages, fees, fines, or penalties due from the Operator for violation of any provision of this Section or the operating authority permit.

Section K. OFFENSE AND PENALTY.

(A) A person commits an offense if the person operates without a permit or license as required by this Article.

(B) A person commits an offense if the person fails to display the person's right-of-way license verification card to a peace officer or authorized City employee during the time the person is operating at the permitted location.

(C) An offense under this Article is a Class C misdemeanor.

ARTICLE x. USE OF MICRO-MOBILITY DEVICES AND BICYCLES.

Section A. DEFINITIONS.

In this Chapter:

(A) *Child* means a person younger than 18 years of age who has not been married or had the disabilities of minority removed for general purposes.

(B) *Director* means the director of the department designated by the City Manager to enforce and administer this Article and includes representatives, agents, or department employees designated by the Director.

(C) *Bicyclist* means a person operating a bicycle.

(D) *Blockface* means the linear distance of lots along one side of a street between the two nearest intersecting streets. If a street deadends, the terminus of the dead-end street will be treated as an intersecting street.

(E) *Electric Bicycle*:

(1) Has the meaning assigned by Section 664.001 of the Texas Transportation Code, as amended;

(2) The term does not include:

A. A motorized mobility device, as defined by Section 552A.0101 of the Texas Transportation Code, as amended;

B. An electric personal assistive mobility device, as defined by Section 551.201 of the Texas Transportation Code, as amended; or

C. A neighborhood electric vehicle, as defined by Section 551.301 of the Texas Transportation Code, as amended.

(F) *Helmet* means a properly-fitted bicycle helmet that:

(1) Is not structurally damaged; and

(2) Conforms to current standards of the American National Standards Institute, the American Society for Testing and Materials, the Snell Memorial Foundation, or any federal agency having regulatory jurisdiction over bicycle helmets.

(G) *Motor Assisted Scooter* has the meaning assigned by Section 551.351 of the Texas Transportation Code, as amended.

(H) *Parent* means the natural or adoptive parent or court-appointed guardian or conservator of a child.

(I) *Passenger* means any person riding upon or attached to a motor assisted scooter who is not the primary operator of the vehicle.

(J) *Pedestrian Zone* means the portion of the street that accommodates non-vehicular activity, it extends from the face of the building or edge of the property line to the face of the curb.

(K) *Rider* means a person operating a bicycle or a micro-mobility device.

(L) *Shared Micro-Mobility Service* means a publicly offered transportation service that enables a person to obtain short-term access to a micro-mobility device on an as-needed basis.

(M) *Sidewalk Clear Zone* means the portion of the pedestrian zone that is specifically reserved for pedestrian travel.

(N) *Shared Dockless Vehicle* means a bicycle, an electric bicycle pursuant to the definition set forth in Texas Transportation Code Section 664.001, as amended, or a motor-assisted scooter, pursuant to the definition set forth in Texas Transportation Code, Section 551.351, that is intended to be rented or leased to different users.

(O) *Slow Ride Zone* means an area where shared dockless vehicles may not exceed 10 miles per hour or the speed limit otherwise posted.

(P) *Traffic Control Device* means traffic control signs, signals, devices, and markings previously placed or erected by the police department or department of transportation, or any predecessor department, and now in use for the purpose of regulating, warning, or guiding traffic.

(Q) *Traffic Engineer* means the person authorized to oversee the City's engineering functions, programs, and services pertaining to traffic, vehicular circulation, and pedestrian safety.

(R) *Trail* means a pathway for pedestrian circulation, alternative transportation, and recreational uses that is designed and constructed in compliance with standards and specification adopted and maintained by the city.

(S) *Wearing A Helmet* means that a helmet is properly attached to a person's head with the chin straps of the helmet securely fastened and tightened.

The following rules of construction apply to this Article:

(A) The term "shall" is mandatory.

(B) The term "may" is discretionary.

(C) The singular includes the plural and the plural includes the singular where indicated by the context.

Section B. APPLICABILITY.

This Chapter applies when a rider operates a micro-mobility device or bicycle on a street or sidewalk.

Section C. APPLICABILITY OF VEHICLE TRAFFIC RULES.

A rider shall comply with the requirements of this Chapter imposed on a driver of a vehicle, to the extent that the requirements may be applied to operation of a micro-mobility device or bicycle.

Section D. OBEDIENCE TO TRAFFIC-CONTROL DEVICES.

(A) A rider shall obey the instruction of official traffic signals, signs, and other traffic-control devices applicable to vehicles, unless otherwise directed by a City of Corpus Christi police officer.

(B) Unless a bike lane is specifically designated otherwise, a rider travelling in a bike lane shall not travel in the opposite direction of adjacent motor vehicles in the roadway.

(C) A rider shall obey traffic signs that prohibit a right, left, or "U" turn, except when the rider dismounts from the micro-mobility device or bicycle to make the turn. A rider who dismounts shall obey regulations applicable to pedestrians.

(D) Every motor assisted scooter and electric bicycle must be equipped with a lamp on the front that emits a white light that is visible at a distance of not less than 500 feet and a red reflector on the rear that is visible from a distance of not less than 600 feet when directly in front of lawful lower beams of head lamps on a motor vehicle.

Section E. OPERATION ZONES

(A) The Traffic Engineer is authorized to designate zones where the operation of motor assisted scooters is prohibited and slow ride zones for motor assisted scooters and electric bicycles. Slow ride zones are in the areas where, in the professional judgment of the traffic engineer:

(1) Congested pedestrian or non-motorized traffic is present;

(2) Without a speed limit, a significant speed differential would exist between pedestrians or non-motorized traffic and motor assisted scooters and electric bicycles; and

(3) Without a speed limit, the presence of motor assisted scooters and electric bicycles could endanger public safety.

(B) A rider shall comply with the requirements of this Chapter imposed on a driver of a vehicle, except those by which their nature can have no application, unless directed by a Corpus Christi police officer.

(C) Unless a bike lane is specifically designated otherwise, a rider traveling in a bike lane may not travel in the opposite direction of adjacent motor vehicles in the roadway.

(D) A person commits an offense if the person:

(1) Operates or rides a motor assisted scooter or an electric bicycle at a speed greater than:

(A) 20 miles per hour;

(B) The designated speed limit in a designated slow ride zone; or

(C) The posted speed limit on a public street or trail.

(2) Transports any passenger on a motor assisted scooter or electric bicycle while in the public right-of-way or public park or public plaza within the city, unless the device is equipped with a seat and a set of foot rests for the passenger;

(3) Fails to yield the right-of-way to any pedestrian while operating a motor assisted scooter or an electric bicycle;

(4) Operates a motor assisted scooter on a trail where riding is prohibited or during the hours that riding is prohibited on the trail; or

(5) Operates a motor assisted scooter or electric bicycle on public landscaping or art or on public amenities in a manner that is contrary to the intended use of the amenity.

(E) Except as provided in Sections B and C, a person may ride a micro-mobility device or bicycle on a sidewalk in a reasonable and prudent manner.

(F) Riders shall operate on sidewalks in a manner consistent with the Americans With Disabilities Act and that does not endanger or hinder the movement of persons with limited mobility or other sidewalk users.

Section F. EXITING FROM ALLEY, DRIVEWAY, OR BUILDING.

A rider exiting from an alley, driveway, or building shall yield the right-of-way to a pedestrian on a sidewalk or sidewalk area, or to a vehicle on a roadway.

Section G. PARKING.

(A) A person shall not park a micro-mobility device or bicycle:

(1) In a manner that obstructs pedestrian or vehicle traffic;

(2) In a space designated as a vehicle parking place or between two designated vehicle parking places, unless otherwise marked;

(3) On any part of an accessibility ramp for persons with disabilities, or in any manner that would restrict the movement of persons with disabilities;

(4) In designated and marked special use zones, including, but not limited to, commercial service zones, passenger loading zones, customer service zones and valet zones;

(5) On or near railroad or light rail tracks or crossings;

(6) In a manner that obstructs street furniture that pedestrians access, including, but not limited to, benches and parking pay stations;

(7) On any private property without the permission of the owner

(8) Within 10 feet of an intersection or crosswalk, unless that area is a space designated by the city for the parking of motor assisted scooters or electric bicycles;

(9) On a roadway unless that area is a space designated by the City for the parking of motor assisted scooters or electric bicycles;

(10) On a sidewalk or public path in such a way as to obstruct traffic that prevents the free passage over any part of the sidewalk or public path, including in the sidewalk clear zone or pedestrian zone;

(11) Along a Blockface where the combined width of the sidewalk clear zone and buffer/furnishing/curb zone is less than eight feet;

(12) Within, against, or adjacent to a public transit shelter or public transit stop, in a manner which restricts the use of the shelter or stop by pedestrians who are waiting for public transportation;

(13) In a manner that obstructs fire suppression appurtenances, building entryways or exits, or vehicular driveways; or

(14) In a public park or plaza unless that area is a space designated by the City for the parking of motor assisted scooters or electric bicycles.

(B) A person shall not attach or secure a micro-mobility device or bicycle to public or private property in a manner that may damage, impair, or render the property unusable.

(C) A person shall park a micro-mobility device or bicycle:

(1) On concrete or other non-porous surface;

(2) In designated spaces marked for such use;

(3) In a manner which does not obstruct a roadway, path, sidewalk, crosswalk, or other pedestrian-way;

(4) In a manner which does not obstruct building entrances, exits, fire exits, delivery areas, or alleyways;

(5) In a manner which does not obstruct travel and movement in violation of the Americans with Disabilities Act; or

(6) In a manner which does not trespass on or obstruct private property, unless authorized by owner.

(7) In the pedestrian zone if it is fully contained in the buffer/furnishing/curb zone; or

(8) Fastened to a bicycle rack in the right-of-way, if the device includes a locking mechanism.

Section H. RIDING RESTRICTIONS.

(A) Except as otherwise directed by a Traffic Control Device or a Corpus Christi police officer, a rider shall ride in accordance with state law.

(B) A rider shall not operate a micro-mobility device or bicycle between vehicles traveling or standing in the same direction within marked lanes of a roadway or contrary to established traffic control devices.

Section I. RIDING ON RESTRICTED OR PROHIBITED STREETS.

A rider may not operate a micro-mobility device or bicycle on a street or sidewalk where riding is prohibited or on a street during the hours that riding is prohibited on the street.

Section J. RIDER DUTIES.

A rider who causes injury to a person or damage to property shall immediately stop the micro-mobility device or bicycle and:

(A) Provide any injured person reasonable assistance;

(B) Give the injured person or owner of damaged property the rider's name, address, and phone number; and

(C) If the damaged property is unattended, the rider must leave in a clearly visible way, or securely attached in a visible way to the property, a written notice with the rider's name, address, and phone number.

Section K. HELMET REQUIRED.

(A) Except as permitted by Section C HEALTH CONDITION EXEMPTION a child shall not operate or ride a micro-mobility device or a bicycle, sidecar, trailer, child carrier, seat, or other device attached to a micro-mobility device or bicycle unless the child is wearing a helmet.

(B) Except as permitted by Section C HEALTH CONDITION EXEMPTION a parent shall not permit a child to operate or ride a micro-mobility device or a bicycle, sidecar, trailer, child carrier seat, or other device attached to a micro-mobility device or bicycle unless the child is wearing a helmet.

(C) Under this Section, a helmet must:

(1) Be properly fitted and securely fastened to the child's head with the straps securely tightened;

(2) Not be structurally damaged; and

(3) Conform to the standards of the United States Product Safety Commission.

Section L. APPROVAL OF STANDARDS.

The City Council approves the bicycle helmet standards promulgated by the United States Consumer Product Safety Commission.

Section M. HEALTH CONDITION EXEMPTION.

(A) A child is not required to wear a helmet if the child has in its immediate possession a health exemption identification prescribed by this Section.

(B) The City Manager shall provide a health exemption identification to a child with a written statement:

(1) from a licensed physician that states the child's health condition and explains why the condition prevents the child from wearing a helmet; and

(2) that is approved by the Corpus Christi – Nueces County Public Health District.

(C) The city manager shall establish procedures to implement this section.

Section N. MULTIPLE RIDERS PROHIBITED.

A rider shall not operate a micro-mobility device or bicycle with another rider or occupant, unless the device or bicycle is specifically manufactured and designed to accommodate multiple riders.

Section O. PENALTY; ENFORCEMENT.

(A) A person commits an offense if the person performs an act prohibited by this Article or fails to perform an act required by this Article.

(B) A culpable mental state is not required for the commission of an offense under this Article.

(C) A separate offense is committed each time an offense occurs.

(D) Prosecution for an offense under this Article does not prevent the use of other enforcement remedies or procedures applicable to the person charged with the conduct or involved in the offense.

(E) An offense under this Article is a Class C misdemeanor punishable by a fine not to exceed:

(1) $20 on a first conviction; and

(2) $40 on a subsequent conviction.

(F) The municipal court may dismiss a charge against a person for an offense under Section 12-2-31 (***Helmet Required***) on receiving proof that the defendant acquired a helmet for the child who was operating or riding a micro-mobility device or bicycle in violation of Section 12-2-31 (***Helmet Required***) on or before the 30th day after the citation was issued.

(G) A Corpus Christi police officer or officer designated by the Director may issue a citation for any violation of this Chapter.



ENGAGEMENT SUMMARY

Public engagement is a crucial component in developing Corpus Christi MPO's Active Transportation Plan. The project team conducted both in-person and online engagement to understand the needs of different stakeholders in the community.

The project team conducted 18 stakeholder meetings, including six meetings with Environmental Justice advocates, three Technical Advisory Committee (TAC) meetings, two 2050 Master Thoroughfare Plan workshops, and four in-person public meetings. An online survey was also created for community members to engage virtually.

Stakeholder Groups

- City of Corpus Christi Planning Department
- Coastal Bend Center for Independent Living
- City of Corpus Christi Parks & Recreation Advisory Group
- I Bike CC
- Port of Corpus Christi
- Hype Bike
- Choice Living Community
- Private Citizen
- Coastal Bend Council of Governments
- City of Corpus Christi/Bike Riders Forum
- TAMU-CC Department of Education
- City of Corpus Christi Parks and Recreation Department
- TAMU-CC Accessibility Study Author
- City of Corpus Christi Homeless and Housing Services
- Timon's Ministries
- Catholic Charities of Corpus Christi

Corpus Christi MPO Meetings

- Technical Advisory Committee Meeting
- 2050 MTP Workshop

Public Meetings

- January 16th: Retama Central Library
- January 17th: Portland Community Center
- October 1st: Marvin Bake Middle School
- October 2nd: Seashore Middle Academy

Online Engagement

- January 16 through May 1, 2024

STAKEHOLDER MEETINGS

Notes

City of Corpus Christi Planning Department

June 14 2023, 1:30pm

- Plenty of ROW
  - Most roads have no congestion issues
  - Pape/Dawson has IFCIP roadway data
- Too much ROW for cars
  - Need to reduce/reallocate ROW to accommodate all users
- Vision Zero Tool
  - See DRCOG as a reference
  - Also contact Craig Casper for MPO Vision Zero policy
  - (Safety analysis being done by other subconsultant)
- Bayside ADP
  - Ocean Drive
  - $20 million resurfacing project
  - City Manager is heading up the Ocean Drive Bike Plan
- Parks and Recreation
  - Goals – get trails built
- Brawner & Louisiana Parkway
  - Low hanging fruit for bike/ped projects
    - Connects lower-income neighborhoods
    - Already partially built
- Carmel
  - Will be a more difficult connection for bike/ped
  - Connects major arterials with the City
- Cullen – Collahard Ditch
  - Has slope issues
  - Will have limited ROW available
- See Open Data city webpage for lastest City Limits
- MPO has bike ridership Information
- Alameda – considered bad road for cyclists
- Santa Fe – also considered bad for cyclists
- Oso Bay Trestle
  - City awarded $13 million
  - Extension of Holly – Flour Bluff Trail
- Flour Bluff ADP is adopted
- See City Website for projects funded through the Bond Program
- Need to differentiate facility sizing between on/off road facilities
- Who are the champions?
  - Peter (City Manager) – avid cyclist
  - Councilman Klein, Sylvia Campos
  - Jeff Pollack (avid cyclist, not commuter)
  - Renee
- Obstacles to development
  - ROW purchases are an issue
- Vision Zero
  - Still in its infancy
- Safe Routes to School is an opportunity

Shoreline Drive

- 1.5 miles closed off (one-lane in each direction) each Saturday

MPO Bike Plan

- 10-30% funded

City TAC meetings

- Every Monday
- See website

See RTA bike boarding data

MPO bike ridership data

Corpus Christi

- Remote work not a big percentage of overall commuter trips
- Corpus is primarily a low-income, blue-collar community

Need to balance goals vs current conditions

New Harbor Bridge

- Will have 10ft shared use path and overlook at the top

Corpus Master Plan

- See Daniel Harrison (FNI)

Hike/Bike Corpus Christi

- Refer to Mobility CC Plan

Meet w/ Corpus Christi Parks and Recreation Department – trails

TIRZ funds available – see Open Data for projects in Corpus Christi

- Also have bond funds available

Norma Urban Park

- TIRZ funded
- Better Block Foundation Project
  - Possible source for tactical urbanism?

Coastal Bend Center for Independent Living

June 14 2023, 4:30pm

- Judy Telge seen as the main advocate for mobility-disadvantaged
  - Chair of Corpus Christi Traffic Advisory Committee
  - Need for more representation from those with limited mobility
- Corpus Christi Engineering Department
  - Seen as understaffed.
  - **Not seen as a partner**
  - Perceived obstacle for mobility challenged
- City needs to have a more formalized plan for accommodating mobility issues for seniors
- Lack of accessibility throughout the region
  - Many areas have no sidewalks or curb cuts
  - Mobility challenged often have to go into the street to traverse their community.

Transit
- Bus stops seen as too far apart
- **Drivers will not stop upon request for disabled**
- **Reluctance to criticize CCRTA – their personnel essential for mobility**
- Need strong relationship between active transportation and transit providers
- Have voucher program – getting foundation funding
- Affordability an issue for seniors
  - Opposed to fare increases
  - What about free transportation?
- Need accessible paths of travel!
  - Only 50% of bus stop are accessible for mobility-challenged persons
- "Quick-Wins?"
  - There aren't any
  - Multiple issues affect the lack of easy solutions
  - Need more inclusive planning
  - Focus on project implementation/continuation
- Need a change in leadership / decision-maker structure
- Need to develop partnerships between the cities and the Corpus Christi MPO
  - Don't think they see bike/ped as a priority
- Need to increase the number of accessible stops to decrease the demand for paratransit services
- Dialysis services do not provide transportation services
- Need cost-sharing
- RTA disburses federal funds
  - FTA 5310 / FTA 5307

Traffic
- Need more traffic signal synchronization
- Corpus has car-centric culture
- Urban form and policies geared towards cars and drivers
- Need more bike lanes and road diets
  - Doddridge a good example of a road diet
- Need traffic calming
- Intersection bulbs
  - Reduces crossing distance/time
- Building access
  - Access from thoroughfares problematic
  - But direct access is generally okay
    - Doors need to have levers instead of knobs
    - Sliding doors are seen as beneficial

Bus Stops
- Need more shade at stops
- Heat is impactful on health
  - Forces elderly/disabled to stay home and not attend appointments

Need for abolishing no-fault accidents involving the elderly/disabled.
- Not really in the scope of the study

Pedestrians hit on US 37 at night
- Need for better lighting

Programmatic Needs
- Mobility management
- Get providers to coordinate services
- Reduce barriers
- Who coordinates on behalf of the CCRTA?
  - MPO seen as an option
- National Aging and Disability and Transportation
  - Coordinates with the FTA
- Federally supported mobility management

Regional Transportation Plan
- Stakeholder group
- Is Coastal Bend COG is lead agency?
  - What are they doing?
  - See Mary Afuso
  - Oversees plan

- Political barriers
  - Need to provide amenities
  - People migrating to Corpus come from communities with existing bike/ped networks and expect to see networks here.

Peer Cities
- Montreal, Quebec, CANADA
- Austin, Texas

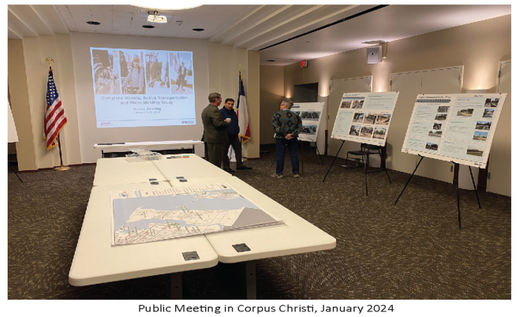
Policies:
- Likes what Cambridge, Massachusetts does
  - Have a policy that any road w/ speed limit over 35 mph must have bike paths.

Essentials of a Successful Bike/Ped Program
- Includes a peer review of Texas cities
- Discussion on the economic (tourism) and health benefits of cycling
- Focus on sustainable transportation
- Provision of bike counters
- Pharoah Valley Golf Course
  - Turn into park/veloway
- Design amenities to attract and keep people in Corpus Christi
- Complements outdoor activities

Funding Sources:
- Grant proposals
- TxDOT / Fed
- Crowdsourcing
- Public/Private Partnerships

Right-Size Roadways (peak hour low volumes)
- Holly
- Flour Bluff Drive

Consider:
- Tactical Urbanism
- Bike to School Week



Public Meeting in Corpus Christi, January 2024

Priority Needs
- Inventory of sidewalks, curb cuts, crosswalks, and buildings with ADA access

STEAR Database (State of Texas Emergency Assistance Registry)
- GIS database of wheelchair users
- Available from the City of Corpus Christi
  - Evacuation database
  - CCRTA is a partner

I Bike CC
June 14 2023, 6:30pm

Preference for buffered bike facilities
- Bike lanes seen as unsafe
- Bike paths best alternative

Priority Projects
- Ocean Boulevard
  - Lots of NIMBY'ers (rich people)
  - Heavy use by cyclists
  - Need more bike separation
- Ditch network (easier to "sell" project)
- Carroll Lane connectors (connects city) to McArdle

4 Main Groups of Riders
- Students
- Tourists
- Bike Commuters
- Historic Riders (south side)

Key East-West spine for riders
- Holly Road
- Painted bike path (armadillos/bollards)
  - FHWA design standards
- Need an extension to Flour Bluff

Need Recreational Loop
- Yorktown – Flour Bluff Road
- Oso River/Creek Network
  - Buffalo Bayou
  - Recreational trail for families

Concerned that we will get a lot of "bike-lash" if we build improvements and nobody uses them.
Alameda Corridor – "University store"
2016 MPO survey
- Had over 200 participants

No Green Bikeways
- Loathe the color

Consider using the ditch network more
Concrete is preferred more than asphalt or gravel
Local Bike Champions
- Jim Kline
- Sylvia Campos
- Craig Casper (CCMPO)
- Downtown Corpus Christi Cooperative (Elisa Macon?)
- Downtown District Management
- Hype Bike - Melanie

North Padre Island
- Residents prefer Golf Carts over bikes

West Side
- Disadvantaged community
- Bikes are considered a necessity
- Opportunity for mobility
- Plans
  - Uptown Plan
  - Greenwood
  - Horn

Challenges
- Corpus Christi Engineering Department
- The City of Corpus Christi generally

Port of Corpus Christi
June 15 2023, 4:30pm
- Strategic Plan for Active Mobility
  - Focus was on vulnerable user safety
  - Recommended sidepaths
  - Destinations identified – schools, parks, food markets
  - Potential areas identified – low income, low car access areas
- Behind curb facilities standard due to city maintenance
- No need for 12' lanes
  - Corpus Christi has speeding issues
- Bike boulevards recommended
- See Coastal Bend in Motion website (now closed)
  - Did bike counts
- Elissa Nejahu @ Parks Department
  - Heads up parks connectivity task force

Choice Living Community
June 16 2023, 3:00pm
- On People with Disabilities Committee
  - Corpus Christi Advisory Committee
  - Report to Nora Vargas (City of Corpus Christi)
  - Made resolution to Council preferring protected bike paths
- Austin area – source for protected bike paths

Request for Kevin to give presentation on July 12th @ 3pm to CC Advisory Committee
- 10-35 minutes

See Texas A&M Access Survey
- See Ashley Voggt (A&M)

Who are the Champions for Bike/Ped?
- Mayor of Corpus Christi

Important Bike/Ped Events
- Beach to Bay Relay Marathon
- Run/Walk event

Bike/Pedestrian Advocate
July 26 2023, 11:00am

- Want to ensure that previous work is not forgotten
- Why hasn't more happened? Why is the plan not being implemented?
- No logical implementation plan for bike/ped
- Maintenance an issue
  - Need proper street cleaner for bikeways
- Recommend reviewing previous surveys and stakeholder comments
- Have not seen aggressive growth in bike/ped since Jeff left MPO
- Need advisory committee to oversee plan implementation
  - Worked with CCMPO TAC
  - Involved in preliminary design
  - No champion for bike/ped at the City of Corpus Christi
    - City staff has lots of avid cyclists
- Perception is that Engineering staff is overwhelmed
  - Things get missed at the planning stage
  - Bond programs every 2 years
- Corpus Christi adopted the MPO bike plan
  - Need accountability for implementation
- Process in early planning stages, not where it used to be.
  - Need to involve street maintenance
  - Jeff Pollack – champion of current plan
  - Jeff Edmonds – director of engineering services
- Need accountability through implementation
- What is the budget?
- Use STRAVA data
- Need the right people in the room at the right time
  - Bond project scoping meeting (see San Antonio)
- Collaborative approach would be beneficial
- What are the current conditions?
- City Departments are seen as too "siloed."
- Existing plan doesn't need to be updated.
  - Needs to be "re-championed", not redone
  - Need a doable plan
- Need for an informal Ad Hoc Advisory Committee or working group
  - Has to be accountable
  - Give feedback on treatments and alternatives
- See Joe Miller (A&M University)
- 2022 Bond Projects being scoped now
- See Mai Bernal on Bond projects at the City of Corpus Christi
- Corpus GIS is seen as useful dataset for the region
  - Add projects from previous bond programs and update network

Coastal Bend Council of Governments
July 26 2023, 3:00pm

- COG responsible for FTA 5311 funding
- Population loss in 9 or its 11 counties
- Uses MPO forecasts
- Blind persons
  - Reliant on public transit for work
- Coastal Bike Plan
  - Recreational use only

Bike Riders Forum
July 26 2023, 6:00pm

- City of Corpus Christi Host - Mai Bernal, P.E.
- Location: Corpus Christi Engineering Department Conference Room
- Attendees:
  - Michelle Jones | Wings Over Texas | mjones@mtt-wingsoftexas.org
  - Ralph Pitzer | Various Rider Groups | Pitzer.ralph@live.com
  - Manny Macias | CCLED & Glowride | Jmmacras3@icloud.com
  - George Miguel Salcido | CCLED and Glowride | george@georgemiguelsalcido.com
  - Edwardo Miguel Martinez | CCLED and Glowride | kinged2180@gmail.com
  - Lee Pradia | lepradia@gmail.com
  - Gerardo Gomez | Gerardo2653@yahoo.com
  - Robert & Elizabeth Cervantes | Robcer8@yahoo.com & elizabethpeza@yahoo.com
  - Ron Beasley | ronbeasley@yahoo.com
  - Team Life Cyclers
  - Team Knight Riders

Rodd Field Road
- Bike lane on sidewalk
- Not suitable for road bikes

Need bikeways that consider all types of riders
Bike lanes are considered dirty and dangerous
- Too much debris
- Often overgrown with grass
- Trash on shoulders of roadways

Power poles often installed in middle of sidewalks
Streetscaping is considered poor quality
- Seen as reflecting inexperience and/or poor training
- Departments seen as not talking to each other
- Possible result from budget cuts?
- Need performance-based contracts

No bike lanes on bridges!
Need to be consistent with bike/ped improvements along corridors
Bike lanes should not include gutter
- Too narrow

Need for a bike safety program and enforcement

Texas A&M University
July 27 2023, 9:30am

- Evaluation of campus master plan
- HEAT map of students (see Neftali Rivera)

Corpus Christi A&M Study
- Noted that 70% of students would try e-Bikes
- E-Bikes seen as more reliable than buses
- Increased use of e-skateboards by students
- 99% of students take the bus from Momentum (1,048 students)
- Did have micro-mobility e-scooter service, but they were left everywhere/tripping hazard and are now banned.
  - Decision made by campus police
- E-scooters/E-skateboards were be seen in bike racks during visit

Need to restart Cyclovilla (stopped in 2020)
Should close down Shoreline/Ocean for bike/ped at certain dates/times
No safe way to cross Shoreline/Ocean for parks
How about Kayak commutes to TAMUCC?
- Kayak rentals, tourism?
- Park location already there

TxDOT Mill and Overlay Project (2025)
- KSJ (FNI) to review

Need beach access – no sidewalks
Cullen ditch
- Connects to Airline

Need to leverage pedestrian ROW to Cullen Middle School location
- Willow, Menger (?), Mont Claire, elementary school consolidation

See Campus Plan online as a reference (see website)

City of Corpus Christi Parks and Rec. Department
July 28 2023, 11:00am

- Park maintenance shared w/ Public Works Department
  - Ditches/medians done by public works
  - Trailways within park are the responsibility of the Parks Department
    - e.g. Salinas Park
- Trestle project submitted but not yet approved
- If a bike/ped extension goes through or to a park, then the parks and recreation department would consider adding it to their network
- Bill Witt park trail discussion (map provided)
- Salinas Park comments (map provided)

Micro-Mobility Policy
- Not in skateparks
- No set policy on Micro-Mobility
- Mustang Island needs guidelines
  - Focused on sidewalks and pathways for golf carts

Labonte Park
- 38-88 acres
- Expand to RV park

SPID (entire stretch)
- TxDOT facility
- Ask businesses to participate
  - Mandate sidewalks with new construction

Shannon (?) Trail
- Perfect example
- Use of concrete increases its longevity
  - Will sustain the weight of maintenance equipment

PRAC
- Parks and Recreation Advisory Committee
- Can meet Aug. 9th/ Sept. 13th / Sept. 6th

Conquer the Coast
- Date set for September 16th

Refer to Pedestrian-Trail Access Master Plan (2013)
Refer to Corpus Christi ADA Master Plan (2012)
Parks and Recreation Trails Network Overview
- 27 miles current (90 miles NRPA suggested)
- 14% within ¼ mile
- 32% within ½ mile
- Walking/Biking trails are the most requested amenity from the public

TAMUCC
July 28 2023, 1:30pm

- Need for increased accessibility throughout region
- Beach access for disabled
  - "Moby Mats"
- More parks and recreational spaces
  - Better terrain, materials, and equipment
- Make small businesses more accessible to mobility challenged
- General difficulty accessing transit
  - Where can we strategically add bus lanes?

City of Corpus Christi Housing Department
July 28 2023, 4:00pm

- Meeting with Jennifer Buxton and Rich Penska
- Need for sidewalks and bus access
- Need bus shelters and shading
- Will take access over facility condition
- Homeless services generally do not move
- For libraries, need sidewalks and access
- Perceived lack of support at the City for homeless services
  - No GIS support

National Studies

- HUD.gov
- USICH.org
- Give national statistics on % of homeless that are disabled / mobility-challenged

Timons Ministries
November 15 2023, 9:00am

- Waldron Road location
  - Lots of fatal accidents
- Access to Timon's Ministries is difficult for the homeless
- Parker Park (nearby)
  - Needs benches and shade
- No homeless shelter in Flour Bluff
- No public housing
- Homeless can't cross Oso Bridge
- Bus service is sketchy
- Homeless have mental health issues
- Hard to get from transit to shelters
- Need more bus passes
  - No discount
- Most homeless walk or take transit
  - Bicycles got stolen
- Homeless elderly at great risk
  - Money often gets stolen
- Homeless need public restrooms and outdoor showers
  - Timon's serves 100-150 persons/day
- Require shuttles to downtown services
  - Food stamps
  - Social Security
  - MHID

Catholic Charities of Corpus Christi
November 16 2023, 3:30pm

- FNI given tour of facilities and explanation of services
- Provides food bank and homeless shelters and support services for homeless
- Also provide immigration services
- Often run out of day passes for transit
  - Need more!
- Homeless cyclists need assistance maintaining their bicycles
  - Flat tires and general maintenance
- Also provide shuttle services for disabled for church services
  - Seen as critical need otherwise shut-ins have no social interaction
  - Caregivers often biggest obstacle in getting disabled out
    - Don't believe that disabled can have limited independence
    - Need for constant supervision

Mark-up Maps

Exhibit D-01: *City of Corpus Christi Planning Department, June 14 2023*

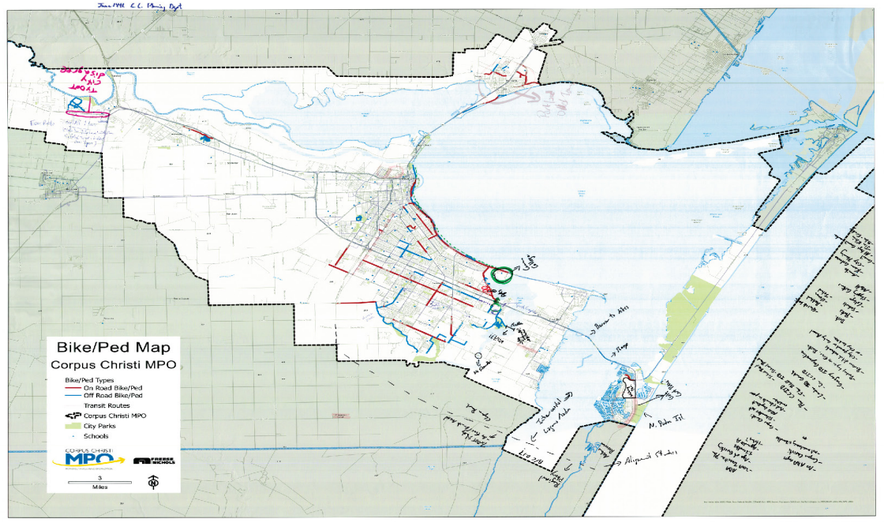


Exhibit D-02: *City of Corpus Christi Planning Department, June 14 2023*

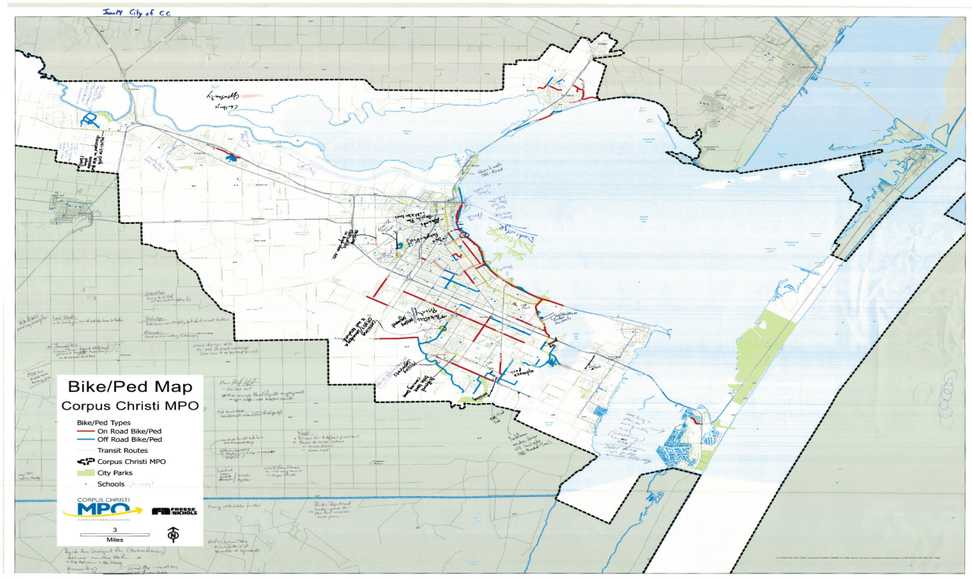


Exhibit D-03: *I Bike CC, June 14 2023*

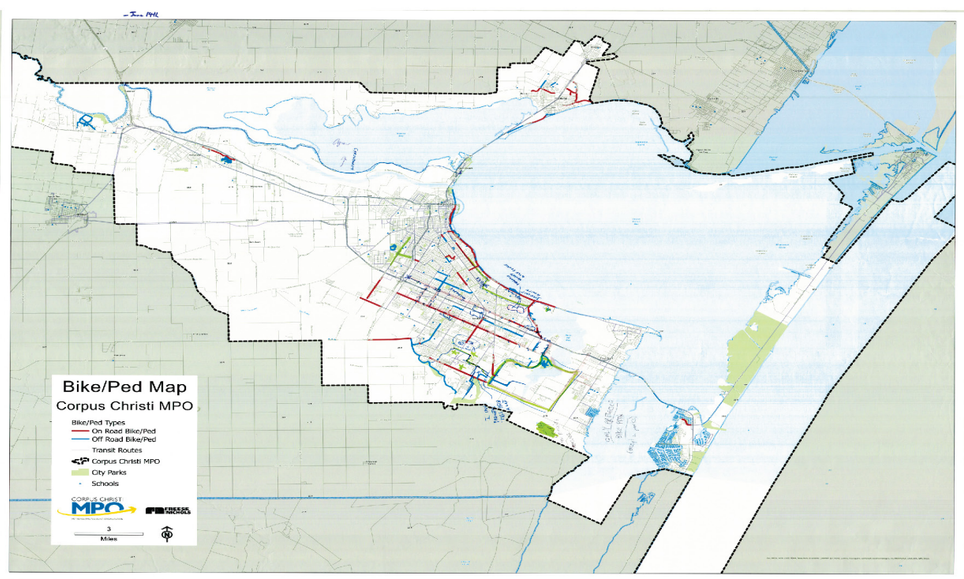


Exhibit D-04: *Hype Byke, June 16 2023*

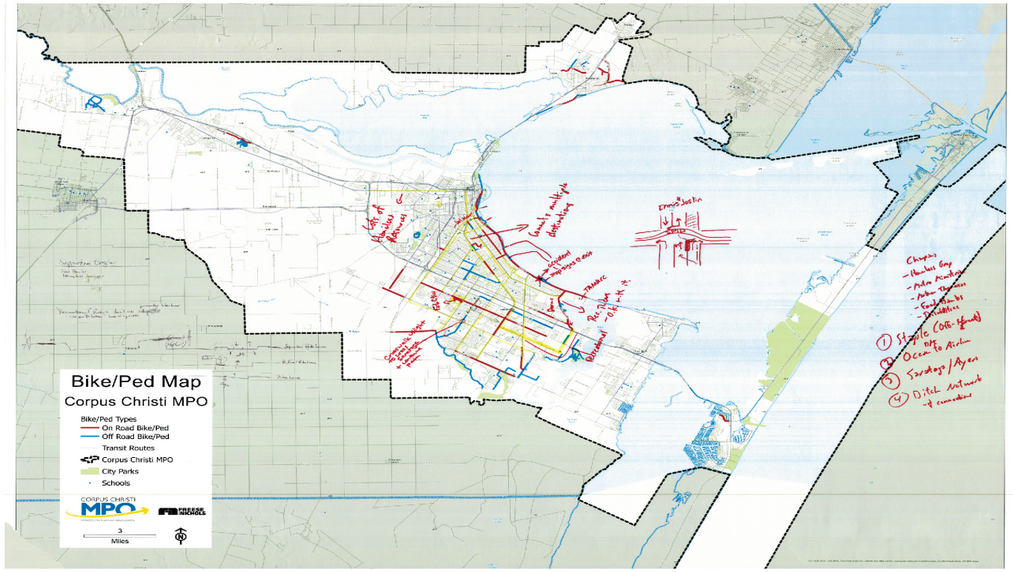


Exhibit D-05: *Bike Riders Forum, July 26 2023*

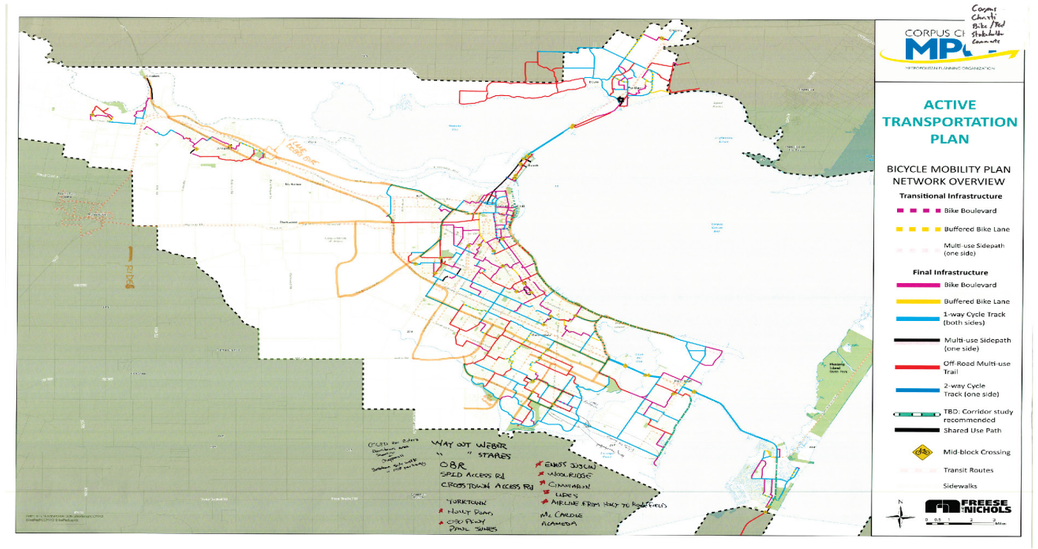


Exhibit D-06: *Bike Riders Forum, July 26 2023*

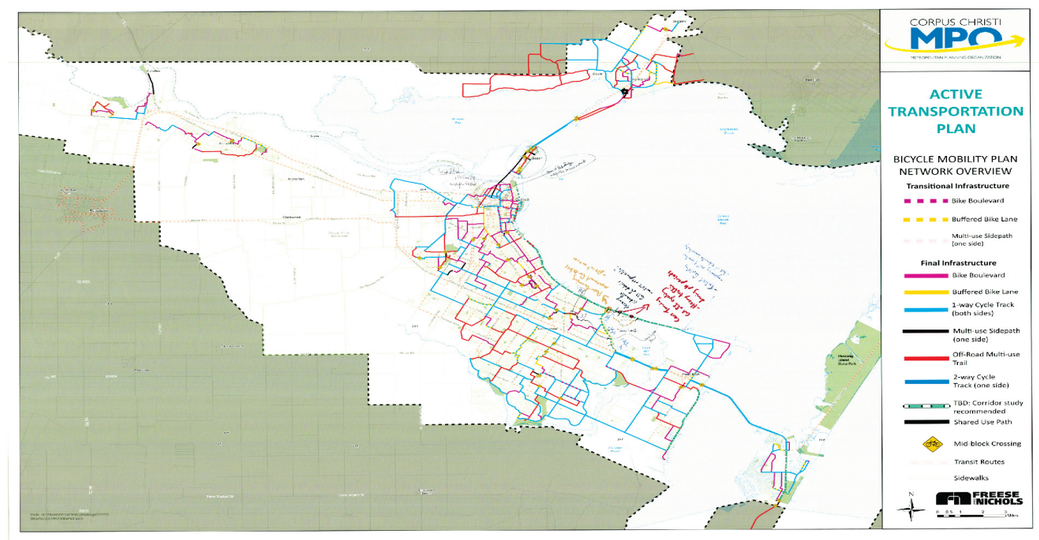
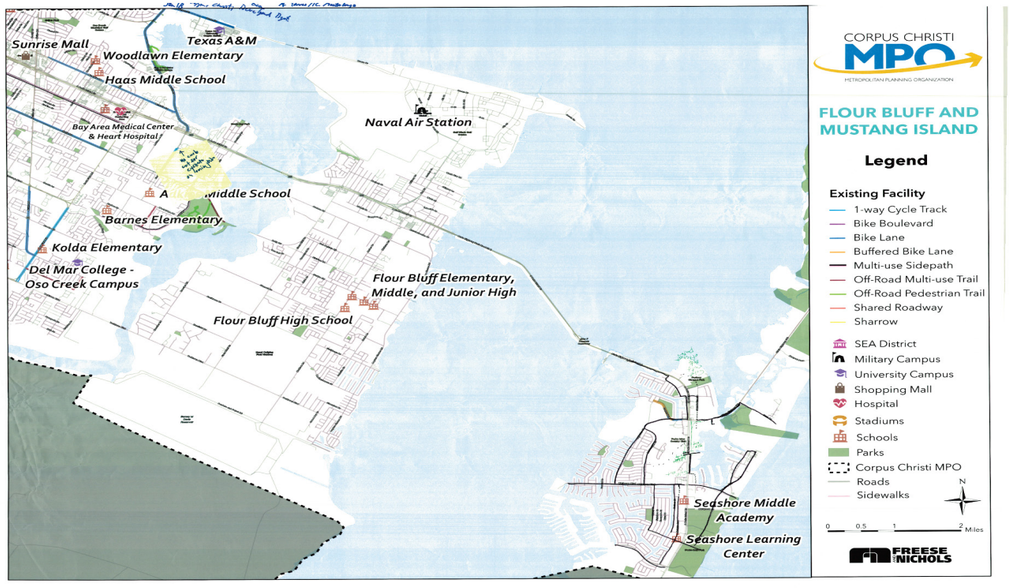


Exhibit D-07: *City of Corpus Christi Planning Department, January 18 2024*



PUBLIC MEETINGS

Notes

General Observations:

Both public meetings had very poor attendance, with most attendees being stakeholders from whom we had previously obtained comments.

Most attendees viewed the exhibits, but provided nominal comments on the maps, although several did fill out the survey.

January 16th: Retama Central Library, 5-8pm

Map Comments:

- Discontinuous sidewalks on Glenoak Drive in Flour Bluff
- Put a trail on Brawner Pkwy, from Ocean Drive to Ramsey Street
- Put a trail on Carmel Pkwy/Aberdeen, from Staples to Ocean Drive
- Construct a sidewalk network around Leopard Street and Rand Morgan Road
- On Ennis-Joslin Rd, no curb cuts for cyclists south of SPID.
- Need Safe Routes to School!
- Need intentional connection for cyclists between TAMUCC/Downtown/Del Mar
- Create a trail along the Oso Creek through Corpus Christi
- Listing of high crash locations, homeless population in Corpus Christi
- A bike trail circumnavigating Corpus Christi Bay would elevate this whole area! Think Conquer the Coast route, but always open!
- Holly Road needs barriers to protect cyclists. There's been loss of life along Holly Road.
- Design a map of protected cycling infrastructure to share to those who cycle as a means to commute.
- Give citations to vehicles that block/impede bicycle traffic (Ocean Drive, Carroll Lane, etc.)
- Market cycling protection
- Add barrier/buffer to each bike lane that's currently only painted
- We can start with signed bike routes designed to connect "sides" of town
- Need a safe bike path that connects western Oso to Mustang Island
- As many bike trails connecting to parks and schools as possible
- Install safe crossing at Saratoga and Sehanen hike/bike trail to continue the path
- Missing link at Yorktown
- Connect trails near school
- Missing link at end of Oso Pkwy trail
- Put trail crossing of Yorktown near Firestation #17
- Extend sidewalk past the first entrance to TAMUCC
- Need safe sidewalks on Gaines Street to Brookdale park.
- Need safe walking routes connecting Graham Road with Parker Pool
- Enlarge all sidewalks to minimum 6 ft within 1 mile of all parks, schools, and tourist attractions

Complete Streets Comments:

Louisiana Street and Brawner Pkwy: Put parking on the outside and buffered bike lanes on the inside.

January 17th: Portland Community Center, 5-8pm

- In Portland, expand the overall network and add a median trail on Memorial Pkwy

Mark Up Maps

Exhibit D-08: *Public meetings, January 16-18 2024*

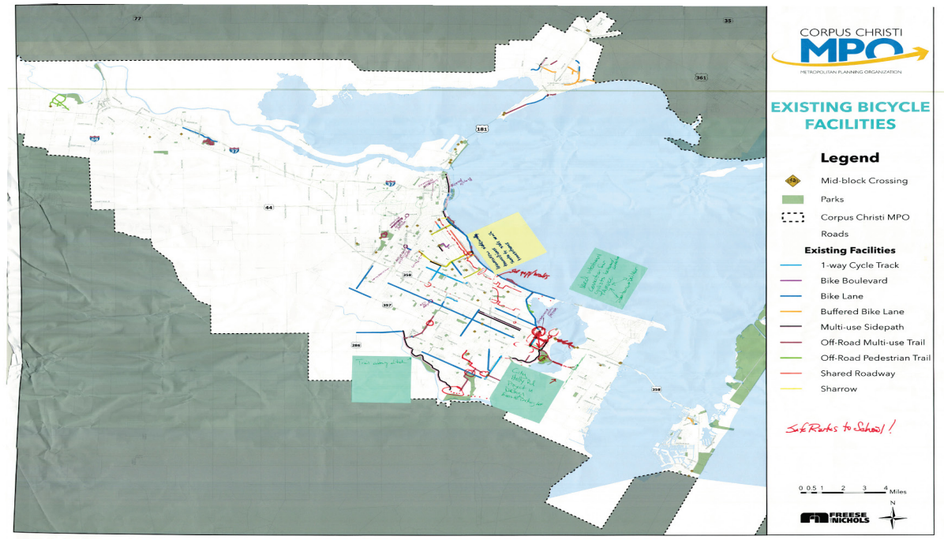


Exhibit D-09: *Public meetings, January 16-18 2024*

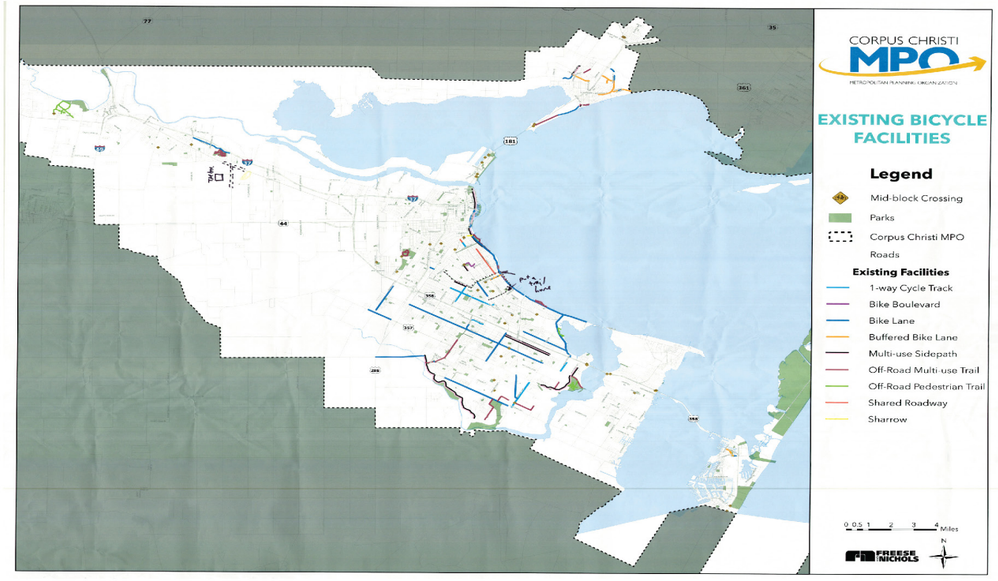


Exhibit D-10: *Public meetings, January 16-18 2024*

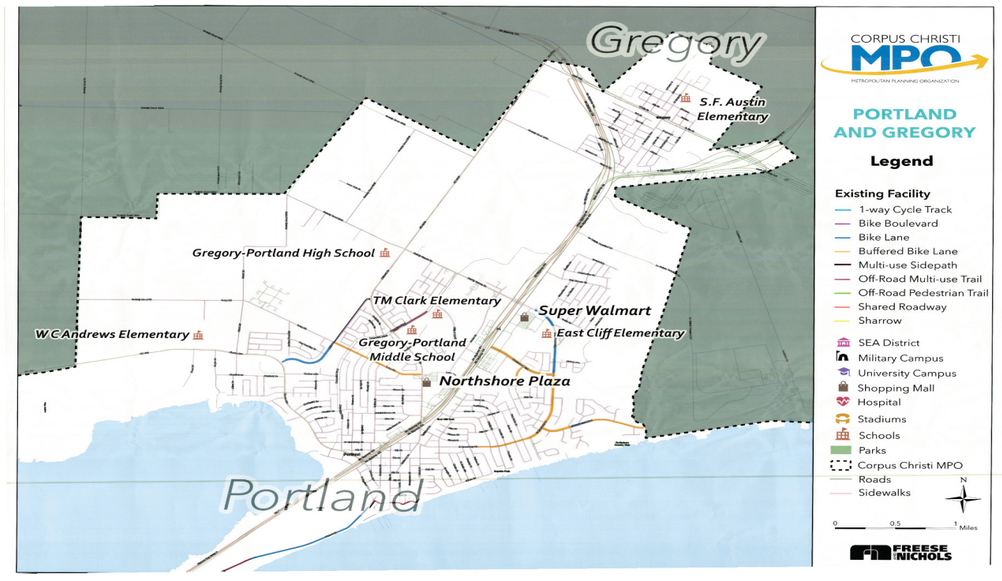


Exhibit D-11: *Public meetings, January 16-18 2024*



Exhibit D-12: *Public meetings, January 16-18 2024*

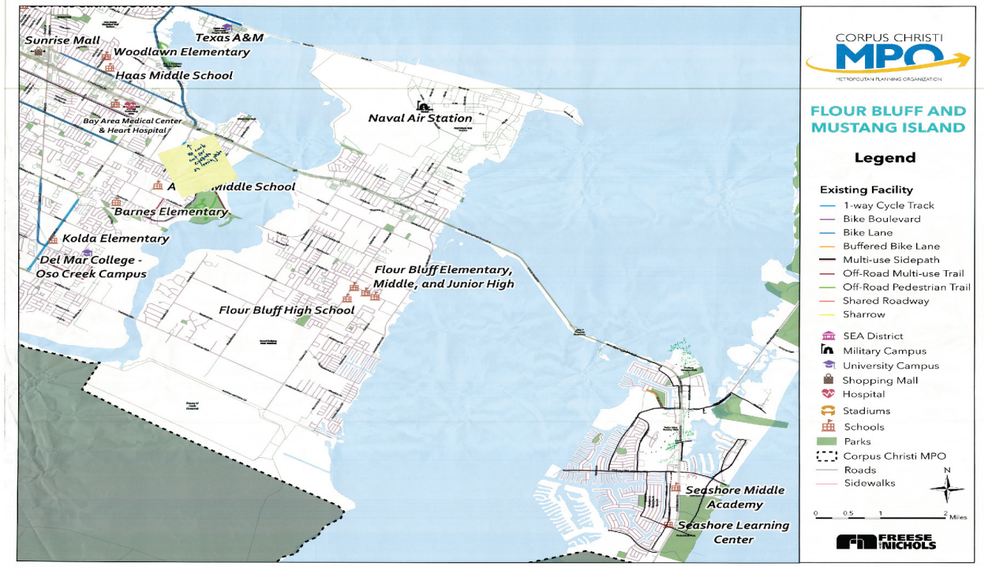


Exhibit D-13: *Public meetings, January 16-18 2024*

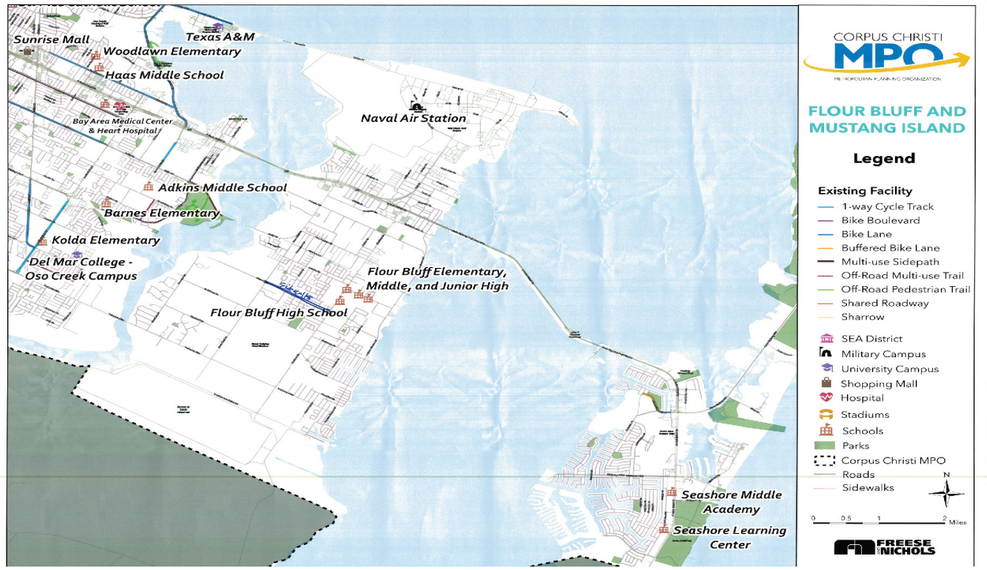


Exhibit D-14: *Public meetings, January 16-18 2024*



Exhibit D-15: *Public meetings, January 16-18 2024*

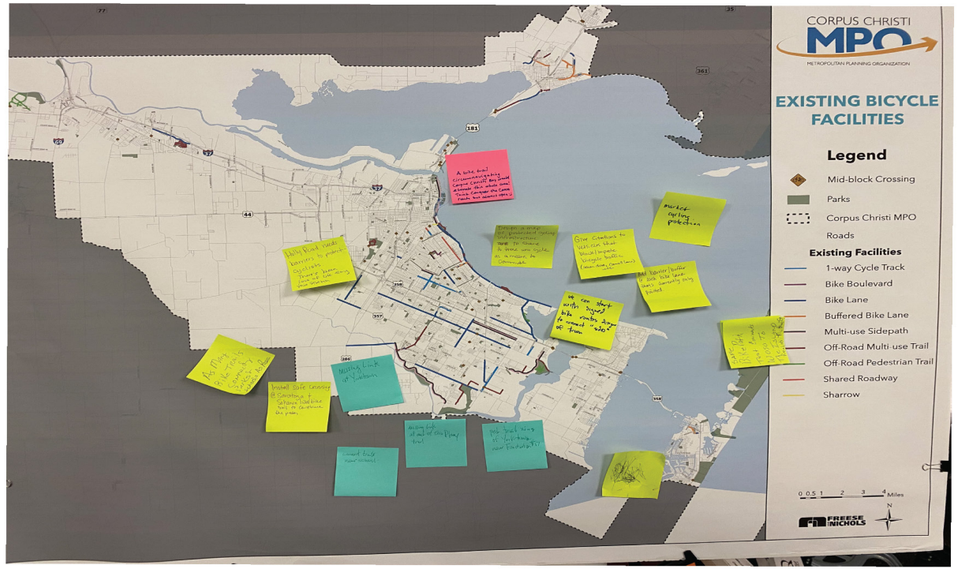


Exhibit D-16: *Public meetings, January 16-18 2024*

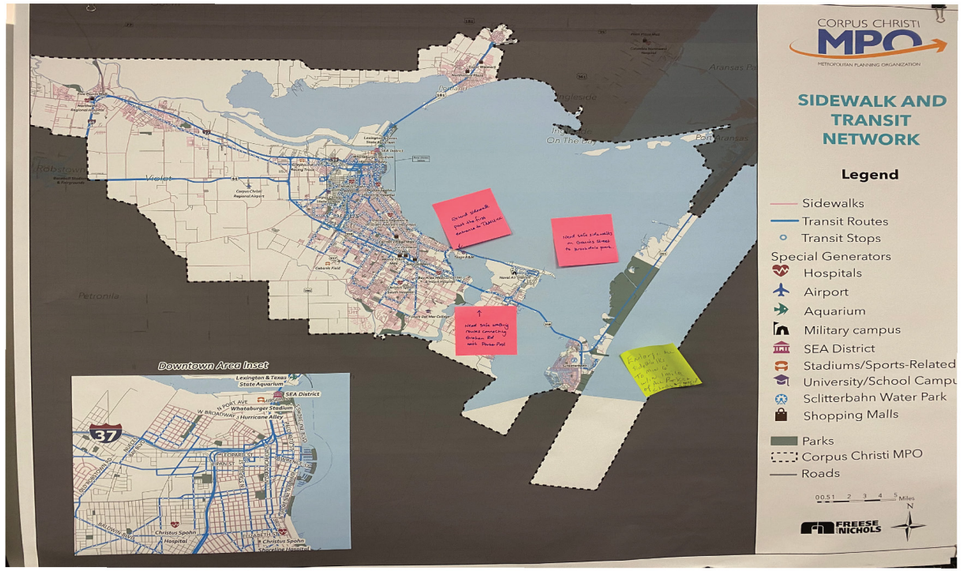


Exhibit D-17: *Public meetings, January 16-18 2024*

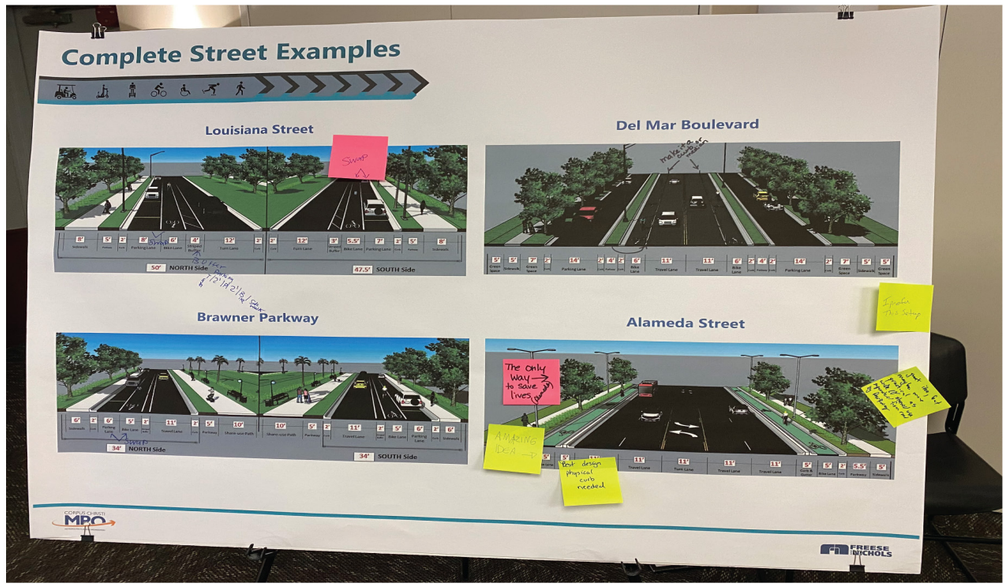


Exhibit D-18: *Public meetings, January 16-18 2024*

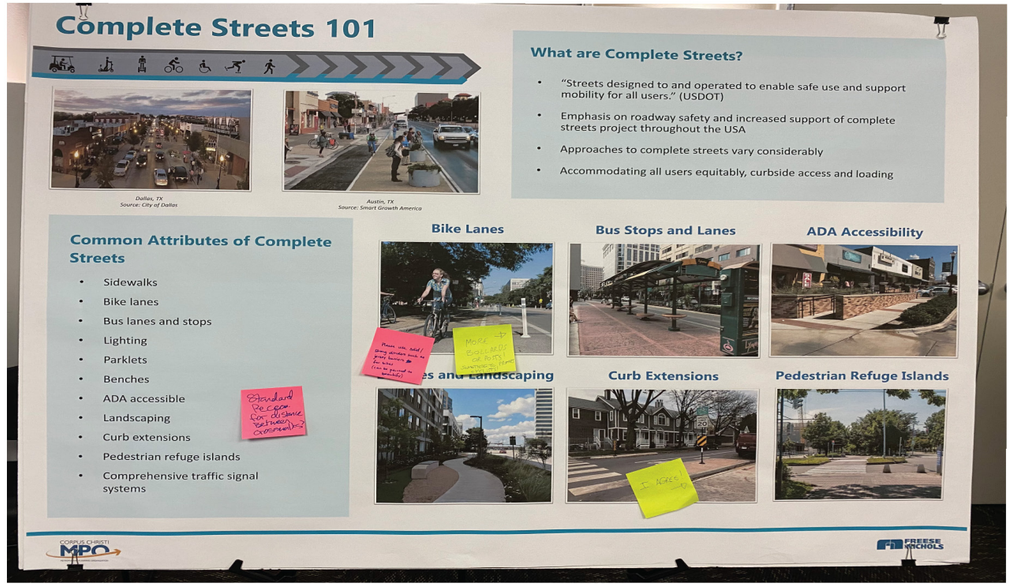


Exhibit D-19: *Public meetings, January 16-18 2024*

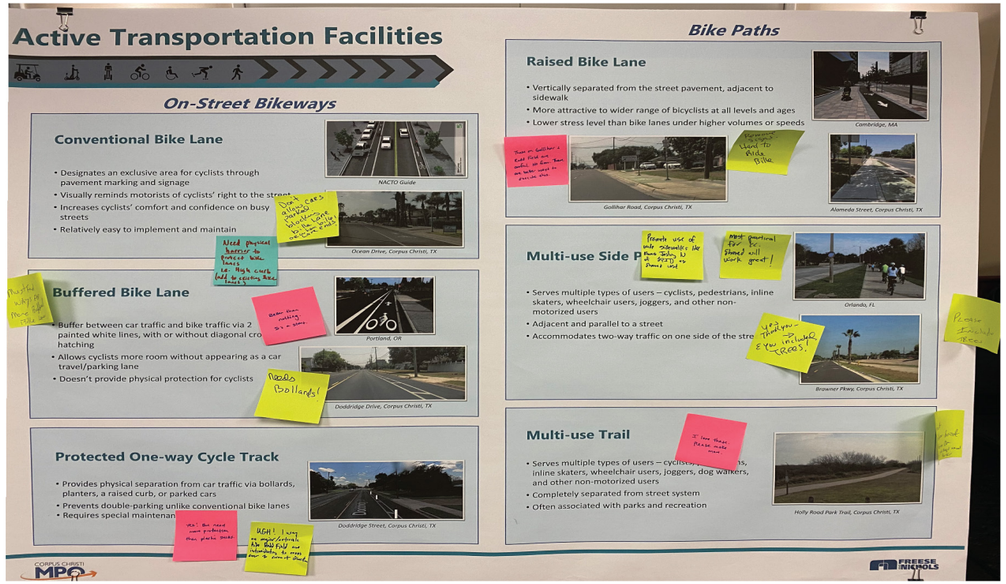


Exhibit D-20: *Public meetings, January 16-18 2024*



ONLINE ENGAGEMENT

Interactive Map

Exhibit D-21: *Online Survey Interactive Map comments*

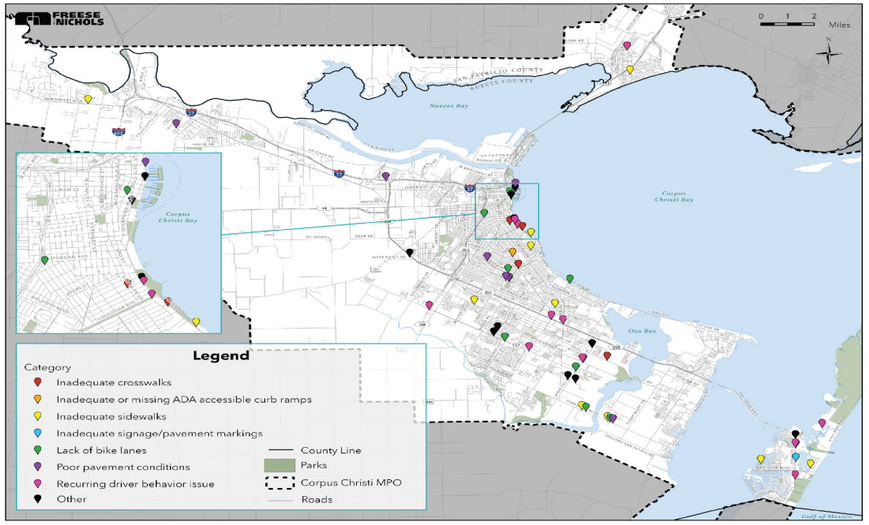


Exhibit D-22: *"Other" category comments on Interactive Map*

- No sidewalks
- Street lighting. It is very dark without the walking path lit up.
- Flashing light would be good here to get across Saratoga from Shea Parkway safely. I've seen runners run through traffic to access the rest of Shea Parkway.
- no, sidewalk, bike lane
- no sidewalk or bike lane, and poor pavement
- Daily gridlock. Poorly timed lights
- Poor crossing habits of pedestrians and vehicles
- Recurring driver behavior issue - All over
- Poor pavement conditions - All over
- Lack of Bike Lanes - All over



Steering Committee Meeting, June 2023

Online Survey Results

Exhibit D-23: *Question 1 How often do you take the following active transportation option listed below?*

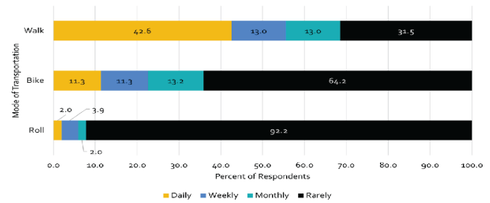


Exhibit D-24: *Question 2 Which active transportation trip(s) do you take the most?*

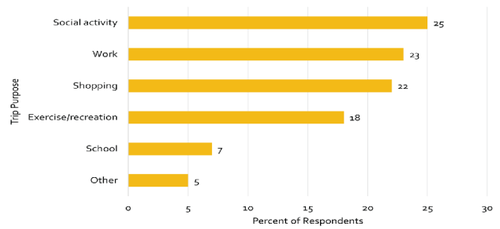


Exhibit D-25: *Question 3 On average, how long are your trips (total round trip in miles)?*

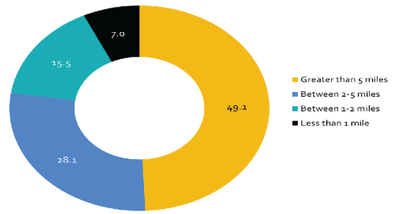


Exhibit D-26: *Question 4 The regional partners need to prioritize active transportation even if that means redirecting resources from other transportation needs.*

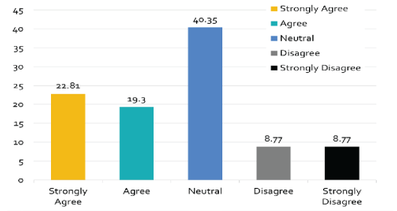


Exhibit D-27: *Question 5 Please list the following improvements in order of priority with your highest priority at the top (1) and lowest priority at the bottom (4).*

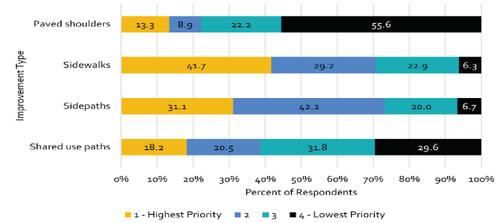


Exhibit D-28: *Question 6 How safe do you feel while using active transportation in your neighborhood?*

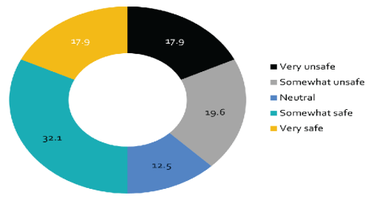


Exhibit D-29: *Question 7 How effective do you think current policies are in addressing safety concerns?*

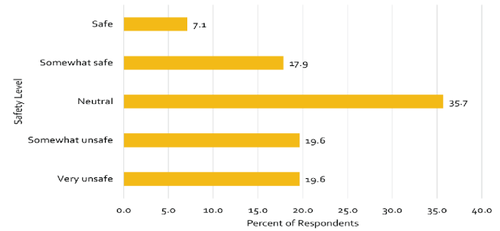


Exhibit D-30: *Question 8 What are your top 3 safety concerns when you travel?*

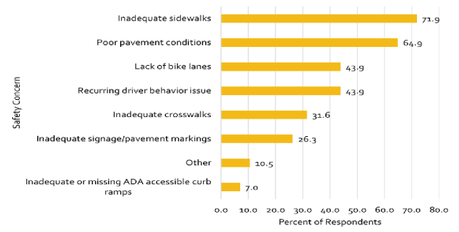


Exhibit D-31: *Question 9 Please list the following safety measures in order of priority for improving safety in the region with your highest priority at the top and lowest priority at the bottom.*

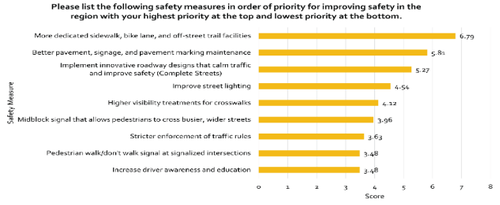


Exhibit D-32: *Question 10 Please note any other thoughts to enhance safety to the existing transportation system.*

Free responses:

- Going through refresher courses every three or five years
- Consider a flyover from Flour Bluff to Mustang Island.
- More sidewalks for pedestrians where they currently do not exist.
- better signs
- sidewalk maintenance - more tripping hazards/broken sections with ponding than should be deemed acceptable.
- Separated bike/walking lane
- Design neighborhood and communities for walkablilty and smart use.
- MORE POLICE OFFICERS, tougher Judges and District Attorneys
- Add rain n sun roofs over bus stops
- Please address the passenger safety issues regarding homeless, people under the influence and filthy people who leave seats smelling of bodily fluids.
- Sidewalks that extend beyond neighborhoods
- More bike lanes to connect people with common locations, shopping and work.
- Wider sidewalks. Drivers are the problem.
- Please create a infrastructure dedicated to cycling to alleviate loss of life when commuting. We need PROTECTED bicycle lanes that separate motorist traffic, bicycle traffic and pedestrain traffic.
- Bayfront is the crown jewel of our city. I would like to see a Dedicated multiuse pathway from art museum to naval air station that would accommodate walking, biking, wheelchairs, scooters etc. Wide and separate from the roadway. And extension over new
- Lower speed limits.
- Better protection for pedestrians.
- Marketing
- Sides I ride on are angles, uneven and unsafe for my bike. Street sweepers brush rocks,Glass,And trash into bike lane,Making them unsafe to ride in.
- Wider sidewalks , more bike paths away from motor cehicles

Exhibit D-33: *Question 11 How would you describe typical behavior of motorists when you are walking, biking, or rolling?*

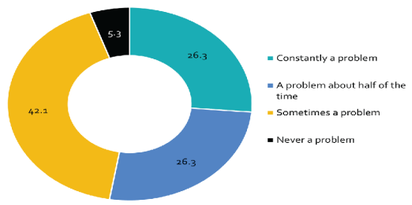
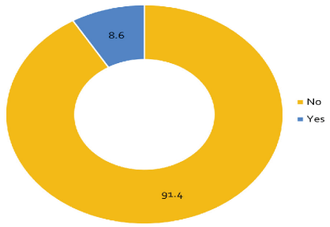


Exhibit D-34: *Question 12 Please explain your response based on your typical experiences and if you have ever had a close call with a potential crash.*

Free responses:

- I've been hit by cars twice while riding my bike.
- Drivers constantly on their phones also forgetting basic rules of the road And slower reaction times
- I typically don't walk/bike/roll
- Drivers run red lights
- Drives not obeying speed limits
- Drivers do not typically pay enough attention.
- Drivers do not understand when pedestrians have the right of way and put pedestrians at risk of being hit.
- You always have to be on the lookout for vehicles because sometimes people are not paying attention to the road.
- Just typical occasional speeder. None.
- car speeding through/not stopping at stop sign
- If I ride on the road, some motorists honk at me for no reason which is not safe when riding a bicycle. Walkers are usually on sidewalks and can't get around them easily without having to stop or get into the grass.
- People drive to fast on the feeder streets like SPID
- People don't pay attention enough to their surroundings.
- Motorist often don't bother to follow traffic laws at all, so if it is slow and stop while someone waits to turn or hop the sidewalk and keep going, they are going to hop the sidewalk.
- I've witnessed a kid getting hit by a car in front of a school, my son has had 2 or 3 near misses at intersections/ crosswalks
- Uninsured motorist
- My route takes me along 30-60mph roads with no bike accomodations
- Cross walking signs not working or there not being any cross walks
- Only one in twenty are the priblem
- Occasionally drivers will ignore when pedestrians are allowed to walk to take a protected turn
- Yes close calls
- I have close calls in the cross walk across Ocean Dr. at Del Mar slmost every time. People drive through red lights often.
- It's drivers not bikers or ped. They need more space.
- I was within 2 ft of being hit by a lifted Dodge Ram. The driver swerved into the painbted bike lane.
- I am a 70 year old hobby cyclist and live to get outside and enjoy a casual but long distance ride. Corpus Christi doesn't have safe, multiuse trails. San Antonio has done a very good job developing their trail system and we like to go there for riding
- Drivers seem to think they need to be first, turning right in Front of me or cutting me off
- Drivers don't pay attention and rarely dedicated pedestrian lanes
- Drivers are falling asleep, texting, or drunk early in the morning when going on walks.
- Distracted drivers. Lack of respect of current pedestrians lanes
- A lot of drivers are on their phones and police presence seems scarce.
- Motorists playing on phone and crossing into painted bike plane.
- Motorists running red light at HAWK beacons. Motorists driving or swerving into bike lane. in bike
- Cars coming too close when walking , riding bike
- Drivers leaving lots, etc only look left. They don't look right.

Exhibit D-35: *Question 13 Have you ever been involved in a non-motorized related crash?*





Open House in Corpus Christi, January 2024

Exhibit D-36: *Question 14 Please tell us more about the crash and its location.*

Free responses:

- I was at intersection. I did not notice a stop sign due to a tree covering it and was T-bone on the driver side. The other driver was on his phone and did not see me crossing
- I was in crosswalk in the opposite direction of oncoming traffic and driver was only paying attention to oncoming cars and hit me.

Exhibit D-37: *Question 15 Are there any additional comments or suggestions you would like to share regarding active transportation?*

Free responses:

- If drivers can pay more attention to the traffic lights turn on their blinkers to let people know that they are turning and stopping, and if people with bicycles are educated and operating their bikes on the correct side of the streets
- As the permanent and temporary population increases on the Island, consider replacing the bike lanes with wider golf cart lanes. No one on the Island rides bikes, while a large majority of the population travels by golf cart or UTV.
- Traffic signals are not synchronized which makes city commuting unsafe and inefficient. Takes way too long to go around town.
- Create separate biking lanes; biking lanes separated from cars by using posts. Do not put biking lanes on the sidewalks & paint the bike lanes green. Stupid idea!!
- A longer separated bike/walking path would be great, even if it wasn't in my neighborhood. I would drive to it to safely be able to walk or bike.
- Public transportation options here are poor at best and could be bolstered if made the only way to get through town if not walking.
- Please fix the homelessness in Corpus Christi, and the opportunistic crime here. I cannot even get friends of family to visit here. It is embarrassing.
- There needs to be better integration with CCRTA like bike lockers at bus stops. I don't think I could trust regular bike racks. I've also seen many bus stops with no proper pedestrian access
- Please address safety issues in the bus regarding the homeless, people under the influence, people with mental disabilities and people who soil themselves and leave seats filthy. The RTA bus needs to address these issues for rider safety inside the bus rather than outside issues.
- Should be a high priority. Especially to connect neighborhoods to nearby retail and recreation.
- We just need to start including planning for more bikes paths. I wouldlike to be able to get to ride Ocean Drive safetly.
- Enforcement of people running red lights would be helpful.
- Implementing a proctected bike lane infrastructure will save lives!
- Many citizens can benefit from bicycle roads. People who need exercise will benefit, lowering obesity rates. Teenagers who are saving up for a vehicle can safely bike to work. The less fortunate can safely travel. Health enthusiasts can enjoy riding. The main concern is safety. It's quite unsafe to ride anywhere in the city limits, but the popularity of electric bikes, scooters, and mopeds is rapidly growing.
- More HAWK beacons everywhere please.
- Thanks for doing this. I hope something comes from it.

Exhibit D-38: *Question 16 When biking, how often do you wear a helmet?*

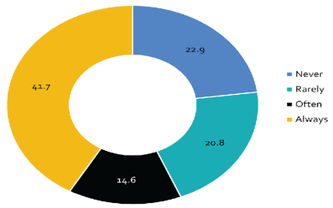


Exhibit D-39: *Question 17 How would you describe your biking experience level?*

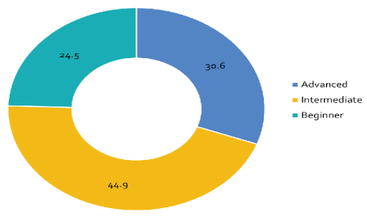
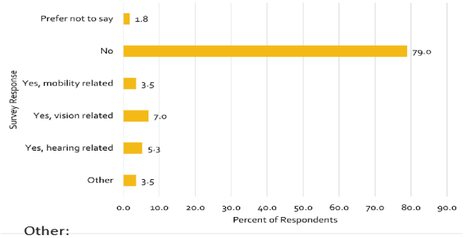


Exhibit D-40: *Question 18 Do you use any safety accessories such as lights, reflective gear, or mirrors? If so, please specify.*

Free response:

- I use multiple lights, reflective wear, and reflectors on my bike
- Are use all the necessary, safety equipment, white light in the front red light in the back I do have a high visibility safety vest. I also wear long sleeves and gloves with goggles and a helmet and I have a litter mirror to watch my backside.
- I rarely bike. When I do, however, it's my responsibility to ensure proper gear.
- All the above
- Lights
- None
- lights
- All of the above
- I don't ride a bike.
- Yes. Lights in front and back of bike. Bright clothes. Bright colored helmet.
- reflectors
- lights & reflectors
- Loud pipes
- Flashing and steady lights, reflective vest, mirror
- No
- All of the above
- Mirrors.
- Lights and refeletive gear.
- Lights
- Yes, all of the three above.
- Mirror, lights - both headlight, taillight and brake light. I always wear a helmet.
- Lights, mirrors
- Yes all the above
- Lights on front and back, reflectors, bell, Gloves
- Yes, lights and cameras. Cyqliq bike cameras, front and rear.
- Reflective gear

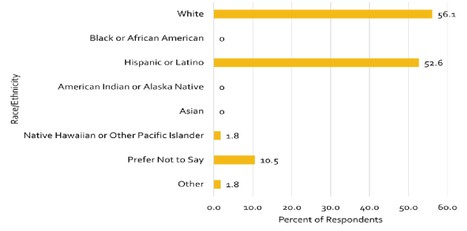
Exhibit D-41: *Question 19 Do you currently have any disabilities?*



Other:

- Anxiety

Exhibit D-43: *Question 21 What is your race/ethnicity?*



Other:

- Indigenous

Exhibit D-42: *Question 20 What is your age?*

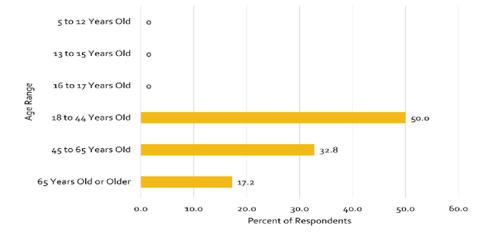


Exhibit D-44: *Question 22 What is your gender?*

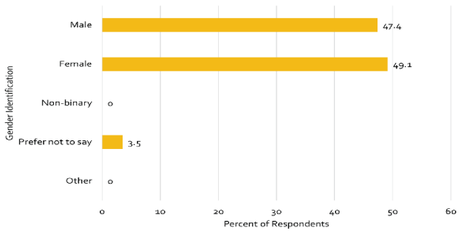


Exhibit D-45: *Question 23 What language(s) is spoken at home?*

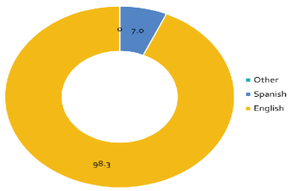


Exhibit D-46: *Question 24 What is your household annual income?*

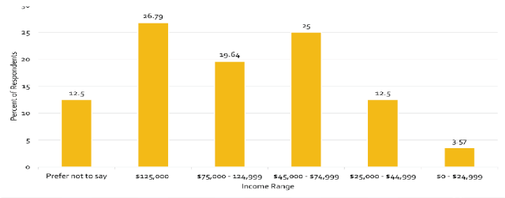
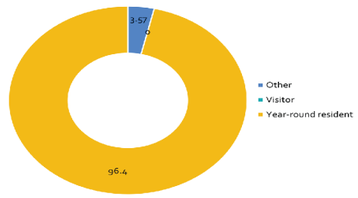


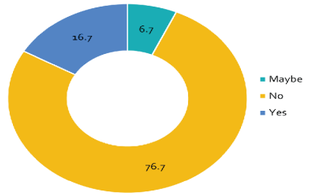
Exhibit D-47: *Question 25 Are you a year-round resident of the region or a visitor?*



Other

- I live here
- Resident

Exhibit D-48: *Question 26 Would you be interested in participating in a focus group over the next 6 months to provide more input on transportation needs and priorities in the Corpus Christi region?*





ENNIS JOSLIN ROAD COMPLETE STREETS CONCEPT

Ennis Joslin Road is an important link in the creation of a 20-mile bike/ped-friendly corridor that would extend from Flour Bluff to North Beach. This project would link:

- The Holly Road Trestle Bridge
- Ocean Drive protected bike lanes and shared-use path (SUP)
- Shoreline Boulevard separated bike lanes and SUP
- SUP across the new Harbor Bridge

The completion of the 20-mile corridor will provide a great experience for active transportation in Corpus Christi and would be a part of the Texas Bicycling Tourism Network for the Corpus Christi area.

Current Street Configuration

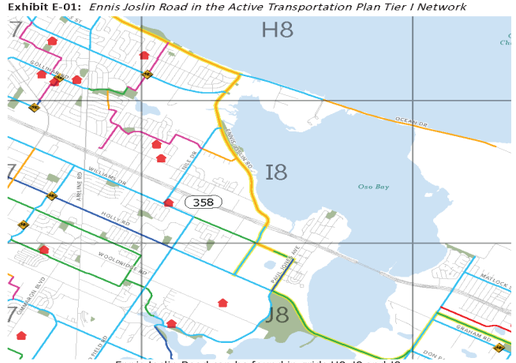
The segment of Ennis Joslin Road north of South Padre Island Drive (SPID) provides an 8-foot-wide SUP along the east side of the street and a 5-foot-wide sidewalk along the west side. Narrow (3 to 4 feet wide) bike lanes are provided in each direction. The Texas Department of Transportation (TxDOT) recently completed a pavement overlay and restriping of this roadway segment. South of SPID, 10-foot-wide SUPs have been installed along with the roadway widening between Williams Drive and Holly Road, consistent with the Strategic Plan for Active Mobility.

Ennis Joslin Road is intersected by multiple east-west active transportation corridors. Williams Drive provides 10-foot-wide SUPs along both sides of the street west of Rodd Field Road. As part of the design for the eastbound extension of Williams Drive, an SUP/trail will extend between Rodd Field Road and Ennis Joslin Road. The bike/ped facilities along Ennis Joslin Road connect to the Holly Road trail and the Trestle Bridge as well as the SUP along Oso Parkway. North of SPID, east-west bike/ped facilities are planned along McArdle Road, S. Alameda Street and the Ocean Drive corridor.

Land Uses along Ennis Joslin Road

Land uses along Ennis Joslin, are currently high-density residential (apartments) to the north of SPID, with more planned high-density residential developments to the south of SPID. The high-density residential nature of the corridor would be well served by a multimodal corridor that encourages active transportation activities on par with the level of accommodations typically provided to the personal automobile.

Exhibit E-01: *Ennis Joslin Road in the Active Transportation Plan Tier I Network*



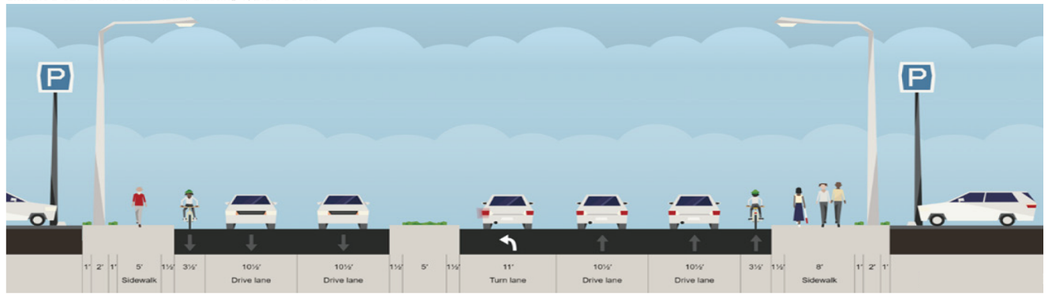
Ennis Joslin Road can be found in grids H8, I8 and J8.

ENNIS JOSLIN ROAD CONVERSION TO AN ACTIVE TRANSPORTATION FOCUS

Ennis Joslin Road: Ocean Drive to SPID

Ennis Joslin Road between Ocean Drive and SPID is a 4-lane divided roadway with a typical section depicted in Exhibit E-02. In each direction, 10.5-foot travel lanes are adjacent to a narrow 3.5-foot-wide bike lane, with a posted speed limit of 35 mph. On one side, an 8-foot-wide SUP is provided, and on the other side a 5-foot-wide sidewalk is provided.

Exhibit E-02: *Ennis Joslin Road, Existing Typical Section*

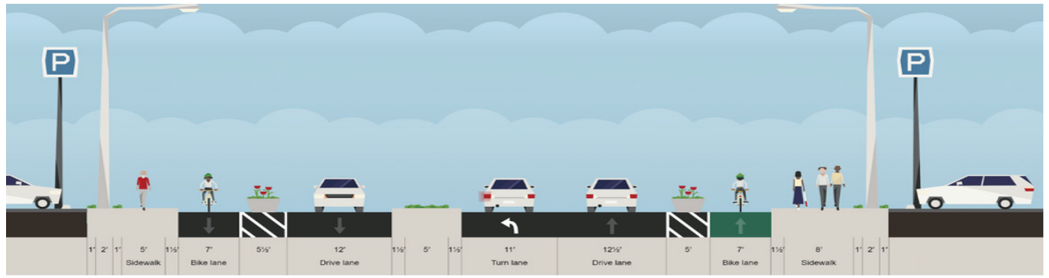


Alternative 1

Bicyclists feel that the existing 3.5-foot-wide bike lane is too narrow to be next to travel lanes with traffic at speeds 35 mph or higher. A proposed treatment would be to re-stripe the northbound and southbound lanes, leaving the median and the left turn bays as they are, to convert one travel lane in both directions to buffered/protected bike lanes, as depicted in Exhibit E-03.

The proposed cross-section would have 12.5-foot-wide lanes for vehicular traffic, a 5-foot-wide buffer (with planter boxes or bollards), and 7-foot-wide foot travel lanes. The posted speed limit would be reduced to 30 mph. This treatment would only involve pavement markings and portable planters in the buffer. More substantial changes to the right-of-way could be deferred until full reconstruction is warranted.

Exhibit E-03: *Ennis Joslin Road, Proposed Treatment, Alternative 1*

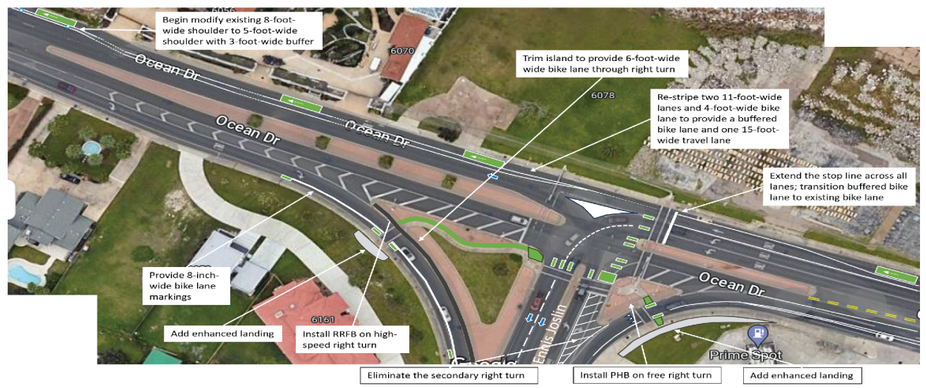


Transition at Ocean Drive

An important connection for this corridor is the intersection of Ocean Drive at Ennis Joslin Road. Though a bike lane is provided along the north side of Ocean Drive, accessibility is difficult. The intersection channelization and controls heavily favor motor vehicles to the detriment of bicyclists and pedestrians that use the intersection. Proposed improvements would provide a high quality of service to motorists while improving the mobility and protection for bicyclists and pedestrians, and is shown in Exhibit E-05. Notable enhancements include:

- Keeping the swooping free-flow right turns, but enhancing the crossings by adding Rectangular Rapid Flashing Beacons (RRFB) for user activation as needed
- Eliminating the second right turn to Ocean Drive, which is not needed for capacity and adds to driver confusion
- Channelizing northbound Ocean Drive to one lane through the intersection is practical given that only one lane feeds it currently and the slight lateral displacement will encourage slower driving through the intersection
    - Space is available to provide a buffered bike lane through the intersection

Exhibit E-05: *Re-channelization of Ocean Drive at Ennis Joslin Road*



Alternative 2

This alternative would create 8-foot-wide SUP on both sides of Ennis Joslin Road. This would reduce the width of the improved southbound bike lane and its buffer by 3 feet and modify the curbline to widen the existing sidewalk to 8 feet. This concept is depicted in Exhibit E-04. This treatment would involve pavement markings, buffer planters, reconstruction of curbs and drainage inlets, and reconstruction of the western sidewalk.

Design Specifics

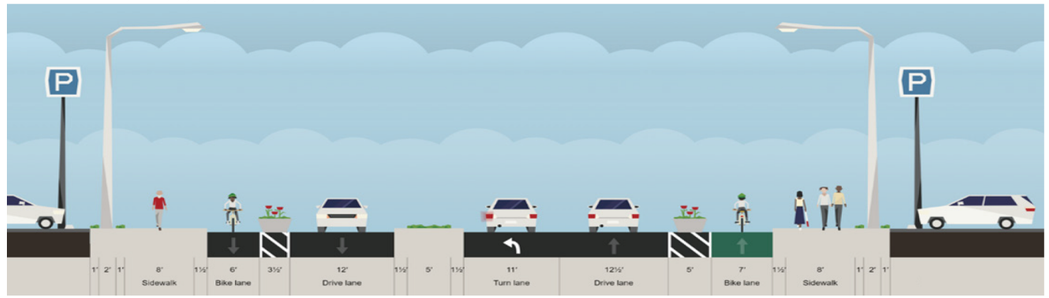
Right Turns and Bus Stop Treatments

At driveways, street intersections and bus stops, the protected bike lane treatment would be interrupted for a distance of 200 feet and only a dashed line indicating the continuation of the outer edges of the buffer to the bike lane would continue through the driveway, street intersection or bus stop. Along right turn lanes, buses would be allowed to enter the 12-foot-wide bikeway space and dwell in the bike lane area to serve the bus stop.

Transitions

At SPID and at Ocean Drive, the cross-section of Ennis Joslin Road changes to serve the intersection traffic movement. The proposed typical section treatments would need to be modified to provide an adequate traffic movement at these junctions.

Exhibit E-04: *Ennis Joslin Road, Proposed Treatment, Alternative 2*



Ocean Drive East of Ennis Joslin Road

Complementing the Ennis Joslin Road multimodal treatments, the bicyclist accommodation enhancements would be continued along Ocean Drive east of Ennis Joslin Road to the Naval Air Station entrance.

Exhibit E-06: *Enhanced Bike Lanes on Ocean Drive*



Exhibit E-07: *Enhanced Bike Lanes on Ocean Drive at Island Boulevard*



Exhibit E-08: *Enhanced Bike Lanes on Ocean Drive at Sand Dollar Boulevard*



Ennis Joslin Road at S. Alameda Street

This concept would remove the raised median on Ennis Joslin Road between Ocean Drive and S. Alameda Street and replace it with a narrower striped median. This would permit a wider bike lane on southbound Ennis Joslin Road. The flush median would also improve access to homes that are along the connector between Ennis Joslin Road and S. Alameda Street. The large radius turn lane from southbound Ennis Joslin Road to westbound S. Alameda Street would be reconfigured to a right turn lane as a traffic calming measure.

The rightmost lane of southbound Ennis Joslin Road would become a right turn only lane at the intersection with S. Alameda Street, beginning the road diet for the southbound flow along Ennis Joslin Road. South of S. Alameda Street, the outside lanes of Ennis Joslin (in both directions), would be converted to buffered bike lanes.

In the northbound direction, Ennis Joslin Road would transition from one to three lanes. Approaching Ocean Drive, this section would include one buffered bike lane, one right turn lane, and one left turn lane.

Exhibit E-09: *Ennis Joslin Road at S. Alameda Street*



Exhibit E-10: *Ennis Joslin Road between S. Alameda Street and Ocean Drive*



Transition of Lane Configurations North of SPID

At the first median opening north of SPID, the southbound buffered bike lane would transition to a 4- to 5-foot-wide bike lane to allow two 10-foot-wide through lanes to be provided on the approach to the westbound service road of SPID. At approximately 175 feet in advance of the service road, a new right turn lane would be added into the green space area in front of the CVS store, acquiring right-of-way as needed and potentially relocating some power poles.

Currently, the entire 600 feet of the right lane on the approach to the westbound service road is designated as a right turn only lane, leaving only one through lane for a short segment which causes traffic queues during peak periods. This proposed treatment would alleviate some or all of that peak period congestion while providing for the bike lane to continue up to the stop line at the service road and more effective passage through the SPID interchange.

Exhibit E-14: *Ennis Joslin Road North of SPID*



Ennis Joslin Road at South of S. Alameda Street

This typical section of one through lane with a buffered bike lane continues south of S. Alameda Street to a transitional segment just north of SPID. As the buffered bike lane approaches to driveways, side streets and bus stops, it would be dashed across the vehicular entrance to these locations to allow for vehicles to move out of the through lane to execute their turn or for buses to serve the bus stop.

Buses would be allowed to dwell in the curbside area with cyclists having to enter the travel lane to pass them. As an option, the buffered bike lane could transition into the sidewalk zone as an SUP to go behind the bus stop.

Exhibit E-11: *Ennis Joslin Road at Nile Drive*



Exhibit E-12: *Ennis Joslin Road at Islander Way*



Exhibit E-13: *Ennis Joslin Road at McArdle Road*

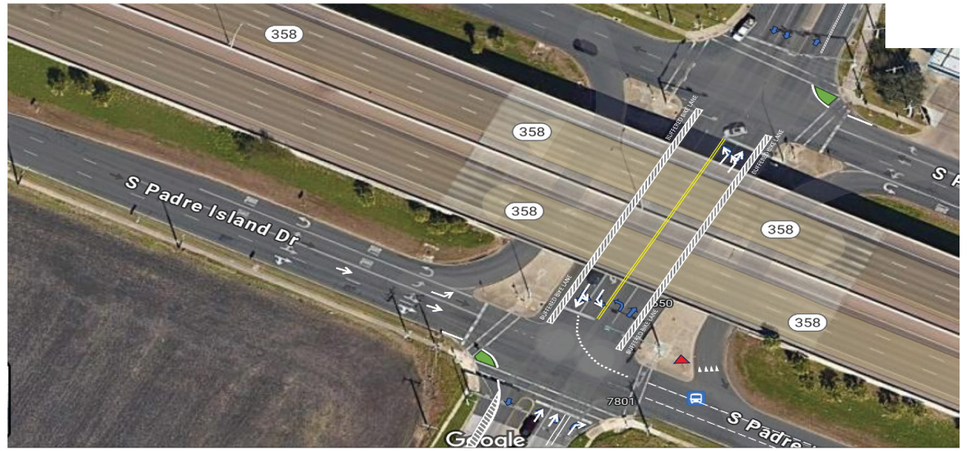


Transition of Lane Configurations at SPID Underpass

Currently, there are underutilized areas of pavement within the intersection underneath the SPID overpass. The pavement between the two U-turns is unencumbered by columns. This proposed treatment would re-channelize the available pavement by providing one 12-foot-wide dedicated left turn lane and one 12-foot-wide through and left turn lane in each direction between the two service roads.

The remaining pavement space would be utilized to provide buffered bike lanes through the intersection. The northbound approach at the eastbound service road would be re-channelized to provide two lanes going straight into the underpass, a dedicated right turn lane, and a bike lane between the right turn lane and the adjacent through lane.

Exhibit E-15: *Ennis Joslin Road at SPID*



Transition of Lane Configurations South of SPID

Between Williams Drive and 400 feet south of SPID, Ennis Joslin Road has pavement to accommodate a six-lane divided roadway, while the remaining 400-foot-long segment is only 60 feet wide. Southbound Ennis Joslin Road is currently channelized with pavement markings to provide only one lane southbound from SPID eastbound service road through the 400-foot-long segment and then channelized for two lanes with a 21-foot-wide outer lane to the intersection at Williams Drive. At Williams Drive, Ennis Joslin is a four-lane boulevard roadway with 10-foot-wide SUPs on both sides.

Northbound from Williams Drive, Ennis Joslin Road is striped for two travel lanes with a 21-foot-wide outer lane. The proposed treatment would rework the pavement markings north of Williams Drive to provide two 11-foot-wide travel lanes in each direction and utilize the extra pavement width to provide a buffered bike lane in each direction (5-foot-wide buffer and a 6-foot-wide bike lane). A traffic signal would be installed at the intersection of Ennis Joslin Road at Williams Drive and allow for a future extension of Williams Drive to tie into the signalized intersection.

Exhibit E-16: *Ennis Joslin Road South of SPID*

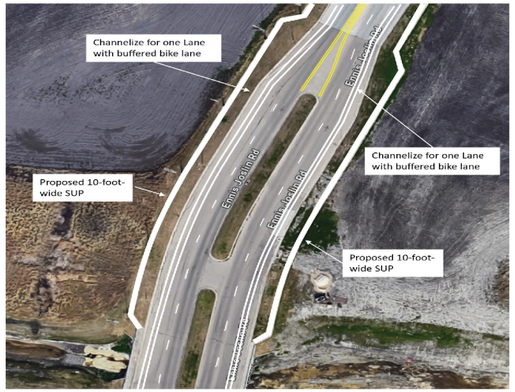
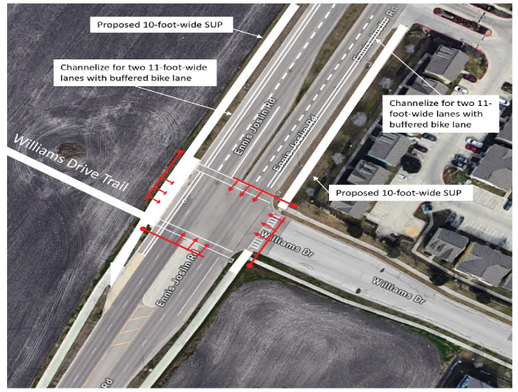


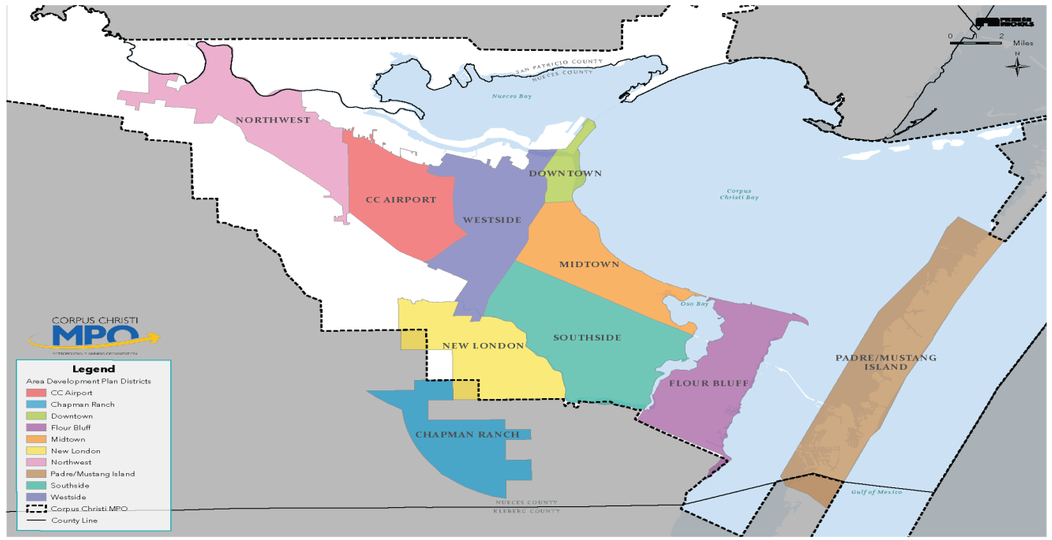
Exhibit E-17: *Ennis Joslin Road at Williams Drive*





LISTING OF AREA DEVELOPMENT PLAN (ADP) PROJECTS

Exhibit F-01: *ADP Districts*



Southside ADP

Exhibit F-02: *Southside ADP: Proposed Projects*

	Project ID	Project Type
SHORT-TERM	R1	Del Mar Southside Campus Bus Stop
	P1	Bill Witt Park Master Plan (underway)
	P2	Bill Witt Park Improvements (underway)
	P3	St. Andrews Neighborhood Park Improvements
	P6	Crossgate Trail
	P7	Schanen Hike & Bike Trail Phase III (underway)
	P8	Oso Creek Trail - Planning
	S3	Pedestrian Connectivity - Extended Sidewalk
	S4	Yorktown Boulevard Street Improvements
	S5	Rodd Field Road Expansion (underway)
	S6	Everhart Road Street Improvements (underway)
	S7	Slough Road Street Improvements (underway)
	S8	Holly Road Street Improvements (underway)
	S9	Lipes Boulevard Street Improvements (underway)
	S10	Wooldridge Drive Street Improvements
	S11	Rodd Field Road Extension
	S12	Holly Road Street Improvements
	S13	Safety Steel Drive Extension
	S14	Pavo Real Street Connection
	S15	Traffic Signal Coordination & Intersection Improvements
	U2	Yorktown Boulevard Water Line Extension
MID-TERM	P9	Schanen Hike and Bike Trail Phase IV
	P10	Drainage Channel Trail Development Program Phase I
	P11	Oso Creek Trail - Phase I
	S16	Wooldridge Drive Street Improvements

	Project ID	Project Type
MID-TERM	S17	Williams Drive Street Construction and Drainage Improvements
	S18	Lipes Boulevard Street Improvements
	S19	Rodd Field Road Extension
	S20	Oso Parkway
	S21	Traffic Signal Coordination & Intersection Improvements*
	S22	Ayers Street Sidewalk
	U6	Williams Drive Channel Improvements
LONG-TERM	P12	Oso Creek Kayak Launch
	P13	Oso Bay Railroad Trestle - Hike and Bike Trail
	P15	Drainage Channel Trail Development Program Phase II
	P16	Oso Creek Trail Phase II
	S23	Oso Parkway Bridges
	S24	Paul Jones Avenue Street Improvements
	S25	Rodd Field Bridge and Extension
	S26	Williams Drive Street Construction and Drainage Improvements (Lexington Rd. to Ennis Joslin Rd.)
	S27	Williams Drive Street Construction and Drainage Improvements (Ennis Joslin Rd. to Paul Jones Ave.)
	S28	Cimarron Boulevard Street Improvements
	S28	Civitan Drive Street Improvements
	U10	Schanen Ditch Improvements

Bayside ADP

Exhibit F-03: *Bayside Exhibit Boards ADP: Proposed Projects*

	Project ID	Project Type
SHORT-TERM	P2	Cole Park Improvements
	P3	Louisiana Parkway Trail Design & Construction
	P4	Cupier Park Improvements
	P5	Sam Houston Park Improvements
	P7	Casa Linda Park Improvements
	P10	Windsor Park Improvements
	P11	Swantner Park Master Plan
	P12	Gollihar/Cullen Ditch Multi-Use Trail
	P13	Koolside Park Sidewalk/Trail
	P14	Swantner Park Water Sports Launch
	P15	Brawner Parkway Trail Design & Construction
	P16	South Bay Park Improvements
	P17	Botsford Park Playground
	P18	Price Park Parking Lot Improvements
	P19	Oleander Park Parking Lot Improvements
	P20	Swantner Park Parking Lot and Lighting Improvements
	P21	Portable Restrooms at Hans & Pat Suter Wildlife Park
	S1	Brownlee Boulevard Reconstruction (Staples St to Morgan Ave)
	S2	South Staples Street Reconstruction (Kostoryz Rd to Baldwin Blvd)
	S3	Swantner Drive Reconstruction (Texan Trail to Indiana Ave)
	S4	Alameda Street Reconstruction (Louisiana Parkway to Texan Trail)
	S5	Alameda Street Design and Reconstruction Project (Texan Tr to Doddridge St)
	S6	McArdle Road Reconstruction (Carroll Ln to Kostoryz Rd)
	S7	Everhart Road Reconstruction (SPID to Alameda St)

	Project ID	Project Type
SHORT-TERM	S8	Ocean Drive and Airline Road Intersection Improvement Project
	S9	Bike/Pedestrian Safety Improvements (Ocean Dr/Airline Rd Intersection)
	S10	Bike/Pedestrian Improvements to Brookdale Park
	S11	Santa Fe St. Multi-Modal Design & Reconstruction (Ayers to Doddridge)
	S12	Tompkins/Fig Street Safety Improvements
	S13	Brawner Parkway Reconstruction (Ramsey to Alameda)
	S14	SPID Intersection Improvement Projects
	S15	Robert Dr. Sidewalks for Bus Stops (Alameda St to Ocean Dr)
	S16	Gollihar Rd. Reconstruction (Airline Rd to Belmeade Dr)
	S17	Neyland Library Traffic Safety Improvements
	S18	Alameda Street Reconstruction and Bike/ Pedestrian Improvements (Everhart to Airline, including Avalon)
	S19	Elizabeth Street Reconstruction (Santa Fe St to Staples St)
	S20	Alameda St. Reconstruction (Doddridge St to Everhart Rd)
	S21	Ocean Dr. Maintenance Program & Median Improvements
	S22	Ocean Dr. Bike & Pedestrian Infrastructure Plan
	N/A*	MPO Complete Streets, Active Transportation, & Micro-Mobility Plan
	U4	Ocean Drive Bridge Replacement
MID-TERM	P1	Price Park Sports Complex Improvements
	P2	Lindale Multigenerational Recreational Facility
	S1	Alameda Street Reconstruction (Staples St to Coleman Ave)
	S2	Ayers Street Intersection and Sidewalk Improvements (Port to Gollihar)
	S3	Kosar Street Reconstruction (Staples St to Naples St)
	S4	Norton Street Reconstruction (Kostoryz Rd to Ramsey St)

	Project ID	Project Type
MID-TERM	S5	Staples St./McArdle Intersection & Sidewalk Improvements (Airline Rd to Holmes)
	S6	Gollihar Rd. Reconstruction & 4 to 3 Lane Conversion Evaluation (Airline Rd to Staples St)
	S7	Carmel Parkway North & South (Staples St to Ft Worth St)
	S8	Bus Rapid Transit Traffic Signal Synchronization and Prioritization (Staples/McArdle/Ennis Joslin/Ocean)
	U4	Carmel Drainage Channel Improvements & Trail (Design Only)
LONG-TERM	P1	Swantner Park Improvements Master Plan
	P2	Trail Around Oso WW Treatment Plant/TAMUCC Momentum
	P3	TAMUCC University Beach Improvement Project
	P4	TAMU-CC Intercampus Boardwalk Project
	S1	Gollihar Street 4 to 3 Lane Evaluation (Greenwood Dr to Staples St)
	S2	Staples Bike Infrastructure (Brawner to Gollihar)
	S3	Carmel Parkway Trail Intersection Improvements
	S4	Alameda St. Reconstruction (Airline to Parade)
	S5	Bike Loop Improvement (Ennis Joslin > Alameda >Airline > Ocean)
	S6	Alameda St. Reconstruction (Parade to Ennis Joslin)
	S7	Ennis Joslin Road to Ocean Drive Intersection Improvements
	S8	Ocean Drive Bike Improvements (Ennis Joslin to TAMUCC)

London ADP

Exhibit F-04: *London ADP: Proposed Projects*

	Project ID	Project Type
SHORT-TERM	S1	FM 2444 - Construct 5 Lane Curb and
	S2	South Oso Parkway Street Improvements
	S3	County Road 33 Street Improvements
MID-TERM	P2	Drainage Channel Trail Development Phase I**
	P3	Oso Creek Trail Phase I**
	P4	Oso Creek Trail Phase II**
	S4	Crosstown Extension to FM 2444 (TxDOT)
LONG-TERM	P5	Oso Creek Channel Trail Development III
	P6	Drainage Channel Trail Development Phase II
	S5	FM 43 Street Improvements (TxDOT)

Flour Bluff ADP

Exhibit F-05: *Flour Bluff ADP: Proposed Projects*

	Project ID	Project Type
SHORT-TERM	P4	Wranosky Park Skatepark Improvements
	P5	Oso Bay Trestle Bridge Hike & Bike Design
	P6	Oso Bay Hike & Bike Trail Phase 1
	P8	Laguna Shores Living Shoreline
	S1	Laguna Shores Phase 1 (SPID to Graham Rd.)
	S2	Laguna Shores Phase 2 (Hustlin'Hornet Dr. to Caribbean Dr.)
	S3	Laguna Shores Phase 3 (Mediterranean Dr. to Wyndale St.)
	S4	Waldron Road Improvements (SPID to Purdue Rd.)
	S5	Waldron Road Improvements (Purdue Rd. to Glenoak Dr.)
	S6	Glenoak Drive Reconstruction + Bike Mobility (Flour Bluff Dr. to Waldron Rd.)
	S7	Flour Bluff Dr. (Don Patricio Rd. to Glenoak Dr.)
	S8	Caribbean Dr. Reconstruction. (Waldron Rd. to Laguna Shores Dr.)
	S9	Yorktown Mud Bridge Evaluation
	S10	Hustlin Hornet Rehabilitation
	S11	Saxony Dr. Rehabilitation
	S12	Micah St. Rehabilitation
	S13	Don Patricio Rehabilitation
	S14	Seafoam Dr.
	S15	Laguna Estates Subdivision Street Rehabilitation
	S16	Years 3-5 IMP
MID-TERM	P11	Laguna Madre / Dimmit Pier Trails Design
	P12	Oso Bay Trestle Bridge Construction
	S17	Paper Streets (Don Patricio Rd. to Division Rd.)
	S18	Dove Lane Paper Street

	Project ID	Project Type
MID-TERM	S19	Division Rd. Improvements
	S20	Mediterranean Dr. Improvements
	S21	Yorktown Blvd Mud Bridge
	S22	Yorktown Blvd. (Mud Bridge to Flour Bluff Dr.)
	S23	Yorktown Blvd. (Flour Bluff Dr. to Waldron Rd.)
	S24	Yorktown Blvd. (Waldron Rd. to Laguna Shores Dr.)
	S25	Waldron Rd. Improvements (Caribbean Dr. to Yorktown Blvd.)
	S26	Flour Bluff Dr. Improvements + Bike Mobility (Glenoak Dr. to YorktownBlvd.)
	S27	Graham Rd. Improvements + Bike Mobility
	S28	Meeks Road Reconstruction (IMP-Eligible project)
LONG-TERM	P13	Dimmit Park Trail System
	P14	Laguna Madre Living Shoreline (GLO Project)
	P15	Laguna Shores Hike & Bike Trail
	P16	Drainage Channel Hike & Bike Trail (Glenoak Dr. to Laguna Madre)
	P17	Drainage Channel Hike & Bike Trail (Parker Park to Laguna Madre)
	S29	Debra Ln. / Jamaica St.- Street, Stormwater, & Pedestrian Improvements + Extension
	S30	Division Rd. Improvements + Bike Mobility

Padre/Mustang Island ADP

Exhibit F-06: *Padre Mustang Island ADP: Proposed Projects*

	Project ID	Project Type
SHORT-TERM	P1	North Padre Island Beach Facility
	P2	Douden Park Improvements
	P3	Aquarius Park Improvements
	S1	Park Road 22 Bridge
	S2	JFK Causeway Access Road Improvements (Bond 2018)
	S3	Jackfish Ave. Improvements
	S4	PR22 Median Improvements (Compass St.)
	S5	PR22 South Access Road Improvements
	S6	Encantada Traffic Safety Improvement Project
	S7	Beach Access Road 2A Design (Bond 2020)
	S8	Beach Access Road 2A Construction
	S9	Island Mobility Plan for Pedestrian, Bicycle, Golf Cart, and Other Alternative Transportation
	S10	Pedestrian and Bike Safety Improvements (North Padre Sea Wall Area)
	S11	Sea Pines Dr. Rehabilitation
	S12	Cruiser St. Rehabilitation
	S13	King Phillip Ct. Rehabilitation
	S14	Aquarius St. Rehabilitation (Commodores Dr. to Das Marinas Dr.)
	S15	Aquarius St. Rehabilitation (Topsail St. to Whitecap Blvd.)
	S16	Caravel Dr. Rehabilitation
	S17	Yardarm Ct. Rehabilitation
	S18	Bowspirit Ct. Rehabilitation
	S19	Mutiny Ct. Rehabilitation
	S20	Beaufort Ct. Rehabilitation
	S21	Blackbeard Dr. Rehabilitation
	S22	Man O War Ct. Rehabilitation

	Project ID	Project Type
SHORT-TERM	S23	Barataria Dr. Rehabilitation
	S25	PR22/SH361 Intersection Improvements Study and Implementation (TxDOT)
	S26	JFK Causeway Evaluation
MID-TERM	P12	Ulberg Park Improvements
	P13	Commodore Park Improvements
	S27	PR22 Pedestrian and Access Management Improvements (TxDOT)
	S28	Packery Channel Loop Road
	S29	Mobility Plan Implementation Phase I
LONG-TERM	P17	Bike Path from Balli Park to Padre Island National Seashore
	S31	Mobility Plan Implementation Phase II

Westside ADP

Exhibit F-07: *Westside ADP: Proposed Projects*

	Project ID	Project Type
SHORT-TERM	T1	FY24 Westside Station near Del Mar College West Campus
	P1	Academy Park (District 1 Parks)
	P2	Temple Park (District 2 Parks)
	P3	Salinas Park (District 3 Parks)
	P4	Salinas Park Neighborhood Connections
	P12	Westhaven Park Improvements
	P13	Dr. Hector P. García Hike and Bike Trail Along Ditch
	P19	Universal League Field Improvements
	P20	Westside Pony Field Improvements
	P21	Sparkling City Field Improvements
	S1	Leopard Street (Crosstown Expwy. to Palm Dr.)
	S2	Leopard Street (Palm Dr. to Nueces Bay Blvd.)
	S3	Flato Road (Bates Road to Bear Ln.)
	S4	Holly Road (Crosstown Expwy. to Greenwood Dr.)
	S5	Gollihar Road (Crosstown Expwy. to Greenwood Dr.)
	S6	Castenon Street (Trojan Dr. to Delgado St.)
	S7	Cheyenne Street (Baldwin Blvd. to Tarlton St.)
	S8	Tarlton Street (Port Ave. to Cheyenne St.)
	S9	Martin Street (Holly Rd. to Dorado St.)
	S10	Lantana Street (IH 37 to Up River Rd.)
	S11	Nueces Bay Boulevard (Leopard St. to IH 37)
	S12	Airport Road (Morgan Ave. to Horne Rd.)
	S50	Baldwin/Morgan Intersection Evaluation
	S51	Mary Street Crime Prevention Evaluation
	S52	Street Lighting Assessment*
	S59	Greenwood Drive Preliminary Design (Port Ave. to Horne Rd.)

	Project ID	Project Type
SHORT-TERM	S60	Bush Street (S. Padre Island Dr. to Holly Rd.)
	S67	Lipan Street Sidewalk and Traffic Improvements
	S13	Delgado Street (Castenon St. to Salazar St.)
	S14	Dryer Circle (Riverton Dr. to Langton Ave.)
	S15	Golden Gate Circle (Old Brownsville Rd. To Dead End)
	S16	Green Lane Drive (Green Tree Dr. to Dead End)
	S17	Green Leaf Drive (Green Tree Dr. to Dead End)
	S18	Green Park Drive (Green Point Dr. to Green Gate Dr.)
	S19	17th Street (Crosstown Expwy. to Marguerite St.)
	S20	San Saba Drive (Concho St. to Comal St.)
	S21	Shawnee Street (Baldwin Blvd. to Lou St.)
	S22	Bartlett Drive (Krejci Dr. to Saxet St.)
	S23	MacArthur Street (Nimitz St. to Presa St.)
	S24	Barrera Drive (Bloomington St. to Villareal Dr.)
	S25	El Monte Street (Pamona St. to Victor L Ortego St.)
	S26	Harvard Street (Prescott St. to Vitemb St.)
	S27	Green Acre Drive (Green Tree Dr. to Dead End)
	S28	Balboa St. (Pine St. to Morgan Ave.)
	S29	Baldwin Blvd. (Port Ave. to Frontage Rd.)
	S30	Belton St. (Reynosa St. to Greenwood Dr.)
	S31	Dixon Dr. (Petty Dr. to Quaile Dr.)
	S32	Fairview Dr. (Up River Rd. to Kenwood Dr.)
	S33	Garden Rd. (Vestal St. to Juarez St.

	Project ID	Project Type
SHORT-TERM	S34	Garden St. (Prescott St. to Juarez St.)
	S35	Soledad St. (Greenwood Dr. to Carver Dr.)
	S36	Green Pass Dr. (Green Park Dr. to Dead End)
	S37	Green Point Dr. (Bear Ln. to Dead End)
	S38	Hampshire Rd. (Padre Island Dr. to Benys Rd.)
	S39	Juarez St. (Castenon St. to Salazar St.)
	S40	Langton Ave. (Darcey Dr. to Dryer Cir.)
	S41	Mansheim Dr. (Dead End to Orchid Ln.)
	S42	S Port Ave. (Baldwin Blvd. to Morgan Ave.)
	S43	Prescott St. (Gollihar Rd. to Trojan St.
	S44	Riverton Dr. (Dryer Cir. To Archdale Dr.)
	S45	S Country Club Pl. (Up River Rd. to I-37)
	S46	Salazar St. (Juarez St. to Prescott St.)
	S47	Trojan Dr. (Crosstown Expwy. to Castenon St.)
	S48	Vestal St. (Mansheim Blvd. to Gollihar Rd.)
	S49	Vernon Dr. (Dona Dr. N to Dona Dr. S)
MID-TERM	T2	Add Bus Service to Salinas Park*
	S54	Leopard Street N & S (Navigation Blvd. to SPID)
	S55	Navigation Boulevard (Old Brownsville to Agnes St.)
	S56	Navigation Boulevard (Agnes St. to Leopard St.)
	S57	Morgan Avenue (Virginia Ave. to Airport Rd.)
	S58	Morgan Ave (Baldwin Blvd. to Virginia Ave.)
	S61	Morgan Ave./Baldwin Ave. Intersection Reconstruction
	S62	Greenwood Dr. Reconstruction (Port Ave. to Horne Rd.)

	Project ID	Project Type
LONG-TERM	P16	Purchase Property at Southeast Corner of Horne Rd. and Columbia St. to Improve Park Access
	P17	Upgrade Columbia Ditch in Park Areas to Grass-lined & Reconstruct Pedestrian Bridges
	S63	West Point Road (Greenwood to S. Padre Island Dr.)
	S64	West Point Road (S. Padre Island Dr. to Old Brownsville Rd.)
	S65	Holly Road Extension (Greenwood Dr. to Old Brownsville Rd.)
	S66	Feasibility Study for Old Brownsville Rd. (SPID to Airport Rd.)

Tax Increment Reinvestment Zone #3 Traffic and Planning Analysis

Exhibit F-08: *List of TIRZ #3 Proposed Projects*

	Project ID	Project Type
SHORTTERM	S1	Chaparral Street
	S2	Brewster Street (Phase 1)
	S3	Shoreline Blvd
	S4	Chaparral Street
	S5	Artesian Park
	S6	Upper and LowerBroadway Street
	S7	Doss Street/Mestina Street
	S8	Lipan Street
	S9	Comanche Street
	S10	Starr Street
	S11	Peoples Street
	S12	Schatzell Street
	S13	Lawrence Street
	S14	Lawrence Street
	S15	William Street
	S16	John Sartain Street
	S17	Coopers Alley
	S18	Kinney/ChaparralIntersection
	S19	Agnes Street
	S20	Agnes Street/LaredoStreet Corridor
	S25	Micro Transit
	S26	Four-Way Stop Evaluation
	S27	Wayfinding
	S28	Downtown Lighting
	S30	Downtown Streetscape Improvements
	S31	Marina Arts Pavement Directional Markings

	Project ID	Project Type
MID-TERM	M1	Harbor Drive
	M2	Port Avenue
	M3	Brewster Street
	M4	Brewster Street (Phase 2)
	M6	North Broadway Street
	M7	North Broadway Street
	M8	Staples Street Extension
	M9	Power Street
	M10	Belden Street
	M11	Tancahua Street
	M12	IH-37
	M13	Twigg Street Bridge
	M14	Twigg Street
	M15	Upper and Lower Broadway St. North Connection
	M16	Water Street
	M17	Mesquite Street
	M18	Coopers Alley
	M19	Agnes St. and Laredo St.
	M20	Agnes Street
	M22	Water Taxi
	M24	Downtown Lighting
LONG-TERM	L1	Hirsch Street Extension
	L2	Starr Street
	L3	Peoples Street
	L4	Schatzell Street
	L5	Lawrence Street
	L6	William Street
	L7	John Sartain Street

Downtown ADP

Exhibit F-09: *Downtown ADP: Proposed Projects*

Project ID	Project Type
G4	Park improvements—H. J. Williams Park
G5	Shading, streetscape, food truck plaza—Shoreline Boulevard at Arts Center and/or Lawrence
G6	Park improvements—South Bluff Park.
G7a	Bike/ped improvements—Antelope from Staples to Broadway; Peoples from Broadway to Shoreline (3,920 lf)
G7b	Mesquite St bike boulevard (Cooper's Alley to I-37—3,330 lf)
G8a	Waterfront bike/ped improvements—Art Museum to Art Center (6,930 lf)
G8b	Bike/ped improvements—waterfront between Art Museum and ferry dock/Ortiz Center (1,500 lf)
G8c	Bike boulevard—Ortiz Center to I-37 on Mesquite (3,700 lf)
G9a	Cycle track & transitional bike boulevard—Hillcrest Park to Mesquite via Winnebago, Sam Rankin, N Sam Rankin, Resaca (11,000 lf)
G9b	Bike boulevard—Port Ave from Mesquite, W Broadway, Lexington, Minton, Kennedy, Koepke, Van Loan, Noakes to Nueces Bay Blvd (7,730 lf)
G10a	Cycle track—Winnebago, Staples, Comanche, Alameda
G10b	Cycle track, bike boulevard, Blucher Park path—Comanche from Culbertson, Blucher Park, Cooper's Alley
G11a	South Chaparral and Coleman bike boulevards (4,920 lf); Park Ave cycle track (930 lf)
G11b	Buford and 3rd St Cycle tracks (3,850 lf); 6th St Bike boulevard to Morgan (1,000 lf)
G12	Recreation Trail—Aquarium to Dolphin Park along existing Beachwalk to New Harbor Bridge; along Timon and Surf-side median (8,000 lf)
G13	Birding and wetland park

Project ID	Project Type
P1	Parking supply/demand, placement and pricing study
S1	Brownlee Boulevard Reconstruction (Staples St to Morgan Ave)
S1	Streetscape improvements
S2	Streetscape improvements
S3	Streetscape improvements
S4	Pedestrian improvements—Leopard Street at Broadway: stop signs,crosswalks
S5	Pedestrian improvements—Accessible ramps from Upper to Lower Broadway
S6	Light Up CC—Peoples Street
S7	Uptown Neighborhood Initiative lighting—Leopard Street
S8	Phase 1: Brewster from Tancahua to Chaparral; sidewalks shared ped/vehicle street
S9	Phase 2: Brewster/Mesquite/Chapar-ral/Hirsch
S10	Phase 3: Chaparral to Whataburger Field and Brewster
S11	Street/ped improvements—Shoreline Boulevard
S12	Street/ped improvements—Coopers Alley–Shoreline Blvd to Broadway
S13	Street/ped improvements—Lawrence Street–Shoreline Blvd to Broadway
S14	Street/ped improvements—Hillcrest-Kennedy Ave., Peabody Ave., crest-Kennedy Ave., Peabody Ave., Van Loan Ave., Hulbirt St., Minton St., Neuces St., John St.
R3	Street extension—Shoreline Boulevard extension
R4a	Staples Street pedestrian and bike improvements/safety, traffic calming—I-37 to West Broadway (2,000 lf)
R4b	Roadway and sidewalk improvements—miscellaneous streets (3,000 lf)
R5a	Study and confirm street plan replacing 37/Harbor Bridge/ Broadway inter-change
R5b	I-37 Traffic Circle at Broadway

Project ID	Project Type
R6	Street extensions—Power, Palo Alto, Fitzgerald, Resace & Hughes from Tancahua to Mesquite replacing Harbor Bridge approach (5 @ 720 lf = 3,600 lf); Rebuild Broadway (3,600 lf)
R7	Street extension—Staples to Fitzgerald/Tancahua connector (1,500 lf)
R8	Water Street pedestrian and bike improvements/safety, traffic calming—Kinney to Furman (2,500 lf)
R9	Park Avenue pedestrian and bike improvements/safety, traffic calming—Tancahua to Shoreline Blvd (1,600 lf)
R10a	Timon overlay—Coastal Ave. to Sandbar Ave. (6,000 lf)
R10b	Surfside overlay—Coastal Ave. to Reef Ave. (5,400 lf)
R11	Beach Avenue from Bridge to Beach access (1,300 lf)
T3	Bus rapid transit—Staples Street

Northwest Boulevard (FM 624) Corridor Plan

Exhibit F-10: *List of Northwest Boulevard (FM 624) Corridor Plan Proposed Projects*

Project Strategy	Project Action
Reduce Congestion at I-69	Study alternatives to existing design, identify preferred design
	Allocate/identify funding for design and construction
	Complete construction
Improve intersections for safety and mobility	Incorporate traffic-calming, street lighting, and pedestrian facilities into designs for prominent intersections
Build active infrastructure along roadways	Construct sidepaths as recommended along Northwest Boulevard
	Install buffered bike lanes along recommended roadways
	Install shared-lane markings and signage along recommended roadways
Coordinate with ISD to manage traffic demand	Review signal timing at Wildcat Drive and River East Drive to prioritize predominant traffic movements during peak morning and afternoon periods - particularly during the 4pm rush hour.
	Produce and execute a traffic management plan designed for special events
	Organize a walking school bus program and other activities to encourage walking and biking to school
Reduce lane widths	Design and build enhancements to existing and future conditions of Northwest Boulevard to include narrower lane widths
Enhance planting areas	Design and build enhancements to existing and future conditions of Northwest Boulevard to include street trees
Expand and plant medians	Design and build enhancements to existing and future conditions of Northwest Boulevard to include minimally landscaped, expanded medians
Design and install signage and banners	Allocate/identify funding for design and construction
Install public art	Allocate/identify funding for design and construction

Exhibit F-11: *(Draft) Proposed Padre/Mustang Mobility Plan Facilities*

Street Name	Limits	Owner	Pedestrian	Bicycle	Golf Cart	Other	Notes
Causeway Bridge	Padre Island Access Rd. East or West to Aquarius St.	TxDOT	TBD if separated/ delineated	SUP side path	SUP side path	Min. 20 ft. Side path bridge for ped, bike, golf cart access only.	Alignment north or south to either West or East access Rd to be determined by engineering feasibility study.
PR 22	Aquarius St. To Sea Pines Dr.	TxDOT	8' sidewalks both sides.	14' 15 mph bi-directional SUP for Bike and Golf Carts on both sides of street.	14' 15 mph bi-directional SUP for Bike and Golf Carts on both sides of street.	Proposed 20' landscape buffers + stormwater on both sides of street separating automobile lanes from SUP and sidewalks	200' ROW. Separate design under evaluation for new PR 22 water exchange bridge.
Hwy 361	PR 22 to Lake Padre entrance	TxDOT	8' sidewalk South side (eastbound), 6' sidewalk north side (westbound)	14' 15 mph bi-directional SUP for bike and golf cart on south side (eastbound) + north side (westbound) connection to future Sand Dollar Ave.	14' 15 mph bi-directional SUP for bike and golf cart on south side (eastbound)+ north side (westbound) connection to future Sand Dollar Ave.	Proposed 6' landscaped buffers on both sides of street.	120' ROW. Signalized crossings at PR 22 and Lake Padre entrance with separate crosswalk facilities for pedestrians and SUP users.
Hwy 361	Lake Padre entrance to Zahn Rd.	TxDOT	15' separated side path SUP on southside (eastbound)	15' Separated side path SUP on southside (eastbound)	15' Separated side path SUP on southside (eastbound)		Exploring possibility of 15' shoulder with concrete barrier separating automobile traffic on bridge.
Zahn Rd	Hwy 361 to dune line (lively Beach entrance)	City	10' hike & bike side path	10' hike & bike side path	Golf cart sharrow		Past dune line, investigating option of candlestick-separated sidewalk.
Aquarius Cove	PR22 to Marina Pk Blvd	City	8' sidewalk on both sides of street	Bike sharrow	golf cart sharrow	6' landscape buffers + 2' curb and gutter on both sides of streets separating sidewalk from travel lanes.	Existing 5' sidewalks on both sides of street

Street Name	Limits	Owner	Pedestrian	Bicycle	Golf Cart	Other	Notes
Marina Pk Blvd	PR 22 to Marina Aquarius Cove	City	8' sidewalk on both sides of street	Bike sharrow	golf cart sharrow	6' landscape buffers + 2' curb and gutter on both sides of streets separating sidewalk from travel lanes.	Existing 5' sidewalks on both sides of street
Packery Channel Park Boardwalk	Expansion of boardwalk trail - loop	County	Boardwalk	n/a	n/a	n/a	Birding / nature loop with ADA access
Sand Dollar Ave	Packery Channel Park Rd. To Hwy 361	City	6' Sidewalks on both sides of street	Bike sharrow	golf cart sharrow	6' landscape buffers + 2' curb and gutter on both sides of streets separating sidewalk from travel lanes.	Sand Dollar South of Verdemar is TIRZ #2 paper Street project.
Verdemar Dr.	PR 22 to Sand Dollar Ave.	City	6' Sidewalks on both sides of street	Bike sharrow	golf cart sharrow	6' landscape buffers + 2' curb and gutter on both sides of streets separating sidewalk from travel lanes.	
Jackfish Ave.	PR 22 to Ambrosia St.	City	8' sidewalk on both sides of street	Bike sharrow	golf cart sharrow	At full buildout add 2' curb and gutter and 6' landscape buffers separating sidewalks from vehicles.	Current 5' sidewalk on north side of street.
Ambrosia St.	Jackfish Ave. to Aquarius St.	City	8' sidewalk on both sides of street	Bike sharrow	golf cart sharrow	At full buildout add 2' curb and gutter and 6' landscape buffers separating sidewalks from vehicles.	Proposal for interim to delineate 18' yield street and one 6' sidewalk at pavement grade.
Aquarius St.	PR 22 to Ambrosia St.	City	8' sidewalk on both sides of street	Bike sharrow	golf cart sharrow	At full buildout add 2' curb and gutter and 6' landscape buffers separating sidewalks from vehicles.	Proposal for interim to delineate sidewalks at pavement grade.

Street Name	Limits	Owner	Pedestrian	Bicycle	Golf Cart	Other	Notes
Commodores Dr.	PR 22 to west terminus	City	8' sidewalk on both sides of street	9' Buffered bike and golf cart lane on both sides of street	9' Buffered bike and golf cart lane on both sides of street	Ultimate final buildout includes 2' curb and gutter and 6' landscape buffer on both sides separating sidewalks. And keeping existing medians.	New bridge requires additional review. Interim design includes 5' sidewalks on both sides
Aquarius St.	Commodores to Whitecap	City	8' sidewalks both sides of street	Bike sharrow	Golf cart sharrow	Ultimate final buildout includes 2' curb and gutter and 6' landscape buffers on both sides separating sidewalks.	Interim design includes painting 8' sidewalks at pavement grade.
Dasmarinas Dr.	Aquarius to Whitecap	City	8' sidewalks both sides of street	Bike sharrow	Golf Cart Sharrow	Ultimate final buildout includes 2' curb and gutter and 6' landscape buffers on both sides separating sidewalks.	Interim design includes painting 9' sidewalks at pavement grade.
Whitecap Blvd. (west)	PR 22 to west terminus	City	8' sidewalks both sides	10' buffered bike & golf cart lane	10' buffered bike & golf cart lane	Keep existing medians. 2' curb and gutter and 6' landscape buffers on both sides separating sidewalks.	
Palmira Ave.	Cruiser St. To Sea Pines	City	6' sidewalks both sides of street	Bike sharrow	Golf cart sharrow	2' curb and gutter and 6' landscape buffers on both sides separating sidepwalks.	Prioritize segment near school.

TXDOT ADA SELF-EVALUATION AND TRANSITION PLAN

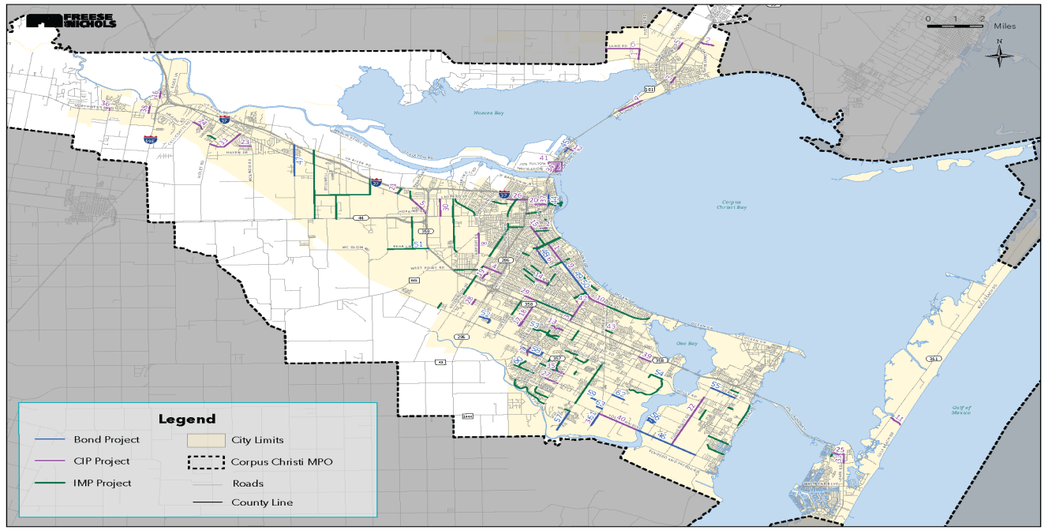
Exhibit F-12: *List of TxDOT ADA Self-Evaluation and Transition Plan Projects*

Project ID	Street	Project Type	County	Year	Cost
091635243	S Port Ave	Traffic Signal Improvements	Nueces	2022	$2,284.00
091635247	Texan Trl	Traffic Signal Improvements	Nueces	2022	$1,942.00
008706031	BS 359B	Construct Pedestrian Infrastructure	San Patricio	2023	$750,000.00
091600250	Various	Construct Pedestrian Infrastructure	Nueces	2023	$2,000,000.00
050701023	SH 234	Resurface Roadway	San Patricio	2023	$275,000.00
091628081	Various	Construct Pedestrian Infrastructure	San Patricio	2023	$236,600.00
091635238	Everhart Rd	Traffic Signal Improvements	Nueces	2023	$27,000.00
091635241	Golihar Rd	Traffic Signal Improvements	Nueces	2023	$20,000.00
091635242	McCardle	Traffic Signal Improvements	Nueces	2023	$35,000.00
091635246	Staples St	Traffic Signal Improvements	Nueces	2023	$20,000.00
091635239	Golihar Rd	Traffic Signal Improvements	Nueces	2023	$15,000.00
091635240	Golihar Rd	Traffic Signal Improvements	Nueces	2023	$15,000.00
091635244	Alameda St	Traffic Signal Improvements	Nueces	2023	$22,000.00
091635245	Alameda St	Traffic Signal Improvements	Nueces	2023	$22,000.00
091635249	Yorktown	Traffic Signal Improvements	Nueces	2023	$15,000.00
061701177	SH 358	Widen Freeway	Nueces	2024	$2,500,000.00
120901030	FM 893	Widen Road - Add Lanes And Shoulders	San Patricio	2024	$1,037,940.00
050701022	SH 234	Rehabilitate Existing Roadway	San Patricio	2024	$500,000.00
032601056	SH 286	Convert Non-Freeway	Nueces	2024	$639,000.00
037302096	SH 44	Resurface Roadway	Nueces	2024	$750,000.00
091635232	Airline Rd	Traffic Signal Improvements	Nueces	2024	$35,000.00
010103120	US 181	Traffic Signal Improvements	San Patricio	2024	$80,000.00
091635231	Ocean Dr	Bridge Replacement	Nueces	2025	$250,000.00
098902057	FM 624	Construct New Roadway Lanes	Nueces	2025	$1,975,000.00
091635252	Yorktown	Widen Road - Add Lanes And Shoulders	Nueces	2025	$2,000,000.00

Source: TxDOT 2022 ADA Self-Evaluation and Transition Plan Supplement

CIP, IMP AND BOND PROJECTS

Exhibit F-13: *City of Corpus Christi CIP, Bond, and IMP Projects*



Corpus Christi Capital Improvement Plan (CIP) Projects

Exhibit F-14: *List of Corpus Christi Capital Improvement Projects*

Map ID	CIP Project Name	Improvement Type
1	Alameda St. (Louisiana St. to Texan Trail	Bike mobility and ADA
2	Elizabeth St. (Santa Fe to S. Staples	Bike mobility and ADA
3	Everhart Road (Alameda to SPID)	Bike mobility and ADA
4	Gollihar Rd (Crosstown Expwy to Greenwood)	Bike mobility and ADA
5	N. Lexington Blvd (Leopard Street to Hopkins Rd)	Bike mobility and ADA
6	S. Staples St (Kostoryz Rd to Baldwin Blvd)	Bike mobility and ADA
7	Aaron Dr. (Saratoga Blvd to Summer Winds)	ADA only
8	Airport Road (Morgan to Horne Road)	ADA only
9	Alameda St. (Texan to Doddridge) Design Only	ADA only
10	Alameda St. (Airline to Everhart)	ADA only
11	Beach Access Rd No 3 - (SH361 to Beach)	ADA only
12	Beach Ave (DE- GuLF breeze to Causeway Blvd)	ADA only
13	Bonner Dr (Everhart to Flynn)	ADA only
14	Brawner Pkwy (Kostoryz Rd to Carroll Ln)	ADA only
15	Brownlee (Staples to Morgan)	ADA only
16	Calallen Dr (Red Bird Ln to Burning Tree Ln)	ADA only
17	Carroll Lane (Holly to Dead End)	ADA only
18	Carroll Ln (SH 358 to Holly)	ADA only
19	Castenon St (Trojan Dr to Delgado St)	ADA only
20	Comanche (Carancahua to Alameda)	ADA only
21	Corn Product (Interstate 37 to Hopkins Rd)	ADA only
22	Flour Bluff Drive (Yorktown to Don Patricio)	ADA only
23	Frontier (Mckinzie to Rockwood)	ADA only
24	Hearn Road (Dead End to Callicoatte)	ADA only
25	Jackfish (Aquarius to Park Rd. 22)	ADA only
26	Leopard St (Crosstown Expressway to Palm Dr)	ADA only
27	Lipes Blvd (Sunwood Dr. to Staples St)	ADA only

Map ID	CIP Project Name	Improvement Type
28	Martin Street (Holly to Dorado)	ADA only
29	McArdle Road (Carroll Ln to Kostoryz Rd)	ADA only
30	McCampbell (Agnes - Leopard)	ADA only
31	Park Road 22 South Access Rd (Commodore to Jackfish)	ADA only
32	Rodd Field (Yorktown to Adler)	ADA only
33	Starlite Lane (Violet to Leopard)	ADA only
34	Surfside Blvd (Breakwater to Elm)	ADA only
35	Timbergate Drive (Snowgoose to Staples)	ADA only
36	Trinity River (F624 to Wood River)	ADA only
37	Upper/Middle/Lower Broadway (Design Only)	ADA only
38	Wildcat (FM624 to Teague)	ADA only
39	Williams Drive (Rodd Field to Lexington Rd)	ADA only
40	Yorktown Blvd (Rodd Field to Oso Bridge)	ADA only
41	North Beach Area Primary Access	Bike mobility and ADA
42	Traffic Signal & Infrastructure Installations	ADA only
43	TxDOT Participation /Traffic Mgmt	ADA only

Corpus Christi Infrastructure Management Plan (IMP) Projects

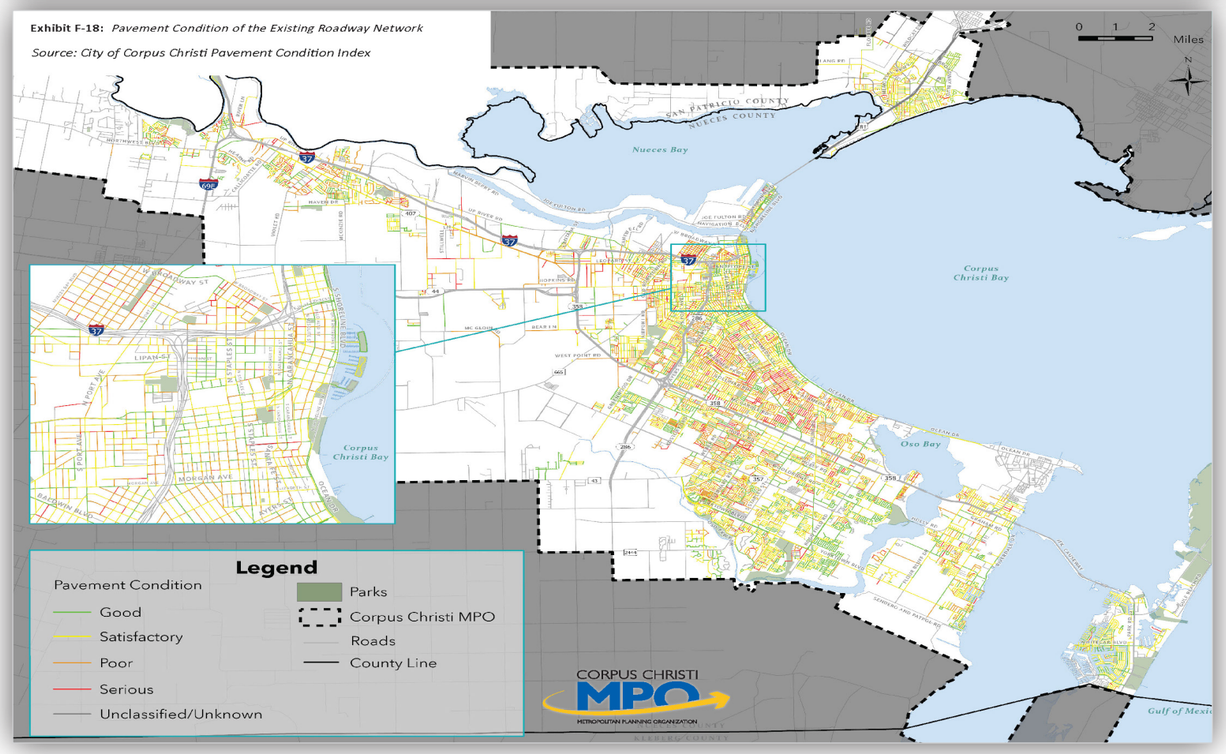
Exhibit F-15: *List of Corpus Christi Infrastructure Management Plan Projects*

Year	District	Street	From	To	Work Plan	Classification
2022	4	Aquarius	Commodores	Das Marinas	Preservation	Collector
2022	4	Aquarius	Topsail	Whitecap	Rehabilitation	Collector
2022	DT	Broadway Middle	Schatzell	Lawrence	Rehabilitation	Collector
2022	1	Elizabeth	Ocean Dr	Santa Fe	Rehabilitation	Collector
2022	DT	Peoples St & T-Head	Lower Broadway	T-Head Loop	Rehabilitation	Collector
2022	5	Sanders Dr	Grand Junction	Saratoga	Rehabilitation	Collector
2022	DT	Schatzell	Water	Lower Broadway	Rehabilitation	Collector
2022	1	Third St	Elizabeth	Morgan	Rehabilitation	Collector
2024	4	Access 3A	St Bartholomew	Beach	Preservation	Collector
2024	4	Alameda S	Ennis Joslin	Airline S	Resurface	Arterial
2024	2	Brawner N	Kostoryz	Ramsey	Resurface	Collector
2024	5	Cimarron Blvd	Airline	Yorktown	Resurface	Arterial
2024	4	Coralvine	Sea Pines	Allamanda	Resurface	Collector
2024	4	Ennis Joslin	Holly Rd	Cedro	Resurface	Arterial
2024	4	Holly Rd	Paul Jones	Ennis Joslin	Resurface	Arterial
2024	5	Marseille	Oso Parkway	Oso Parkway	Resurface	Collector
2024	3	Schanen Blvd	Everhart Rd	Weber Rd	Resurface	Collector
2024	3	Williams	Staples	Airline Rd	Preservation	Collector
2024	1	Willowood Crk	Violet Rd	Willow Heights	Resurface	Collector
2025	3	Bear Ln	Padre Island Dr	Joe Mireuir	Resurface	Arterial
2025	1	Benys	Leopard	Skyline	Resurface	Collector
2025	2	Carmel Pkwy N	Alameda S	Staples S	Resurface	Collector
2025	2	Carmel Pkwy S	Alameda S	Staples	Resurface	Collector
2025	1	Clarkwood Rd	Up River Rd	Agnes	Resurface	Arterial
2025	4	Don Patricio	Dead End	Waldron Road	Resurface	Collector
2025	3	Flynn Pkwy E	Shea North	Holly Rd	Resurface	Collector
2025	5	Grand Junction	Cedar Pass Dr	Wapentate Dr	Resurface	Collector
2025	5	Grenoble	Strasbourg	Cimarron	Resurface	Collector
2025	3	Heinsohn Rd	Agnes	Bear	Resurface	Arterial
2025	2	Kosar St	Staples S	Naples	Resurface	Collector
2025	DT	Lawrence T Head	Shoreline N	T-Head Loop	Resurface	Collector
2025	1	Manning Rd	Sedwick	Agnes	Resurface	Arterial
2025	1	Navigation	Agnes	Leopard	Resurface	arterial
2025	3	Navigation	Old Brownville	Agnes	Resurface	Arterial
2025	4	Retta	Purdue	Glenoak	Resurface	Collector
2025	1	Sedwick Rd	Clarkwood	Southern Minerals	Resurface	Arterial
2025	3	Shea Pkwy N	Everhart Rd	Flynn Pkwy	Resurface	Collector
2025	1	Southern Minerals Rd	IH 37	Sedwick	Resurface	Arterial
2025	DT	Staples N	Comanche	Antelope	Preservation	Arterial
2025	4	Waldron	Pavement Change	Purdue	Preservation	Arterial
2025	5	Wapentate Dr	Aaron Dr	Grand Junction	Resurface	Collector
2026	3	Calle Las Colonas	Saratoga Rd	Dead End	Resurface	Collector
2026	4	Caribbean	Waldron	Laguna Shore	Resurface	Collector
2026	5	Hunt Drive	Saratoga Rd	Timbergate	Resurface	Collector
2026	DT	John Sartain	Shoreline S	Mesquite	Resurface	Collector
2026	3	Kostoryz	Holly Rd	Saratoga	Resurface	Arterial
2026	4	Laguna Shores	Graham	Hustlin Hornet	Resurface	Collector
2026	DT	Lomax	Shoreline S	Lower Broadway	Resurface	Collector
2026	DT	Lower Broadway	Lomax	John Sartain	Resurface	Collector
2026	2	Mc Ardle	Weber	Everhart	Resurface	Arterial
2026	3	Mc Ardle	Carroll Ln	Weber	Resurface	Collector
2026	5	Patti	Dunbarton Oak	Dead End	Resurface	Collector
2026	5	Player	Saratoga Rd	Eider	Resurface	Collector
2026	1	Port	Mary	IH 37	Resurface	Arterial
2026	1	Port	Morgan	Buford	Resurface	Arterial

Year	District	Street	From	To	Work Plan	Classification
2026	2	Staples S	Brawner	Kostoryz	Preservation	Arterial
2026	1	Third St	Morgan	Tancahua	Resurface	Collector
2026	4	Williams	Roddfield	Airline Rd	Preservation	Collector
2026	3	Wooldridge	Cascade	Staples S	Resurface	Collector
2027	1	Baldwin	Leopard	Agnes	Resurface	Arterial
2027	2	Brownlee	Staples	Louisiana	Resurface	Collector
2027	1	Corn Products E & W	Leopard	IH 37	Resurface	Arterial
2027	1	Greenwood	Port	Baldwin	Resurface	Arterial
2027	2	Greenwood	Baldwin	Lawton	Resurface	Arterial
2027	3	Greenwood	Lawton	Horne	Resurface	Arterial
2027	3	Greenwood	Gollihar	West Point	Resurface	Arterial
2027	2	Louisiana Access	Staples	Louisiana S	Resurface	Collector
2027	2	Louisiana N	Staples	Ocean	Resurface	Collector
2027	2	Louisiana S	Staples	Ocean	Resurface	Collector
2027	4	Mediterranean	Otranto	Maui	Resurface	Collector
2027	2	Norton	Kostoryz	Brentwood	Resurface	Collector
2027	4	Robert	Alameda S	Ocean	Resurface	Collector
2027	4	Santa Fe	Robert	Doddridge	Resurface	Collector
2027	3	West Point	Padre Island Dr	Greenwood	Resurface	Collector
2028	1	Agnes	King	Crosstown	Resurface	Arterial
2028	4	Aquarius	Cabana N	Bello	Resurface	Collector
2028	3	Betty Jean	Holly Rd	Williams	Resurface	Collector
2028	3	Betty Jean Cir	Betty Jean	Dead End	Resurface	Collector
2028	2	Blevins	Ayers	Naples	Resurface	Collector
2028	1	Booty	Brownlee	Dead End	Resurface	Collector
2028	5	Boston	Staples	Yorktown	Resurface	Collector
2028	2	Carroll	Staples	Houston	Resurface	Collector
2028	5	Cedar Pass	Sun Valley	Everhart	Resurface	Collector
2028	4	Compton	Waldron	First National	Resurface	Collector
2028	3	Esplanade E	Staples S	Spohn	Resurface	Collector
2028	3	Esplanade W	Staples S	Spohn	Resurface	Collector
2028	3	Greenwood	Trojan	Padre Island Dr	Resurface	Arterial
2028	3	Greenwood	Padre Island Dr	Holly Rd	Resurface	Arterial
2028	2	Horne	Kostoryz	Devon	Resurface	Collector
2028	4	Mc Ardle	Airline Rd	Whitaker	Resurface	Collector
2028	5	Oso Pkwy	Yorktown Blvd	Staples	Resurface	Collector
2028	4	Oso Pkwy	Holly	Canadian	Resurface	Collector
2028	3	Parkway	Wooldridge	Esplanade	Resurface	Collector
2028	5	Snowgoose	Everhart	Timbergate	Resurface	Collector
2028	2	Texan Trl	Staples	Santa Fe	Resurface	Collector
2028	1	Up River St	Palm	Fairview	Resurface	Collector

Exhibit F-18: *Pavement Condition of the Existing Roadway Network*

Source: City of Corpus Christi Pavement Condition Index



Proposed Corpus Christi Bond Projects

Please note that the following bond projects are proposed and have not been approved by voters.

Exhibit F-16: *List of Corpus Christi Proposed Bond Projects*

Map ID	Bond Project Name	Improvement Type
44	Lower Broadway (Cooper's Alley to Twigg)	Bike mobility and ADA
45	North Beach Road Improvement	Bike mobility and ADA
46	Yorktown (Design only) (Oso Bridge to Waldron)	Bike mobility and ADA
47	Rand Morgan (Design only) (McNorton to IH 37)	Bike mobility and ADA
48	South Staples Access Road (Annapolis to Kostoryz)	Bike mobility and ADA
49	Alamaeda (Construction only) (Texan to Doddridge)	Bike mobility and ADA
50	Alamaeda (Design only) (Doddrige to Everhart)	ADA only
51	Bear Lane (Design only) ((Joe Mireuir to Padre Island Dr)	ADA only
52	Allencrest (Design only) (Ayers to Dead End)	ADA only
53	Schanen (Design only) (Weber to Everhart)	ADA only
54	Holly Road (Construction only) (Ennis Joslin to Paul Jones)	ADA only
55	Granham Road (Design only) (Flour Bluff to Waldron)	ADA only
56	Tara Subdivision (Armitage, Audobon, Riata, Riata Circle, Richland, Rosedown)	ADA only
57	Cimarron (Design only) (Bison/Grenoble to Legacy Point)	ADA only
58	Acushnet (Design only) (Weber to Saratoga)	ADA only
59	Lipes (Design only) (Airline to Bronx)	ADA only
60	Grand Junction (Design only) (Wapentate to Cedar Pass)	ADA only
61	Roddfield (Design only) (Yorktown to Adler)	ADA only
62	Brooke (Design only) (Roddfield to Ametrine)	ADA only
63	DS 5 Trail Connectivity	ADA only

Portland Capital Improvement Plan (CIP) Projects

Exhibit F-17: *List of Portland Capital Improvement Projects*

Map ID	CIP Project Name	Improvement Type
Not Mapped	Street Improvements (Sealcoat, Rehabs, and Overlays) and Parking Lot Improvements)	Bike mobility and ADA
Not Mapped	Citywide Sidewalk Improvements, Phases 1 and 2	Bike mobility and ADA
1	Stark Road Widening	Bike mobility and ADA
2	Bay Ridge / Green Lake Linear Park	Bike mobility and ADA
3	Railroad ROW Linear Park	Bike mobility and ADA
4	Sunset Lake Hike and Bike Trail Loop	Bike mobility and ADA
5	Memorial Parkway Hike and Bike Phase 2	ADA only
6	Lang Road Widening (Stark to Midway)	ADA only