

An aerial photograph of Wharton, Texas, showing a grid of streets and buildings. A large, irregularly shaped area is highlighted in a vibrant blue-green color, representing a proposed levee green space design. The design follows the path of a waterway, with a central channel and several large, rounded loops that enclose green spaces and parks. The surrounding landscape includes fields, trees, and some industrial or utility structures.

# Design for Increasing Ecological and Social Resilience

## A Levee Green Space Design for the City of Wharton, TX

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**Committee Member: Prof. Bruce Dvorak, Dr. Jane Futrell Winslow, Dr. Xuemei Zhu**

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Summer, 2021*

Project Sponsors: City of Wharton, Texas & Texas Target Communities Program, TAMU

# Acknowledgements

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Also, I would like to thank Ms. Jeewasmi Thapa, Project Coordinator, and Jaimie Masterson, Director of Texas Target Communities Program at Texas A&M University. They contributed their efforts in the project administration and communication with the City of Wharton community.

In addition, I would like to acknowledge the residents of the City of Wharton who contributed their time to participate in the meetings, fill in online surveys, express their expectations, and provide valuable comments. It really helped me learn about the city and community needs.

Last but not least, I would like to express my thanks to my parents, who provide me with financial and spiritual support to complete my graduate study.

Muzi Li

# Introduction

This booklet presents "Levee Green Space Design in the City of Wharton, Texas," which is a service-learning project funded by the City of Wharton, Texas, through the Texas Target Communities Program.

The city of Wharton is located 50 miles southwest of Houston, adjacent to the Colorado River in Texas. The city was first established as a mail route stop by the Republic of Texas and has long been known as an agricultural center for its production of crops and cattle. Because the city of Wharton was subjected to repeated flooding events, the government considered establishing a levee for flooding protection. Phase One of the engineering design of the Colorado River Flood Control Project was finished in 2020, which includes a levee with a trail on top and some sumps.

This project will propose a levee green space along the bank of the Colorado River in the city of Wharton, based on the flood control system. It will encompass recreational open spaces and flood defense facilities to improve ecological and social resilience, stimulate local businesses, and improve residents' living quality.

The project was completed through the following steps:

## **Step 1: Literature Review & Precedent Study**

- The relevant literature was reviewed and the common issues, concepts, and potential strategies for sustainable and resilient design were summarized.
- Several precedent studies with different contexts and backgrounds related to riverfront green space design and levee trail design were conducted.

## **Step 2: Site Inventory & Analysis**

- The following data and information were collected and analyzed, including regional context, history, demographic, social and economic data, physical condition, general plan, and visual resources.
- Base on the conclusion of site analysis, SWOT analysis was completed.

## **Step 3: Community Involvement**

- An online survey was conducted to let residents in the City of Wharton involve in the design process and express their needs and expectations.

## **Step 4: Programming and Design Concept**

- The proposed design program includes mission statement, design goals and objectives, and designed spaces and requirements.

## **Step 5. Master Plan**

- An overall master plan was developed to address city connectivity, downtown land use, levee green space functions, and identify target design areas.

## **Step 6. Detailed Site Plan**

- The identified health park area was selected as the detailed site design area.
- Comprehensive detailed design for health park was completed including design concept, illustrated site plan, analysis diagrams, and perspectives.

## **Step 7: Refinement and Final Production**

- Final project package includes booklet, presentation files and a 5-minute animation.

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# 1 Project Introduction

1.1 Project Overview

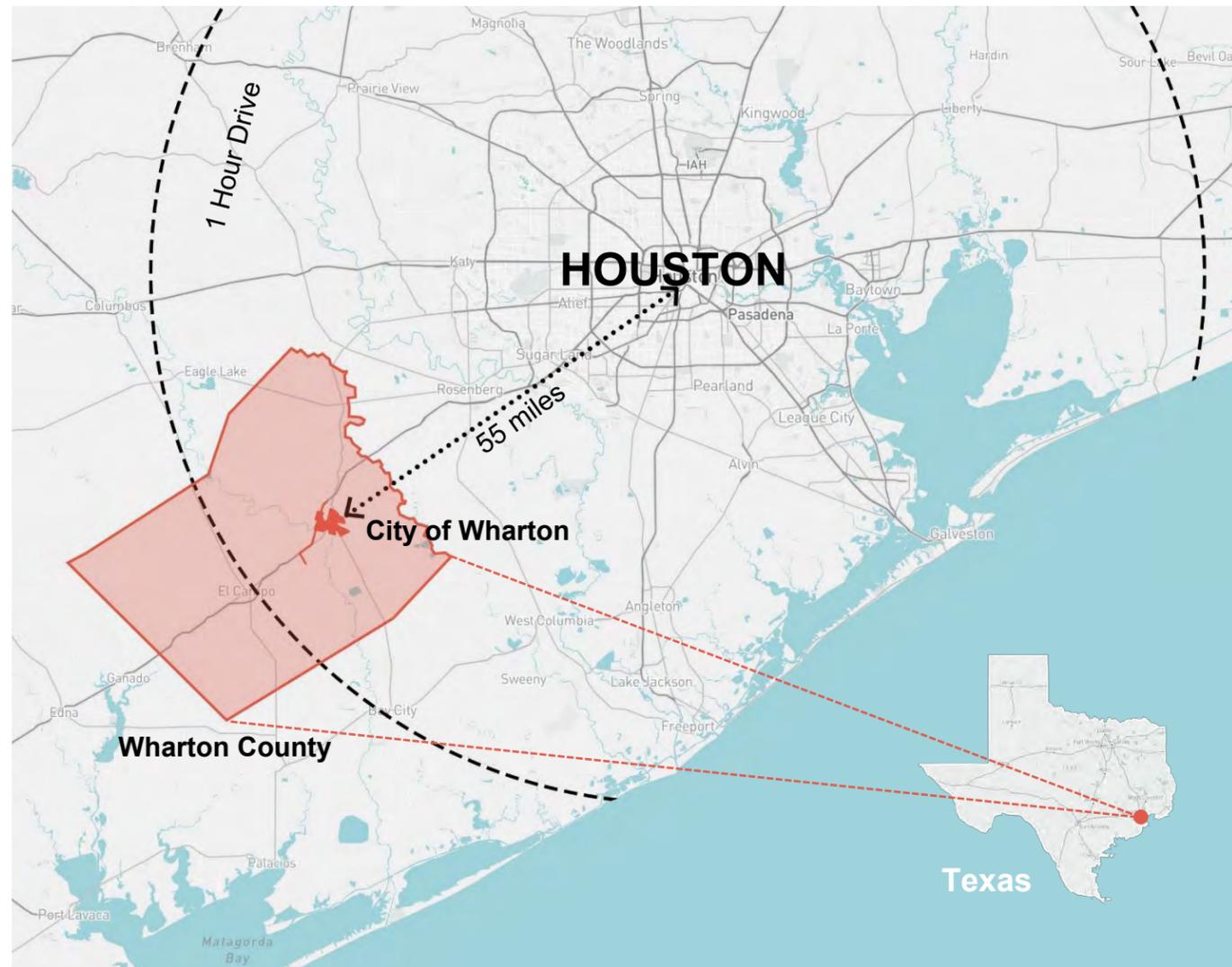
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1.2 Stakeholders

3

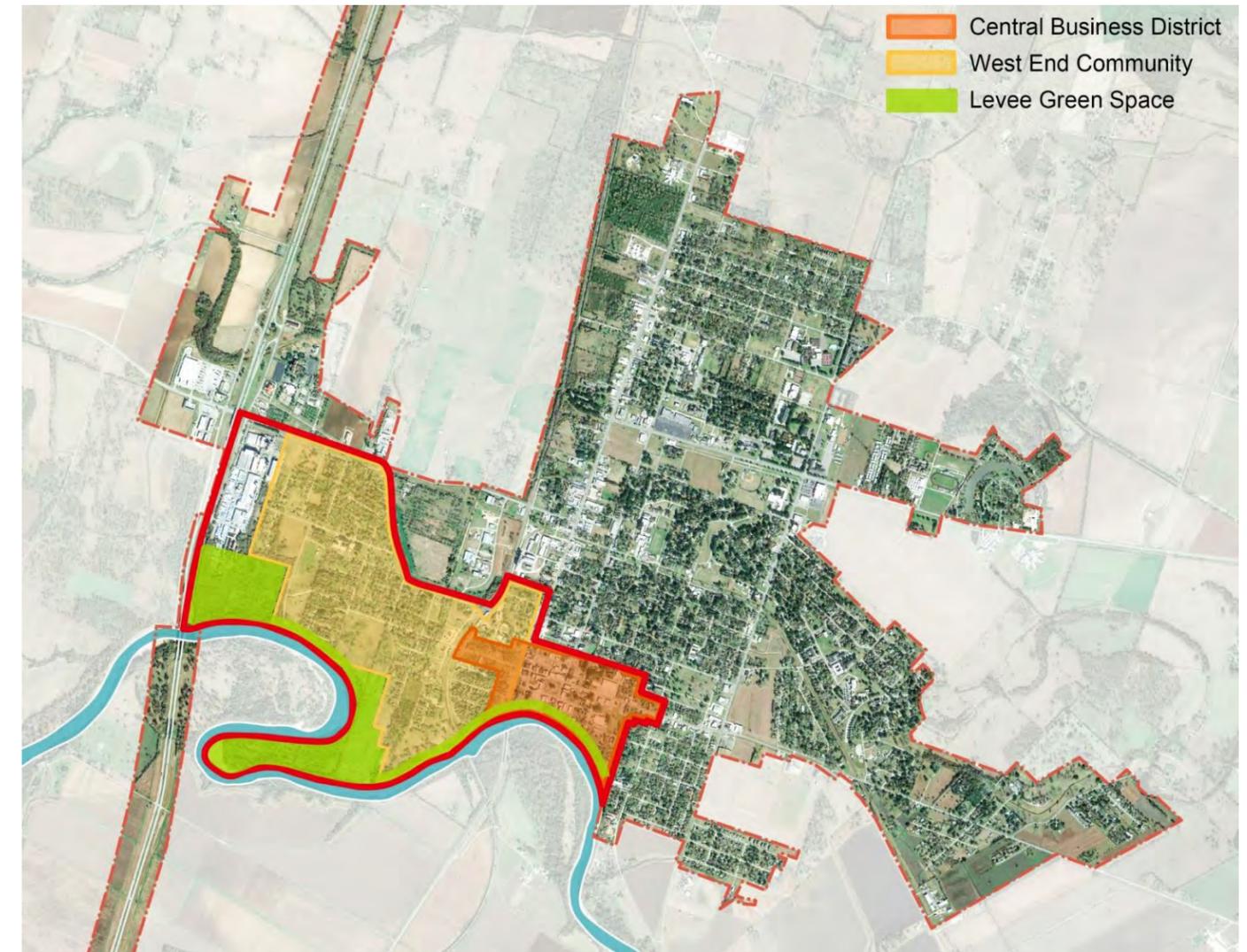
# 1.1 Project Overviews

## 1.1.1 Location



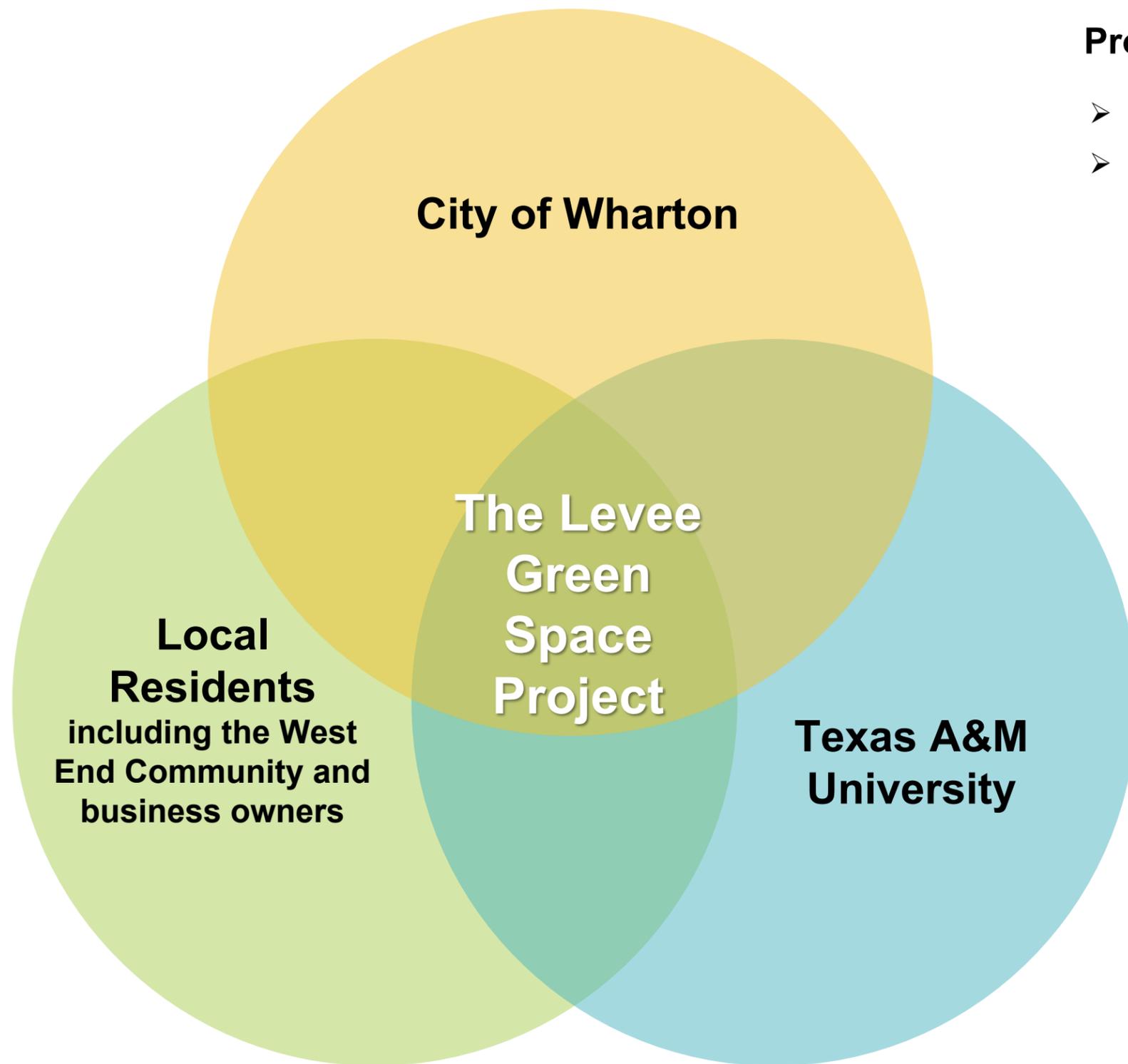
The City of Wharton is a city in Wharton County, Texas, United States. It is located 55 miles southwest of Houston and within a one-hour drive circle. The area of the City of Wharton is about 8.28 sq mi.

## 1.1.2 Purpose of the Project



- To develop a comprehensive master plan for the greenway corridor along Colorado River to address flooding mitigation and stormwater management
- To develop a master plan for the levee green space and trail system to meet the recreational needs of the local residents and to improve the connectivity of the community
- To develop the downtown revitalization design proposal to promote the economic development of the city.

## 1.2 Stakeholders



### Project Sponsors

- The City of Wharton
- The Texas Target Communities Program at Texas A&M University.

# 2 Literature Review & Precedent Study

2.1 Theoretical Context

5-7

2.2 Precedent Study

8-11

## 2.1 Theoretical Context

### 2.1.1 Community Resilience

Community resilience is the sustained ability of a community to use available resources to respond to, withstand, and recover from adverse situations. This allows for the adaptation and growth of a community after disaster strikes.



#### A Healthy Environment

- Protects and restores the natural resource base upon which life depends.
- Seeks to reduce climate impacts through adaptation and mitigation efforts and increase resource efficiencies.

#### Responsible Governance

- Provides community services
- Enforces laws humanely
- Protects its community members
- Manages its finances and meets its budgets under changing conditions.

#### Strong Economy

- Produces necessary resources
- Has a diversified economy
- Has access to financial and physical resources
- Maintains the value of its currency

#### A Prepared System

- Risk reduction activities are planned and funded.
- Networks and partnerships exist to provide support in times of need
- Community members are educated on how to be more prepared
- Organizations within the community are recognized for their resilience initiatives

#### High Quality of Life

A community with a high quality of life has:

- Access to education & information
- Access to affordable housing & quality healthcare
- The existence of social freedoms
- Access to employment and prosperity.

## 2.1.2 United Nations Sustainable Development Goal



The Sustainable Development Goals (SDGs) are the world's shared plan to end extreme poverty, reduce inequality, and protect the planet by 2030.

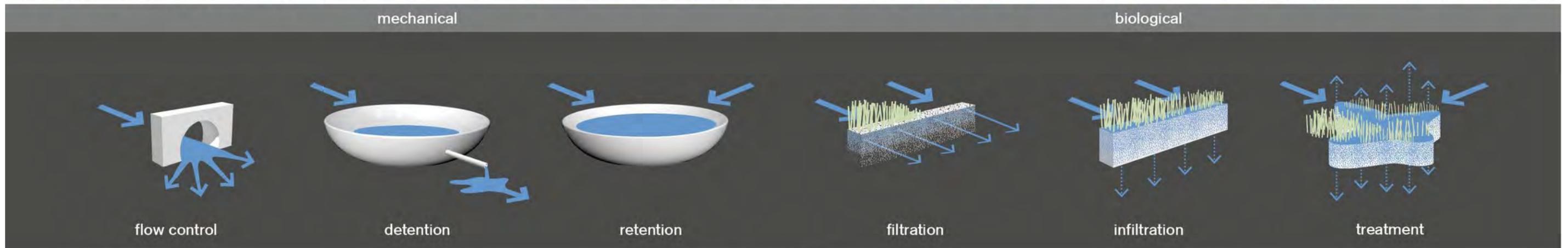
This levee green space design project is related to Good Health And Well-Being, Decent Work And Economic Growth, Sustainable Cities And Communities, and Climate Action

## 2.1.3 Low Impact Development



mechanical

biological



slow

→ spread

→

**flow control:** The regulation of stormwater runoff flow rates.

**detention:** The temporary storage of stormwater runoff in underground vaults, ponds, or depressed areas to allow for metered discharge that reduce peak flow rates.

**retention:** The storage of stormwater runoff on site to allow for sedimentation of suspended solids.

**filtration:** The sequestration of sediment from stormwater runoff through a porous media such as sand, a fibrous root system, or a man-made filter.

**infiltration:** The vertical movement of stormwater runoff through soil, recharging groundwater.

**treatment:** Processes that utilize phytoremediation or bacterial colonies to metabolize contaminants in stormwater runoff.

**Low-impact development (LID)** is a term to describe a land planning and engineering design approach to manage stormwater runoff as part of green infrastructure. LID emphasizes conservation and use of on-site natural features to protect water quality. This approach implements engineered small-scale hydrologic controls to replicate the pre-development hydrologic regime of watersheds through infiltrating, filtering, storing, evaporating, and detaining runoff close to its source. Green infrastructure investments are one approach that often yields multiple benefits and builds city resilience.

## 2.2 Precedent Study

### 2.2.1 Trinity River Corridor Project

**Project Location:** Dallas, TX

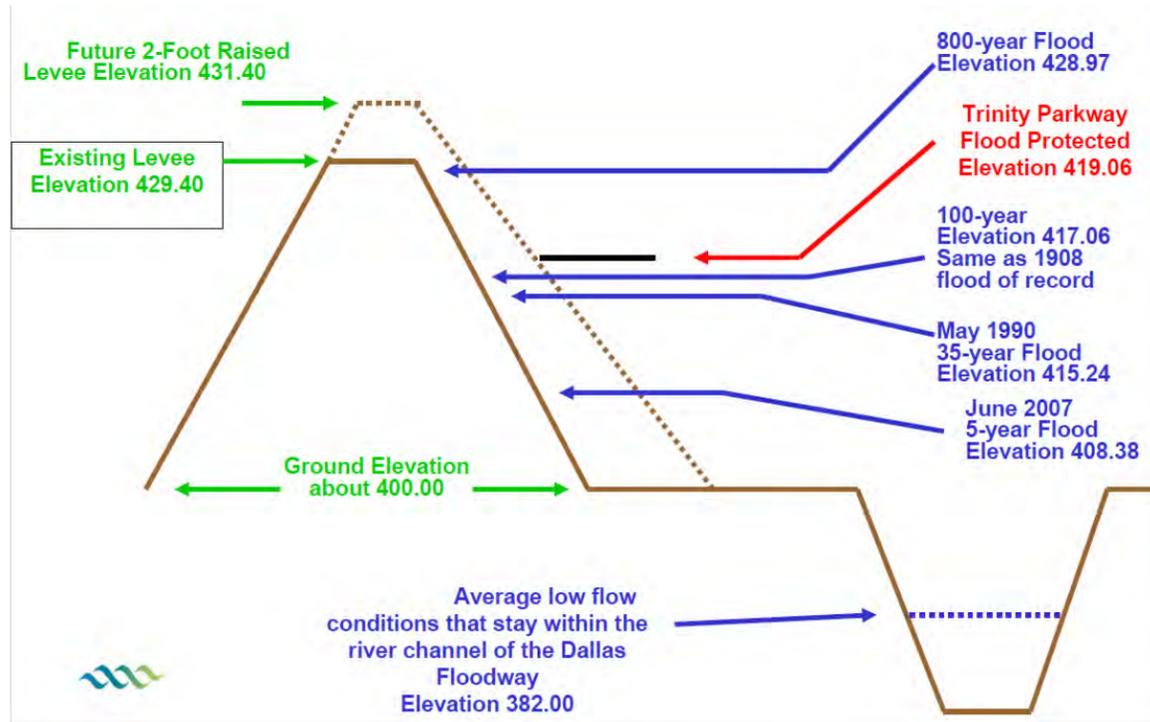
**Time:** 2011

The project covers 20 miles of the Trinity River.

This project addresses a number of regional concerns, though flood protection remains the essential cornerstone of this multi-faceted effort. The inter-related components of the project are:

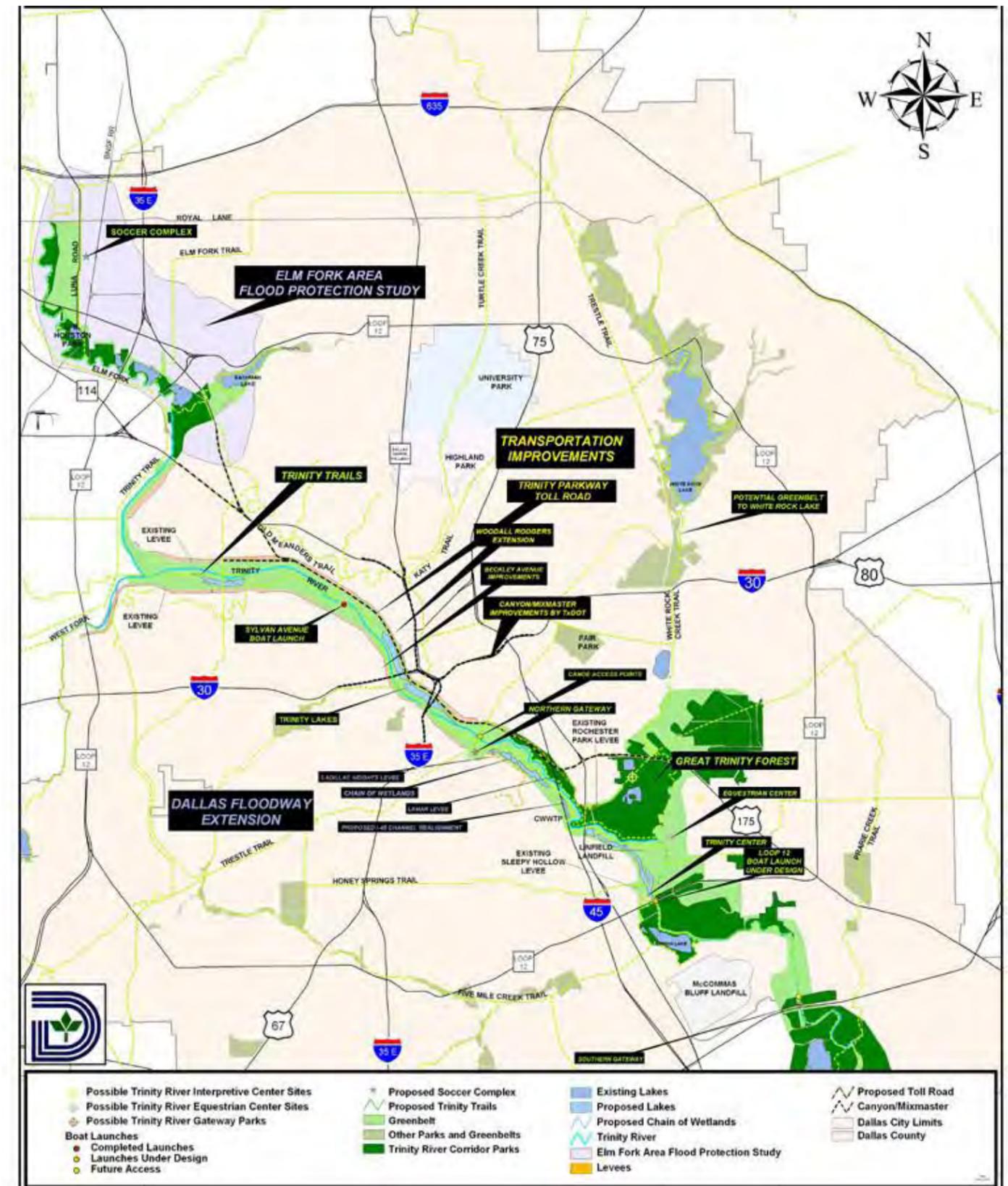
- Flood Protection
- Environmental Restoration
- Recreation
- Transportation
- Community/economic development

#### Flood Protection



Reference: <https://trinityrivercorridor.com/flood-control/dallas-levee-system>

#### Master Plan



## 2.2.1 Trinity River Corridor Project

### Site Plan



Amphitheater

### Design Impact

#### Flood Protection

The City went into action to complete the 100-year flood protection improvements and to work with the Corps on the levee fixes which included 198 Operations and Maintenance (O&M) Improvements. For the Dallas Floodway, the Levee System protects lives and billions of dollars in property value.

#### Recreation

Through the Trinity River Corridor Project, visitors to the river can begin to enjoy the attractive appears along the floodway in the form of the signature bridges and unique recreation areas. Currently, visitors can enjoy the sights and activities available at multiple trails, parks and wetlands. The corridor features scenic views of the downtown Dallas skyline while simultaneously providing broad expanses of land for a variety of outdoor activities.

#### Ecology

Today, throughout the 22 miles of the Dallas Floodway, seasonal wetlands welcome flocks of migrating and resident birds, providing them with natural habitat that occurs all along the Trinity River. Small forest animals thrive in the corridor as well as native grasses and plants.



Levee with trails



Natural environment



Floodway



Stormwater Outfalls.

Reference: <https://trinityrivercorridor.com/flood-control/dallas-levee-system>

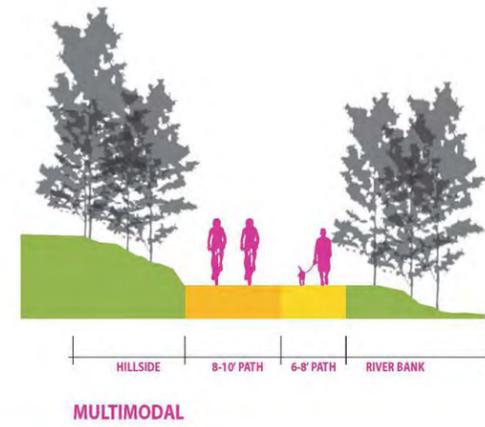
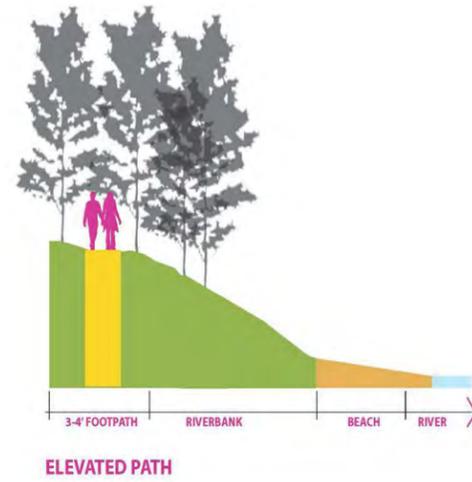
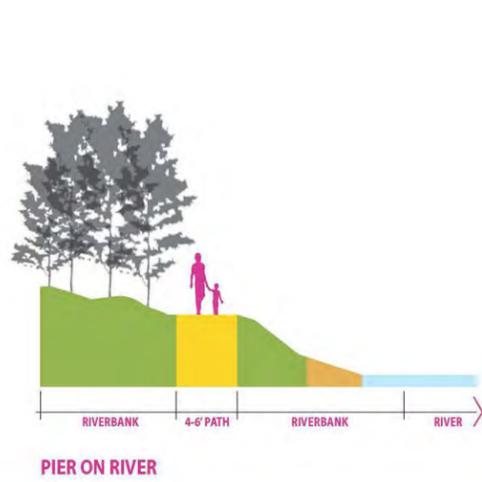
## 2.2.2 West Louisville Outdoor Recreation Initiative



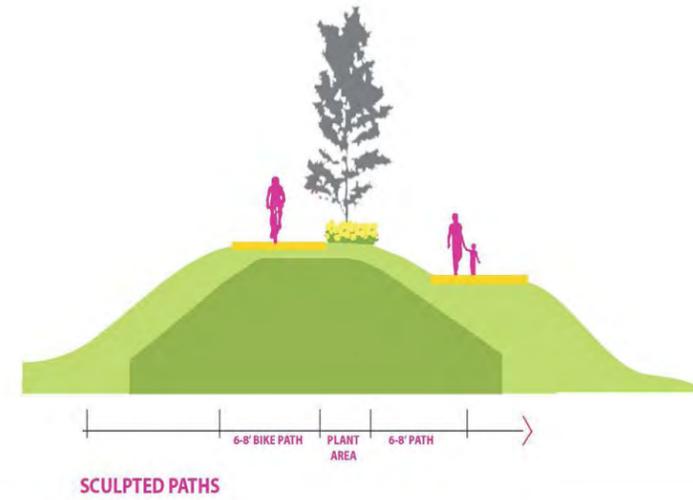
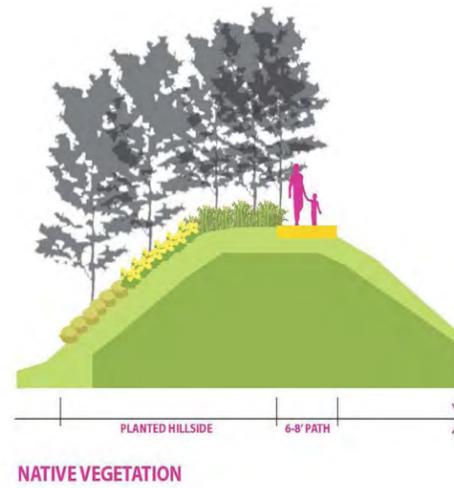
## 2.2.2 West Louisville Outdoor Recreation Initiative

### Trail System

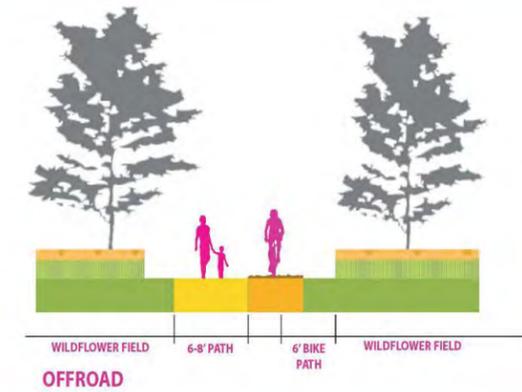
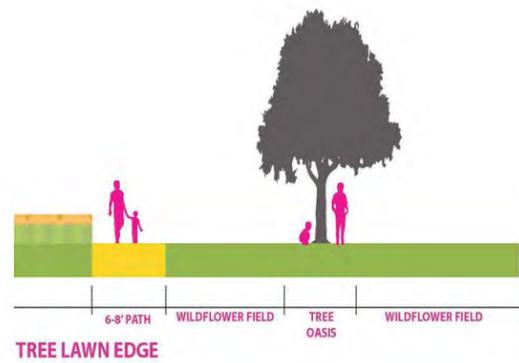
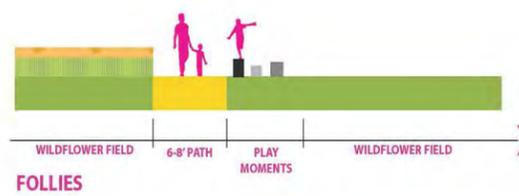
#### RIVERBANK TRAILS



#### LEVEE TRAILS



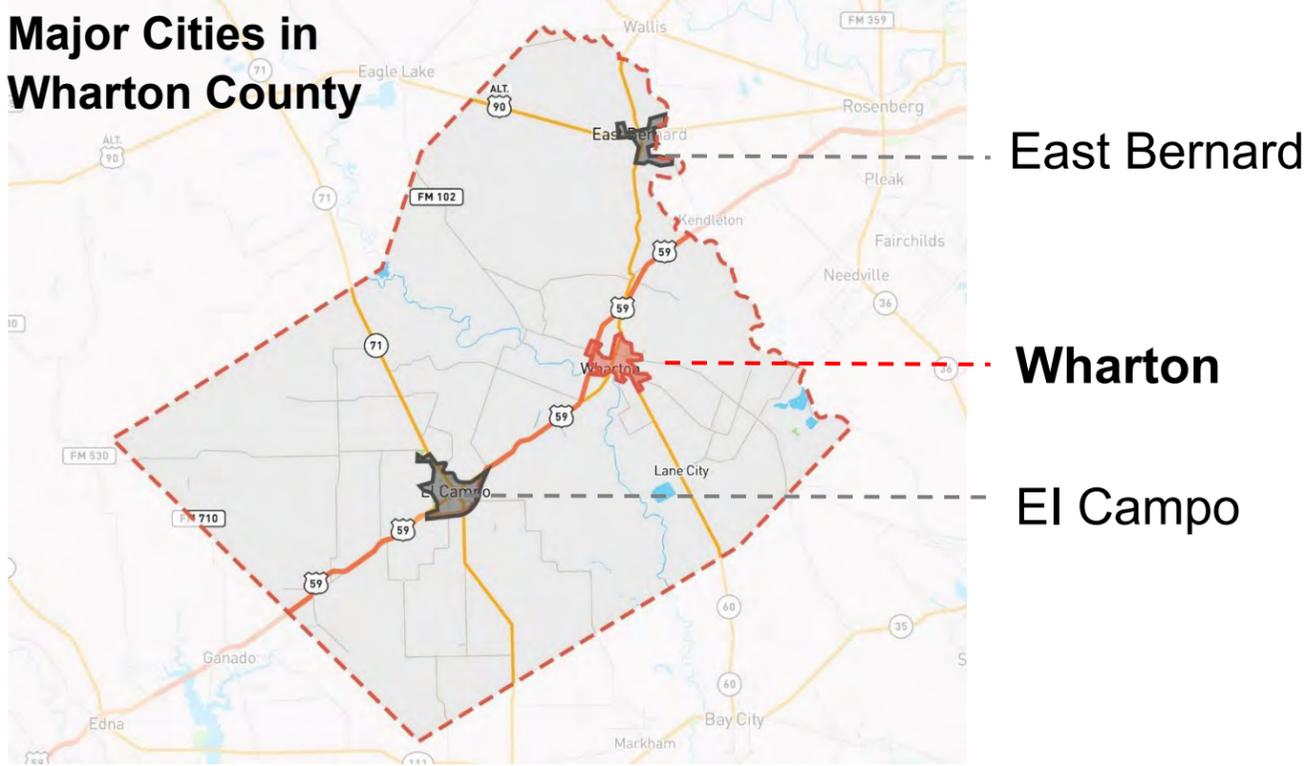
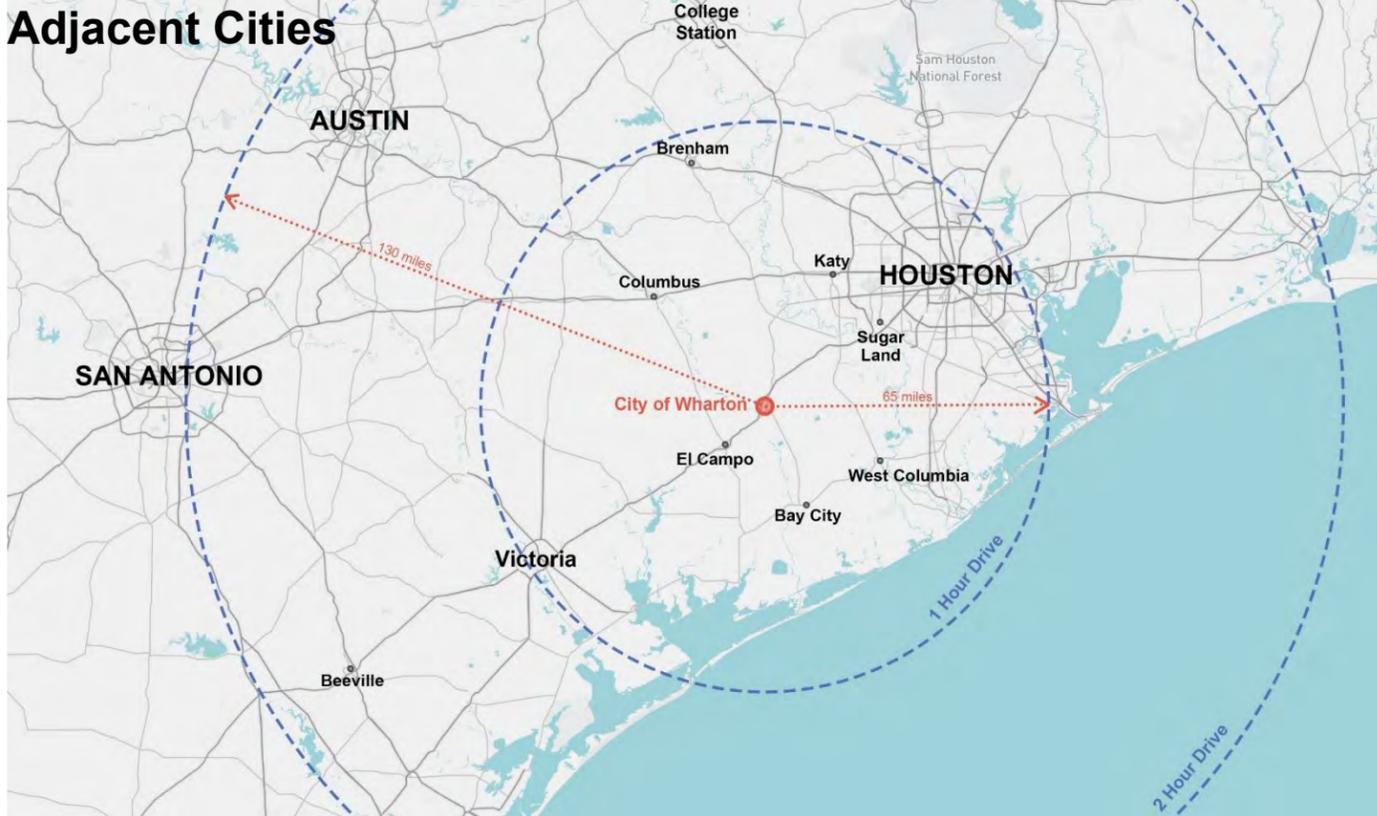
#### UPLAND TRAILS



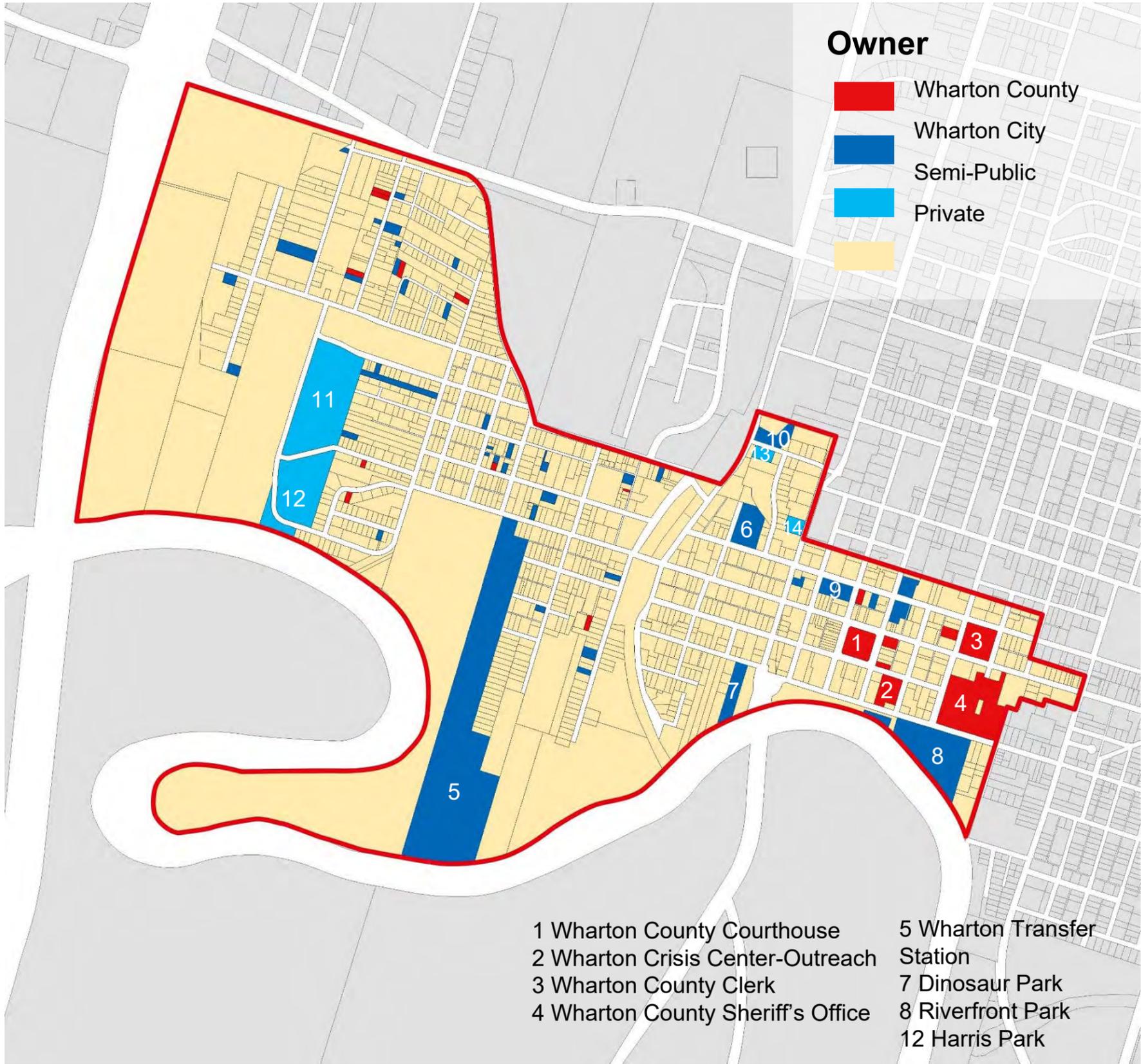
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# 3.1 Regional Context

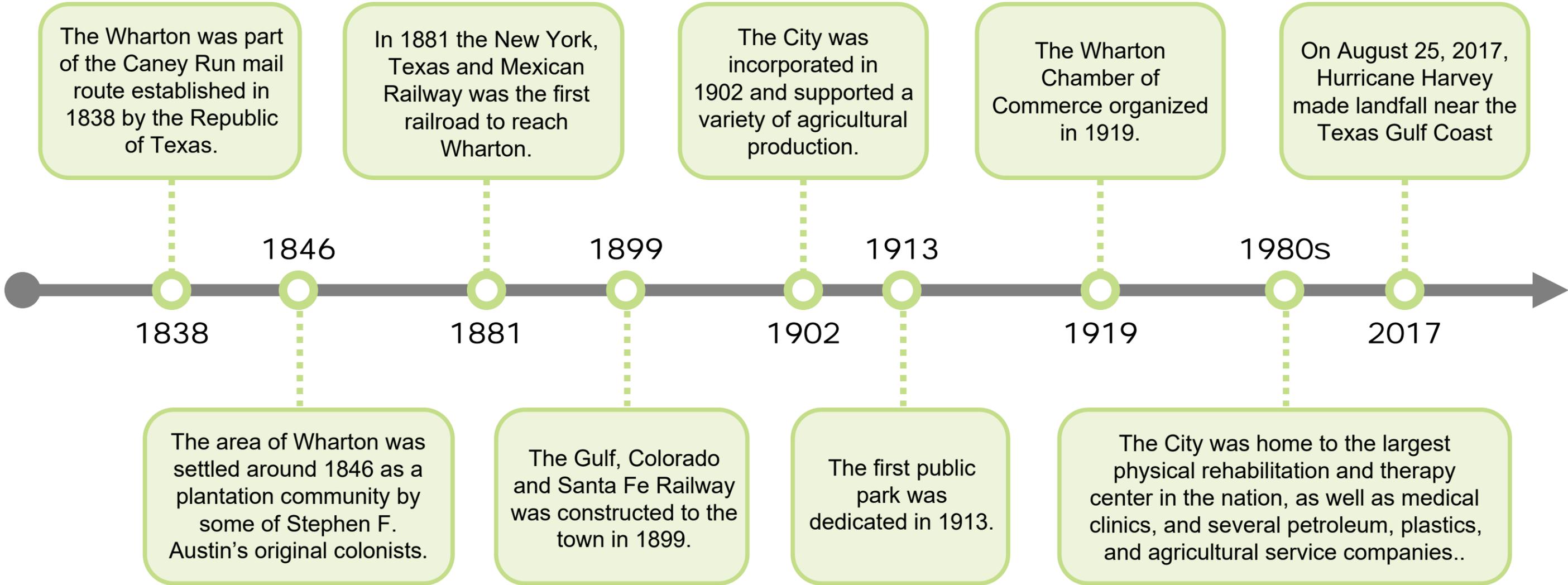


# 3.2 Ownership



Category	Owner	NO.	Acres	Value (\$)
Public	Wharton County	1	1.71	123240
		2	1.27	80729
		3	2.1	126230
		4	6.65	229990
	Wharton City	5	32.65	104295
		6	2.12	91473
		7	1.67	97298
		8	6.99	392158
		9	1.03	74246
		10	1.16	45813
Semi-Public	Wharton ISD	11	11.57	149995
		12	7.45	149995
	Wharton County JR College	13	0.51	12534
	Wharton Chamber of Commerce	14	0.59	131728

# 3.3 City History



The cottonseed train arrives at the Wharton depot.



Wharton County Courthouse



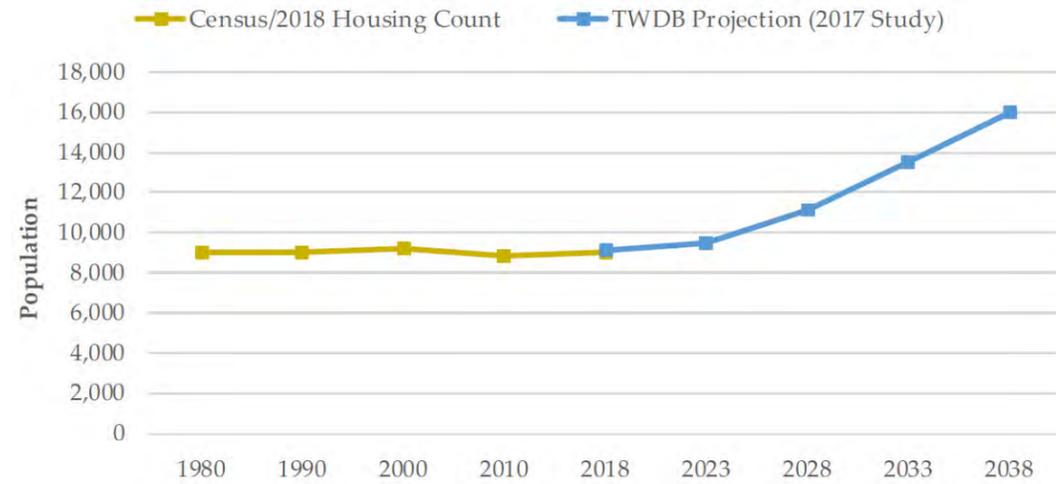
Flooding in Wharton, 1935.



Train Depot

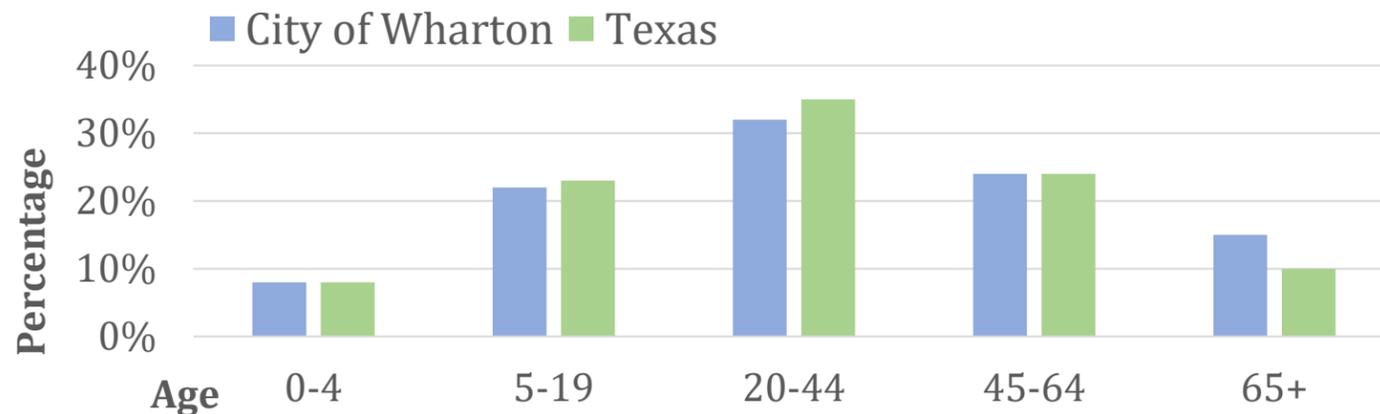
## 3.4 Demographic, Social & Economic Data

### 3.4.1 Forecasted Population



Wharton's population has remained relatively stable over the past 40 years, fluctuating around 9,000 residents. A study projects that Wharton's population will experience growth over the next 20 years, reaching approximately 16,000 residents in 2038. The study is based on an alternative projection from the TWDB (Texas Water Development Board) intended to incorporate the anticipated influence of the Houston urban area's expansion beyond Harris county and along US-59.

### 3.4.2 Age Distribution (Census 2010)



As the chart demonstrates, the percentage of 20-to-44-year-old in the city of Wharton is relatively lower than in Texas. And the percentage of residents over 65-year-old in the City of Wharton is comparatively higher than in Texas.

Data Source: Wharton 2018 Comprehensive Plan

### 3.4.3 Race and Ethnicity (Census 2013)

Race / Ethnicity (% of Total Population)	Wharton County	City of East Bernard	City of El Campo	City of Wharton
White	81.3	91.2	85.8	64.5
American Indian / Alaska Native	0.1	0.0	0.5	0.2
Asian	0.0	0.3	0.0	0.3
Black or African American	14.8	7.4	11.9	30.1
More Than One Race	1.0	0.7	0.0	2.3
Hispanic or Latino	38.0	23.3	50.0	40.0

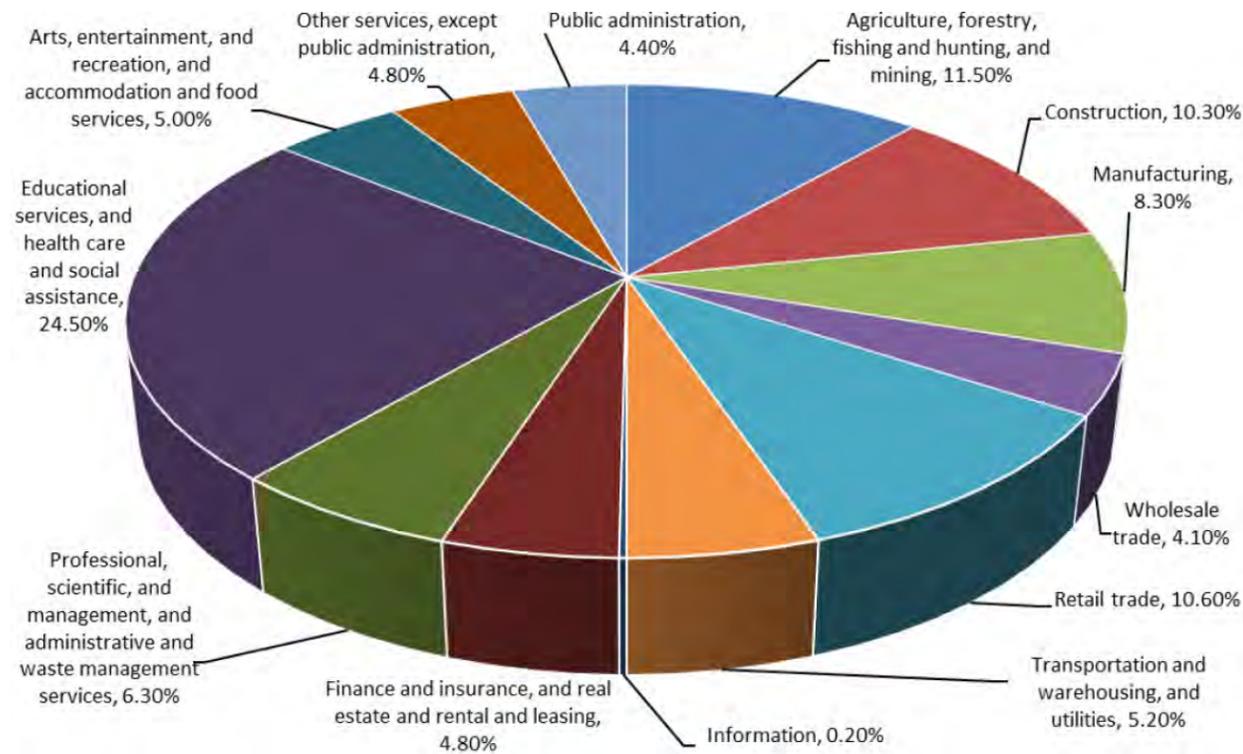
The City of Wharton has a relatively lower percentage of White and a much higher percentage of Black or African Americans than the Wharton county and the other two cities.

### 3.4.4 Economic Characteristics

Economic Characteristics	Wharton County	City of East Bernard	City of El Campo	City of Wharton
Families Below Poverty Level	15.1%	15.3%	19.1%	21.1%
Individuals Below Poverty Level	18.8%	16.0%	23.6%	25.5%
Median Home Value	\$95,600	\$135,100	\$101,100	\$80,000
Per Capita Income	\$20,310	\$24,405	\$20,401	\$16,511
Population >16 Years Old in Labor Force	62%	70.0%	64.9%	60.5%
Population Employed	58.4%	67.5%	60.3%	55.3%

The percentage of both families and individuals below the poverty level in the City of Wharton is the highest among the three major cities. The home value, per capita income and employment rate are the lowest among the three cities.

### 3.4.5 Occupations and Industries



#### Top 3 Employment by Industries

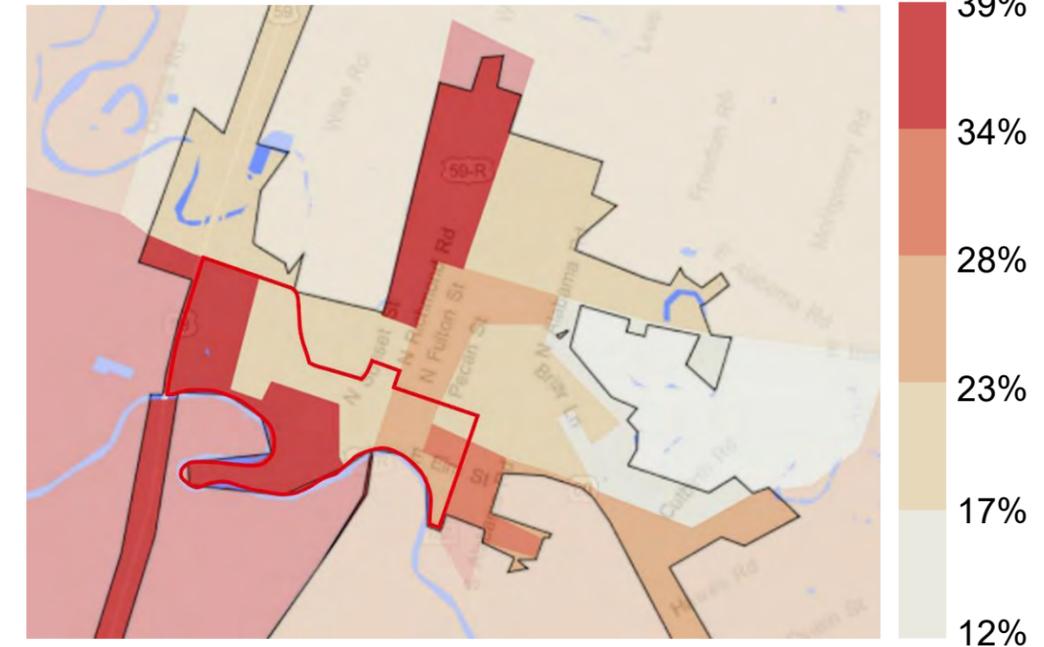
1. Education, health care and social assistance industries (24.5%)
2. Agriculture, forestry, fishing and hunting, and mining (11.5%)
3. Retail trade (10.6%)

### 3.4.6 Workforce Education

Education Level	Texas	Wharton County	City of Wharton
High Education	37%	27%	18%
Moderate Education	34%	38%	44%
Moderate-Low Education	12%	19%	19%
Low Education	17%	17%	19%

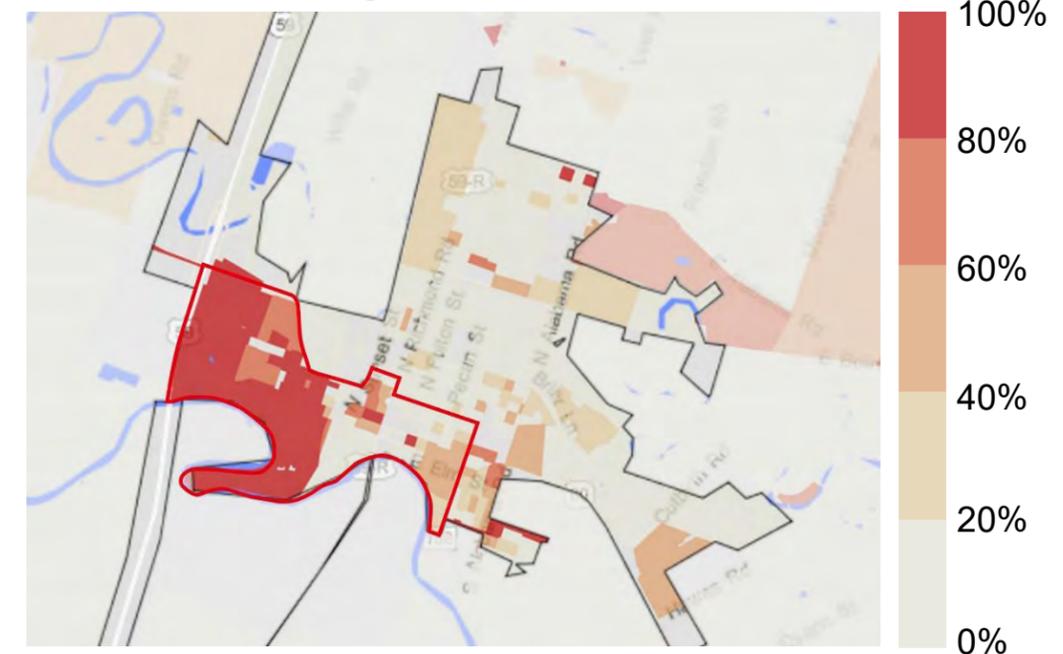
Only 18% of adults in Wharton work in professions that typically require a bachelor’s degree or higher, which is much lower than the percentage in Wharton and Texas. Most of the adults in Wharton work in professions that require high school completion.

### 3.4.6 Date in the Study Area Percentage of Children (0-17)



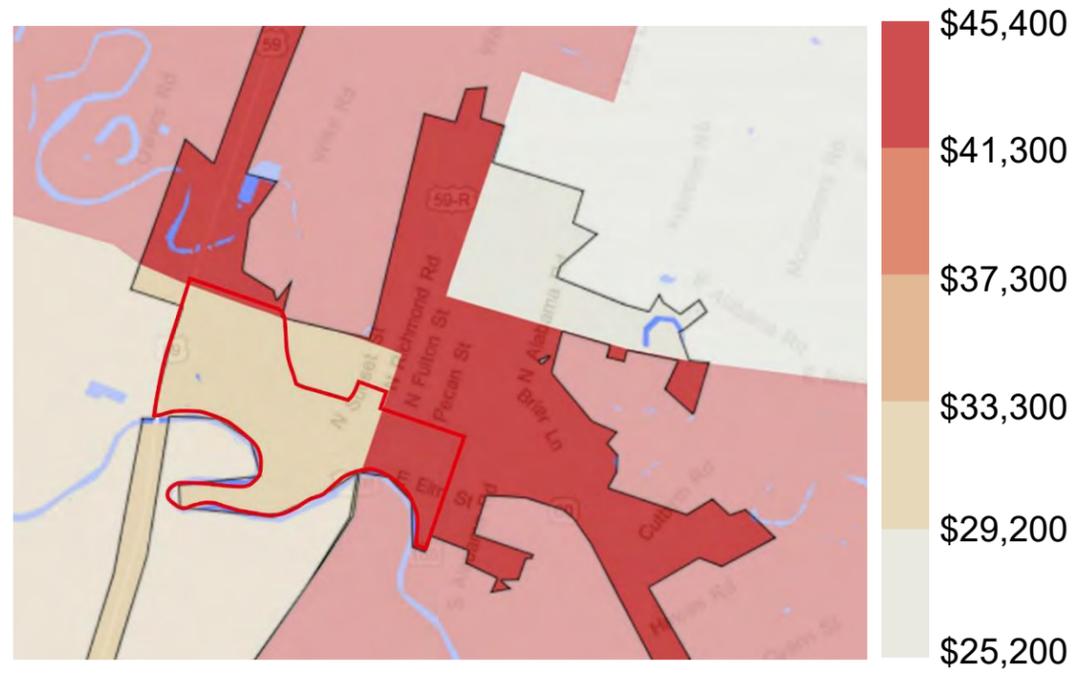
The percentage of children under 17 in the study area is the highest within the City of Wharton.

### Race (Percentage of Black)



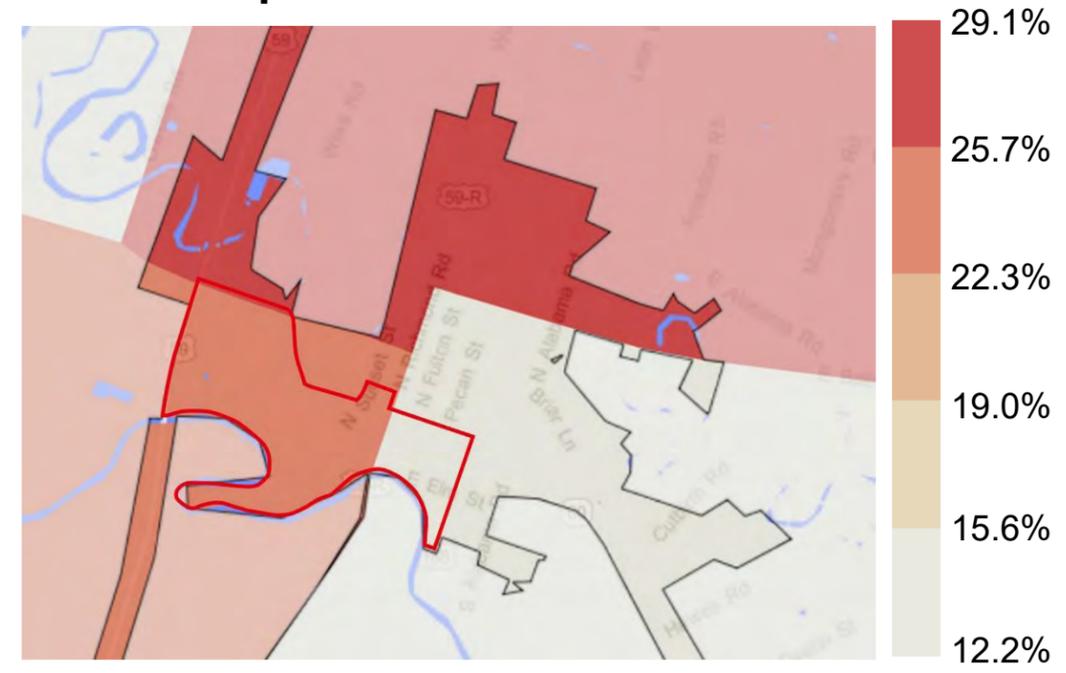
The percentage of Black people in the study area is above 80% and it is the highest within the City of Wharton.

### Annual household Income



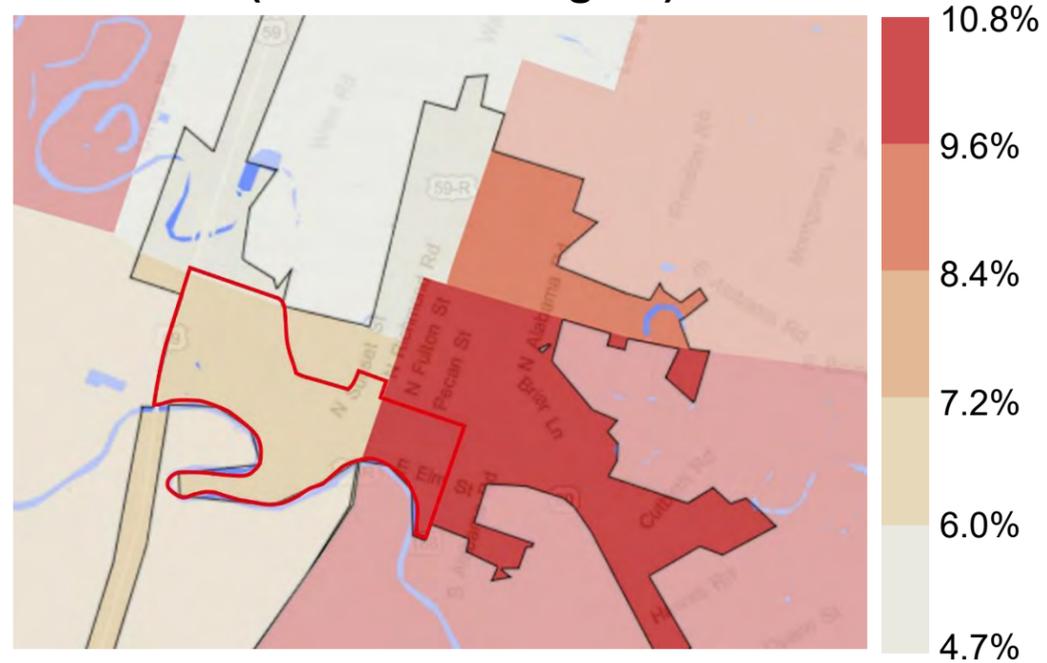
The annual household income in the study area is relatively low within the City of Wharton.

### Food Stamp



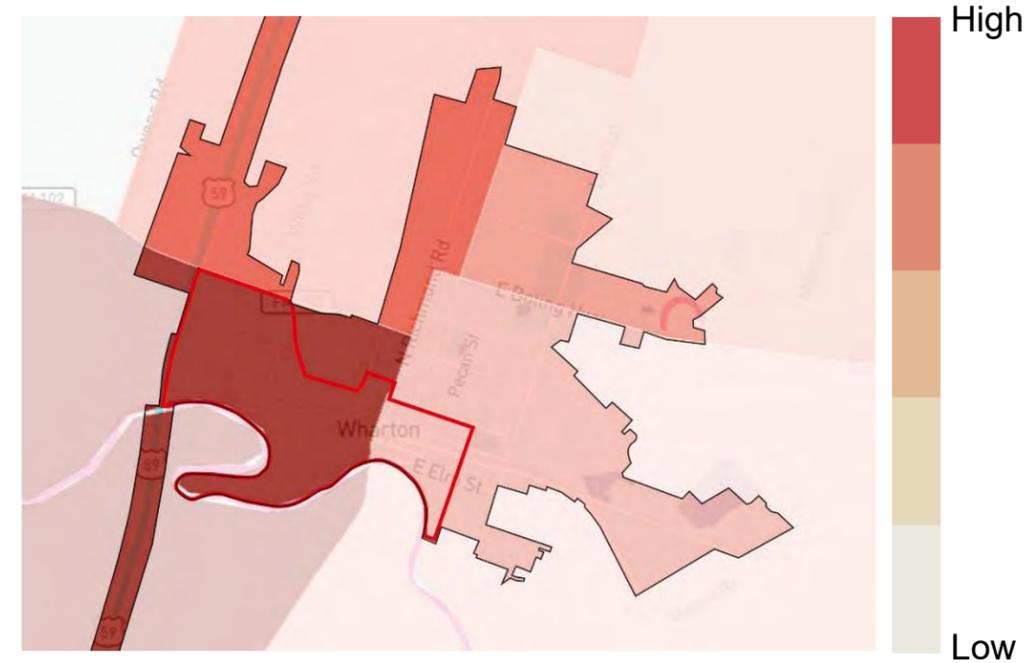
The percentage of people need food stamp in the study area is relatively high in the City of Wharton.

### Education (Bachelor's Degree)



The percentage of people who have a Bachelor's degree in the study area is less than 7%, which is relatively low within the City of Wharton.

### Crime Rate

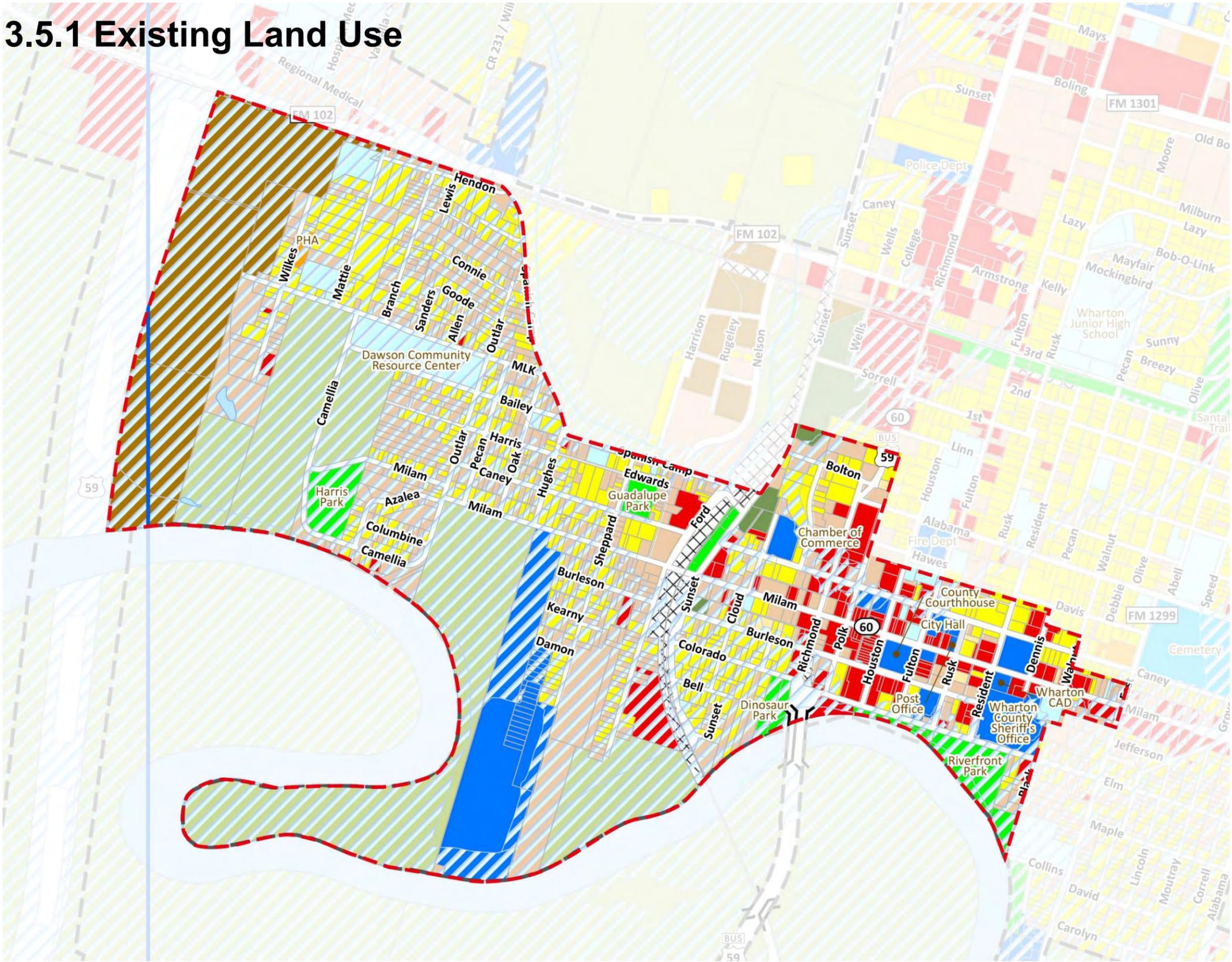


The study area is within the highest crime rate area in the City of Wharton.

Map Source: <https://statisticalatlas.com/place/Texas/Wharton/Overview>

# 3.5 General Plan Analysis

## 3.5.1 Existing Land Use

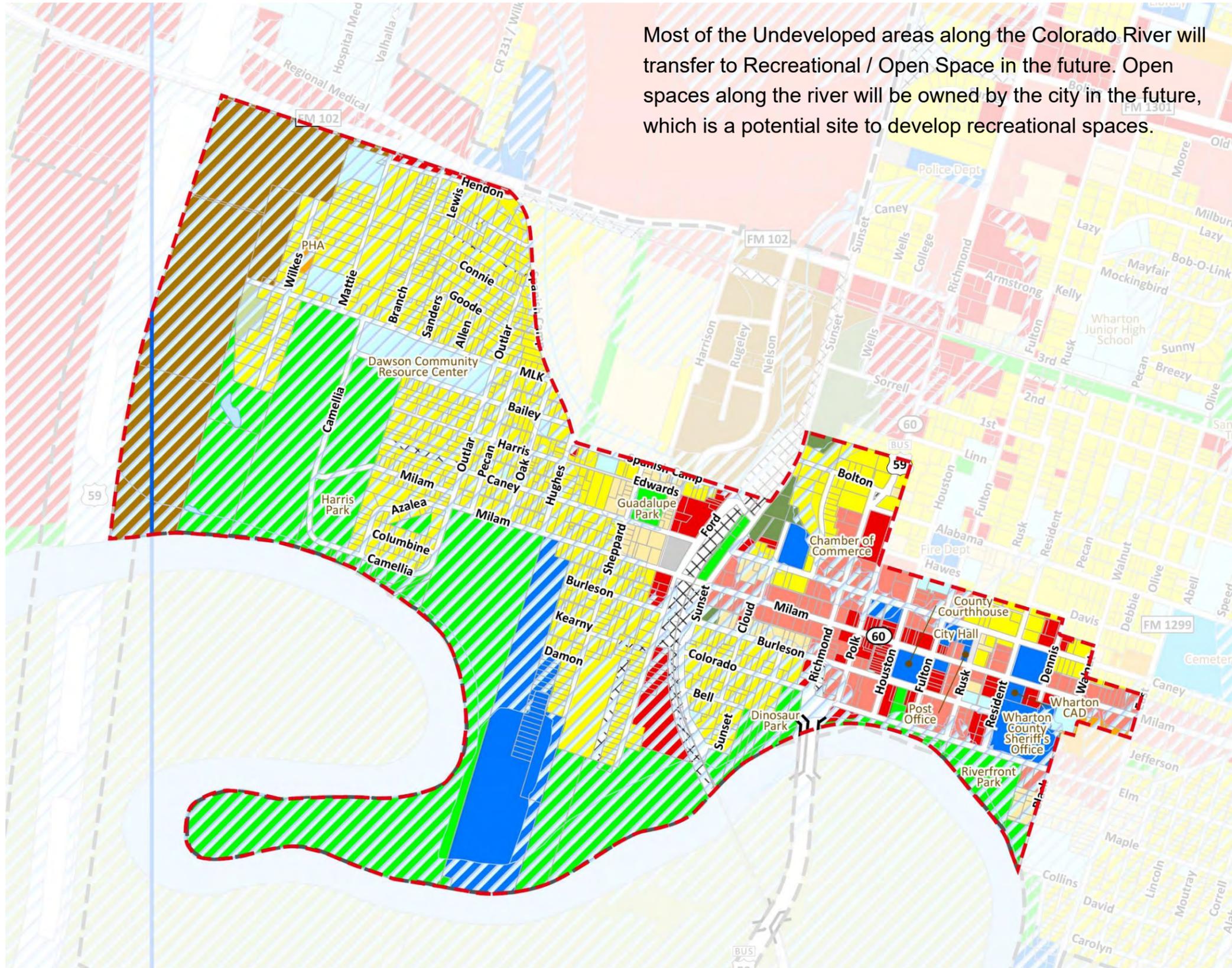


- Right of Way
- Oil Field
- Cemetery
- Agricultural Processing
- Agriculture / Undeveloped
- Semi-Developed
- Single Family
- Multifamily
- Small-scale Multifamily
- Commercial / Retail
- Industrial
- Utility
- Public
- Institutional
- Recreational / Open Space
- City Limits
- Extraterritorial Jurisdiction
- Parcels
- Unbuilt Right of Way
- Railroad
- Bridge
- Stream
- Lake or Pond
- FEMA 100 Year Special Flood Hazard Area

Data Source: Wharton 2018 Comprehensive Plan

### 3.5.2 Future Land Use

Most of the Undeveloped areas along the Colorado River will transfer to Recreational / Open Space in the future. Open spaces along the river will be owned by the city in the future, which is a potential site to develop recreational spaces.



- Right of Way
- Oil Field
- Cemetery
- Agricultural Processing
- Agriculture / Undeveloped
- Semi-Developed
- Single Family
- Multifamily
- Small-scale Multifamily
- Mixed-Use
- Commercial / Retail
- Industrial
- Utility
- Public
- Institutional
- Recreational / Open Space
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- Extraterritorial Jurisdiction
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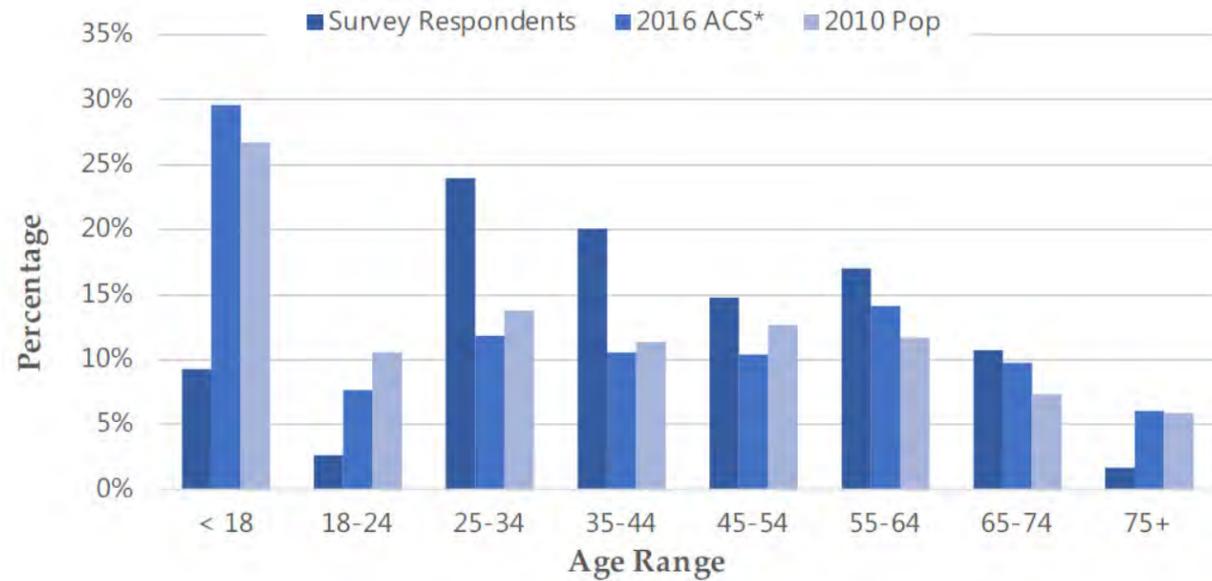
Data Source: Wharton 2018 Comprehensive Plan

# 3.6 Community Needs Analysis

## The 18-question General Survey

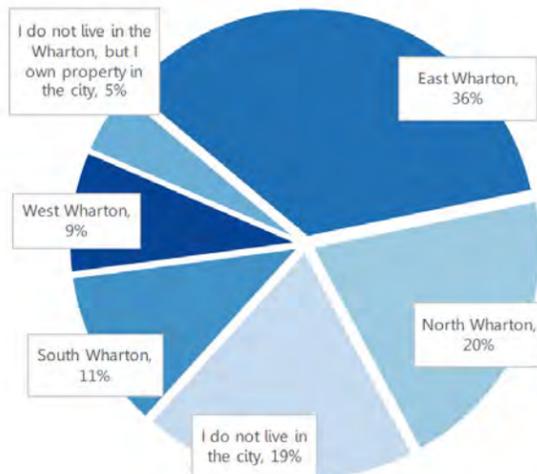
In the Wharton 2018 Comprehensive Plan, the City of Wharton and GrantWorks, Inc. invited community members to complete the General Survey. The survey was available online for approximately two months during spring 2018. Over 308 respondents completed the survey.

### Participants Age Range



Nearly 60% of participants are between 25 and 54 years old. Nearly 30% of participants are above 55 years old.

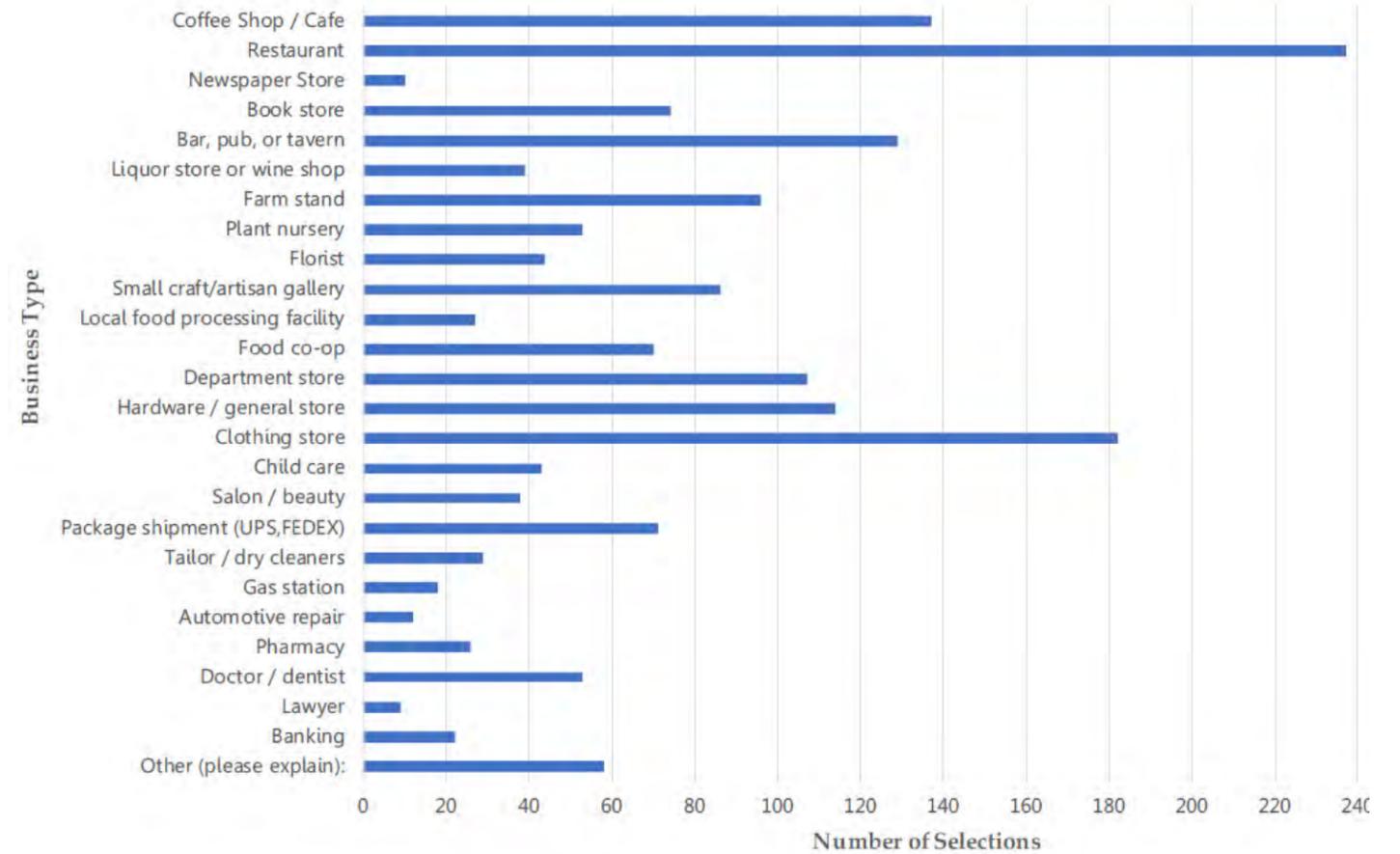
### Where Participants Live



Above half of the participants live in the east and north part of Wharton

Data Source: Wharton 2018 Comprehensive Plan

## Question: Which of the following businesses would like to have, or to have more of, in the downtown Wharton?

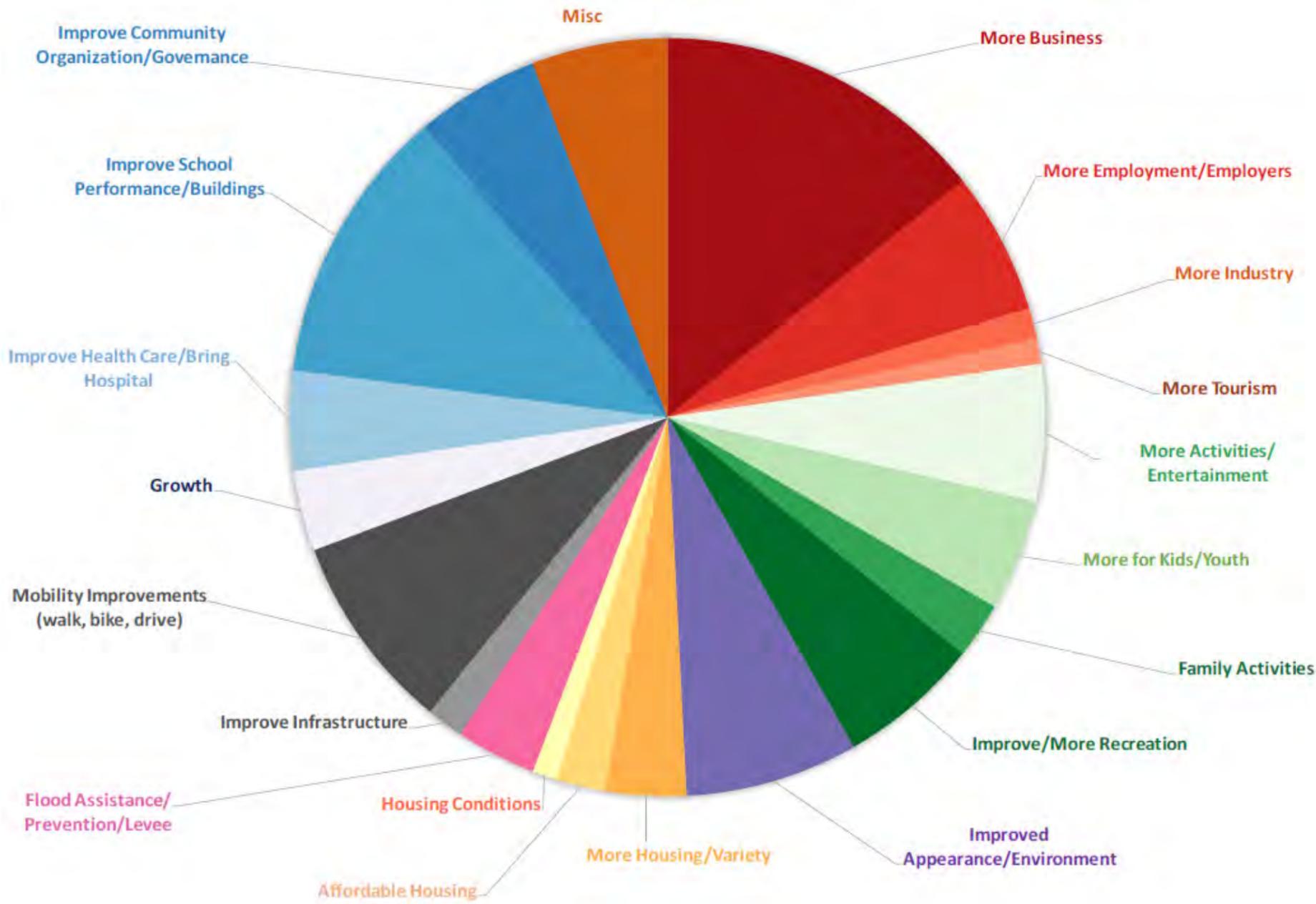


### Top 10:

1. Restaurant
2. Clothing Store
3. Coffee Shop / Café
4. Bar, Pub, or tavern
5. Hardware / General Store
6. Department Store
7. Farm Stand
8. Small Craft / Artisan Gallery
9. Book Store
10. Package Shipment

What citizens need most are businesses that can provide food, such as restaurants, coffee shops, and bars. They also would like to have clothing stores, hardware, and department store to provide essential products. About 20% of participants also expect the gallery and the book store to meet their cultural and artistic needs.

**Question: What is one major improvement or change that you would like to see in Wharton in the next 10 years?**



Category	Percentage
<b>Recreational Function</b> (Music, Activities / Entertainment, for Kids / Youth, Family Activities, Recreation)	25%
<b>Business and Employment</b> (Job Opportunities, Industry)	20%
<b>Public Service</b> (Community Organization Governance, School Performance /Buildings, Health Care / Bring Hospital)	20%
<b>Mobility</b> (Walk, Bike, Drive)	10%
<b>Housing</b> (Condition, Affordable, Variety)	8%
<b>Visual Appearance</b>	8%

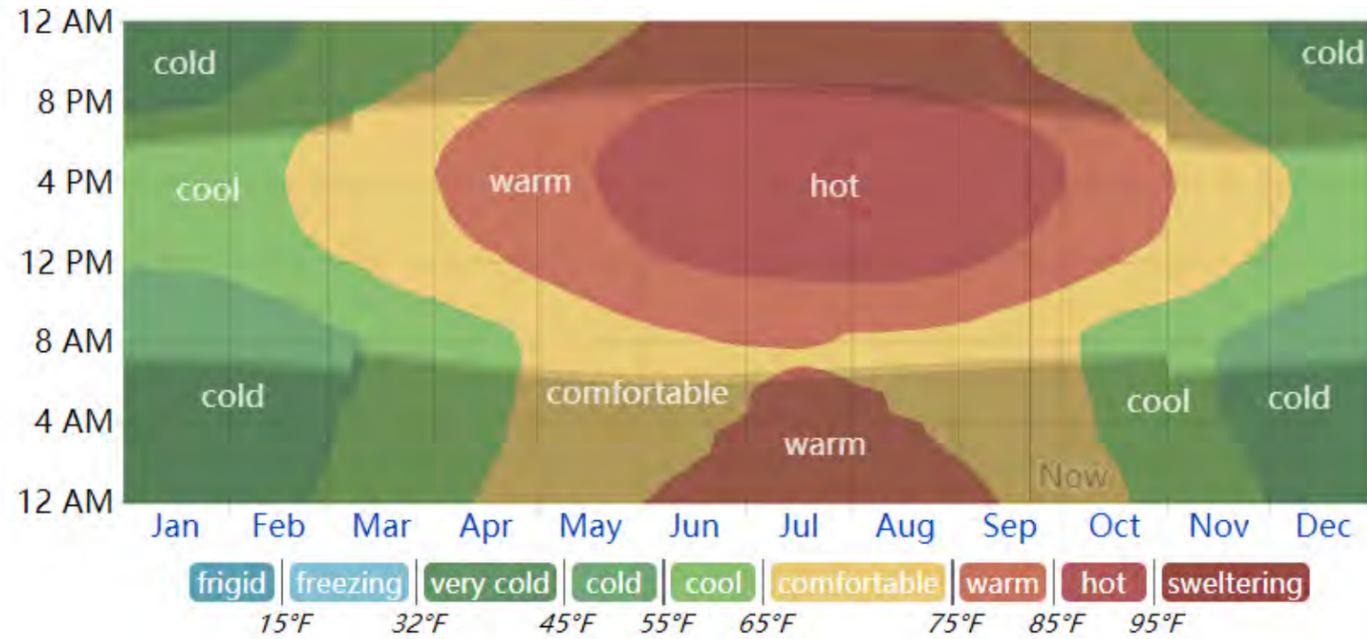
Residents expect to have more recreational functions such as activity space for families, kids, and youth. They also need more job opportunities and businesses. Public services such as community organizations, schools, and health care should also be improved.

Data Source: Wharton 2018 Comprehensive Plan

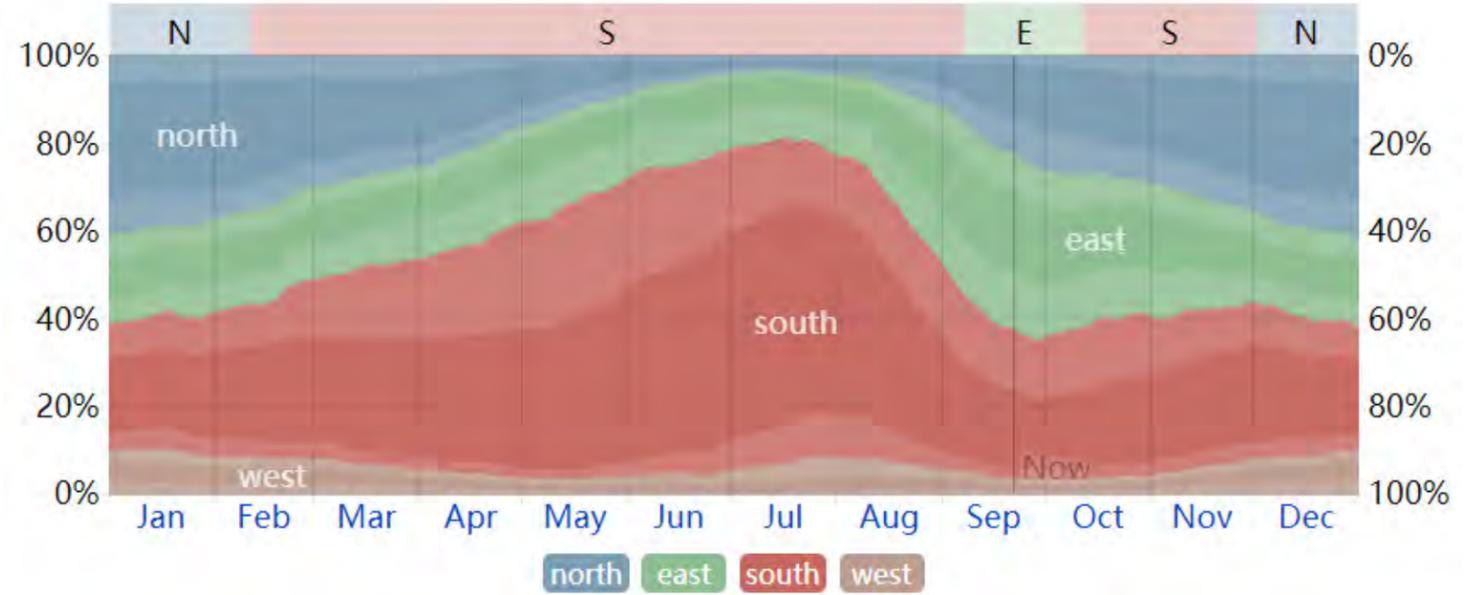
# 3.7 Physical Condition

## 3.7.1 Climate

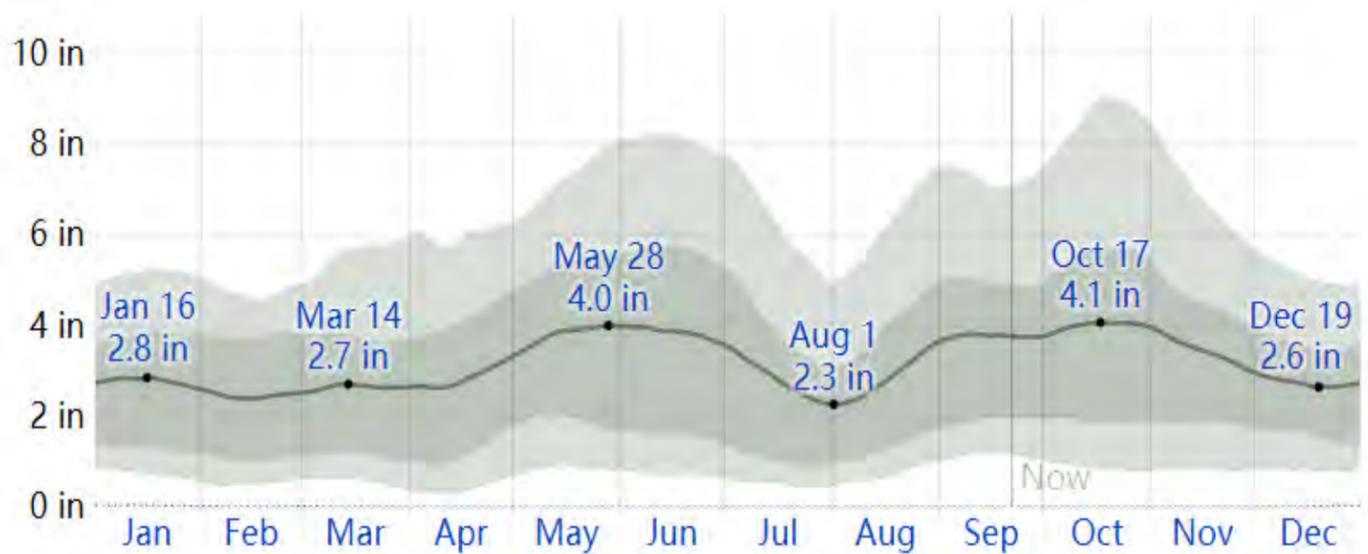
### Annual Temperature



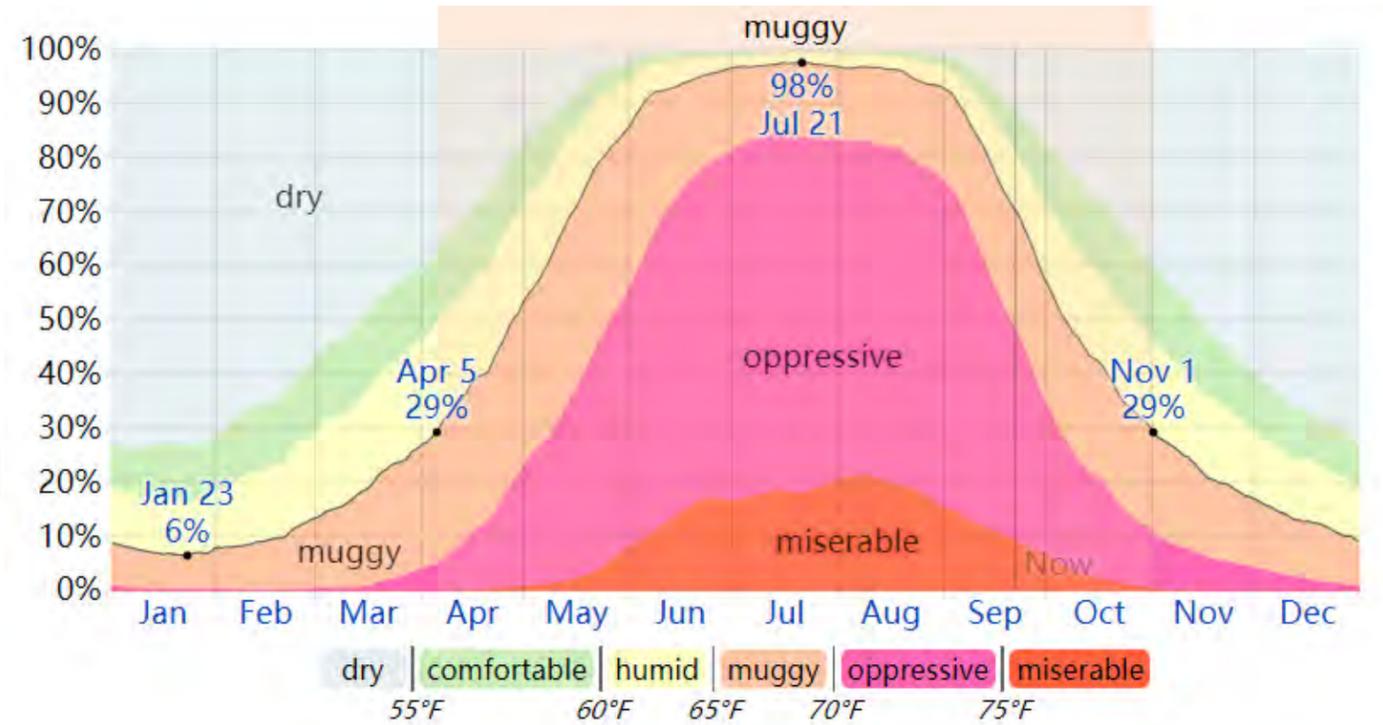
### Wind Direction



### Annual Monthly Rainfall



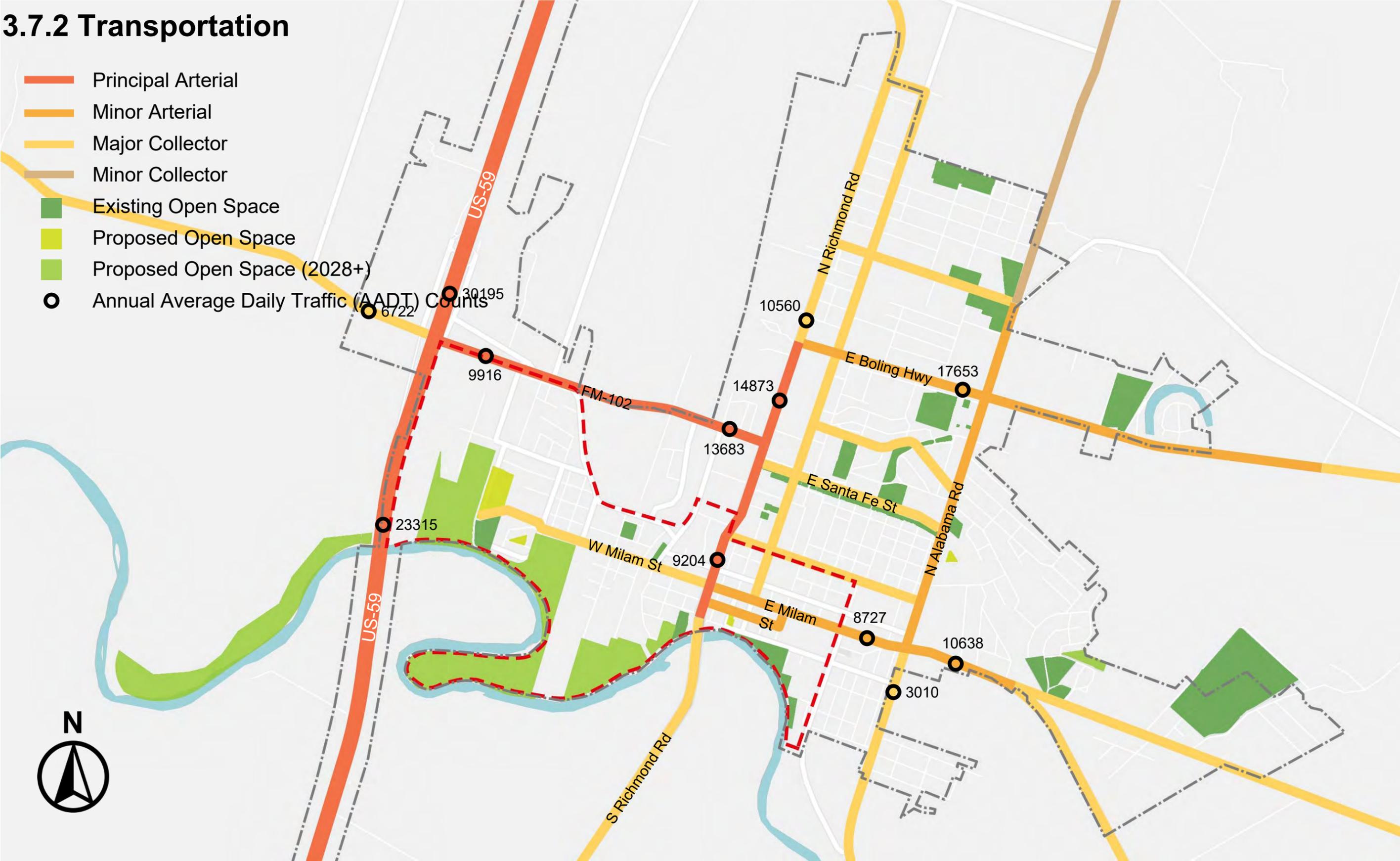
### Humidity Comfort Levels



Data Source: <https://weatherspark.com/y/8776/Average-Weather-in-Wharton-Texas-United-States-Year-Round>

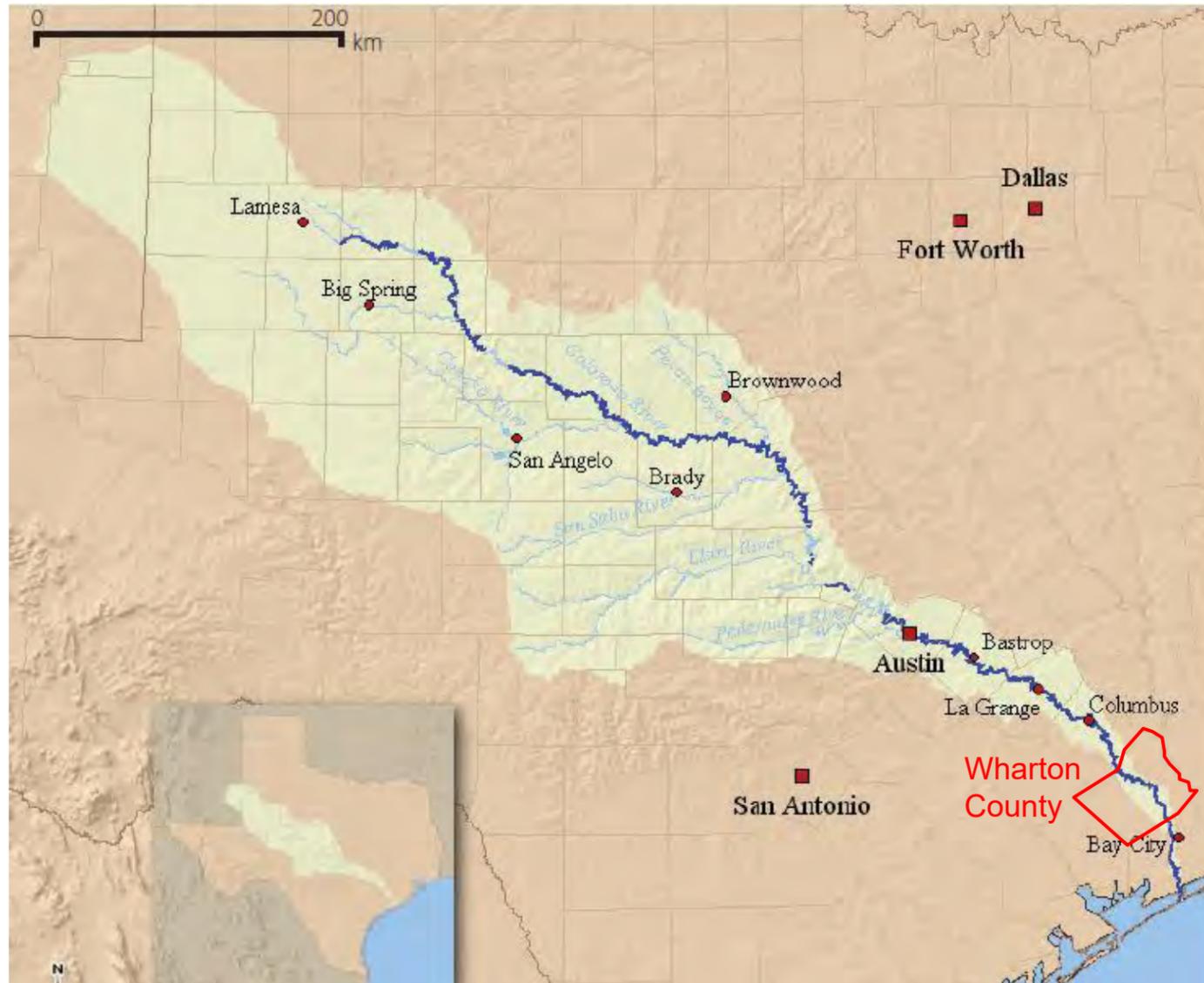
### 3.7.2 Transportation

- Principal Arterial
- Minor Arterial
- Major Collector
- Minor Collector
- Existing Open Space
- Proposed Open Space
- Proposed Open Space (2028+)
- Annual Average Daily Traffic (AADT) Counts



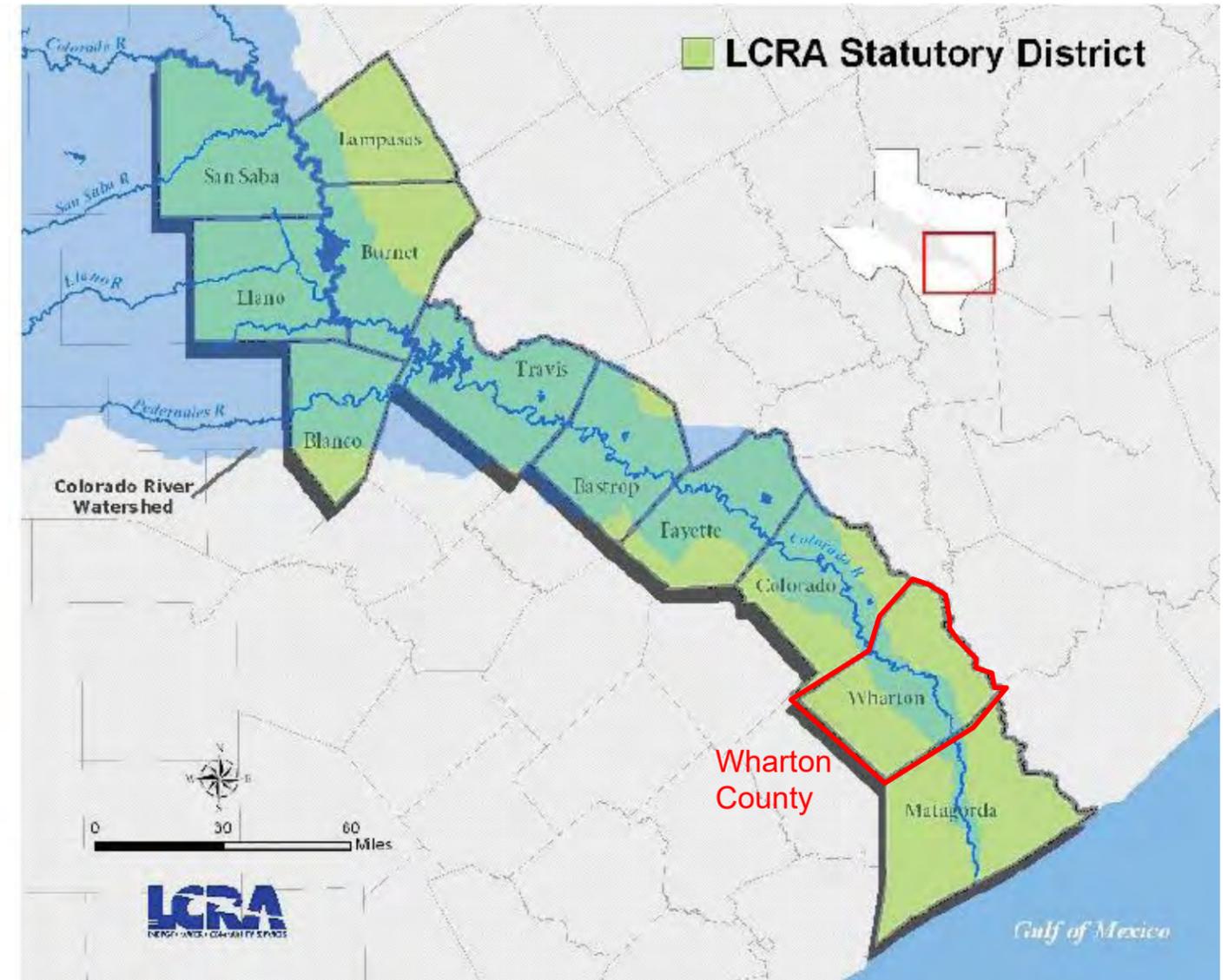
### 3.7.3 Flooding Issue

#### Colorado River Watershed



Map Source: Wharton Recovery Planning Assistance Team Final Report (Dec,2019)

#### Lower Colorado River Basin

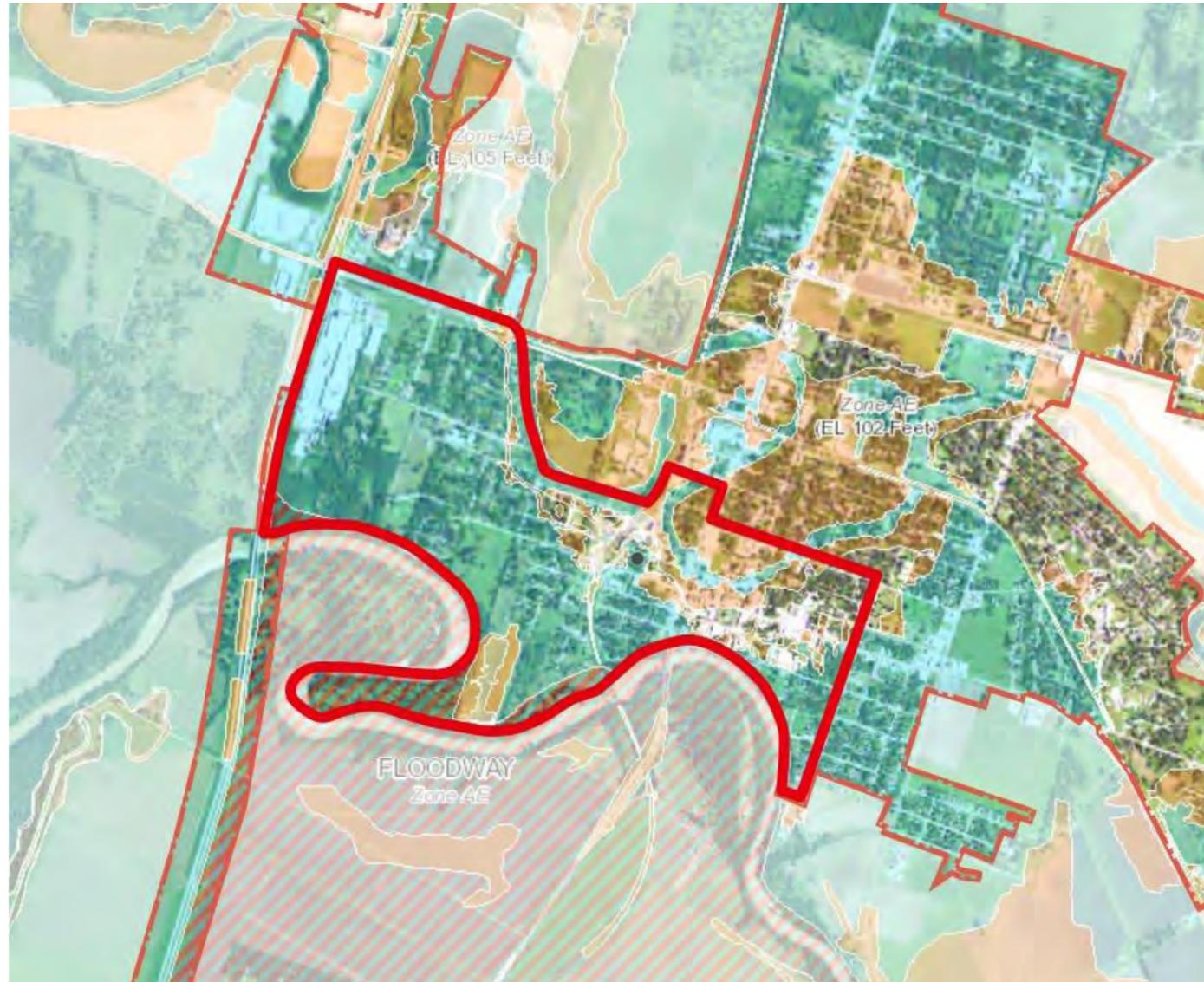


Map Source: Wharton Recovery Planning Assistance Team Final Report (Dec,2019)

#### Reason for Flooding

The City of Wharton is located near the Colorado River. The drainage basin of the Colorado River watershed covers around 15 percent of Texas. Wharton is in the Lower Colorado River Basin in the second-to-last county before reaching the Gulf of Mexico.

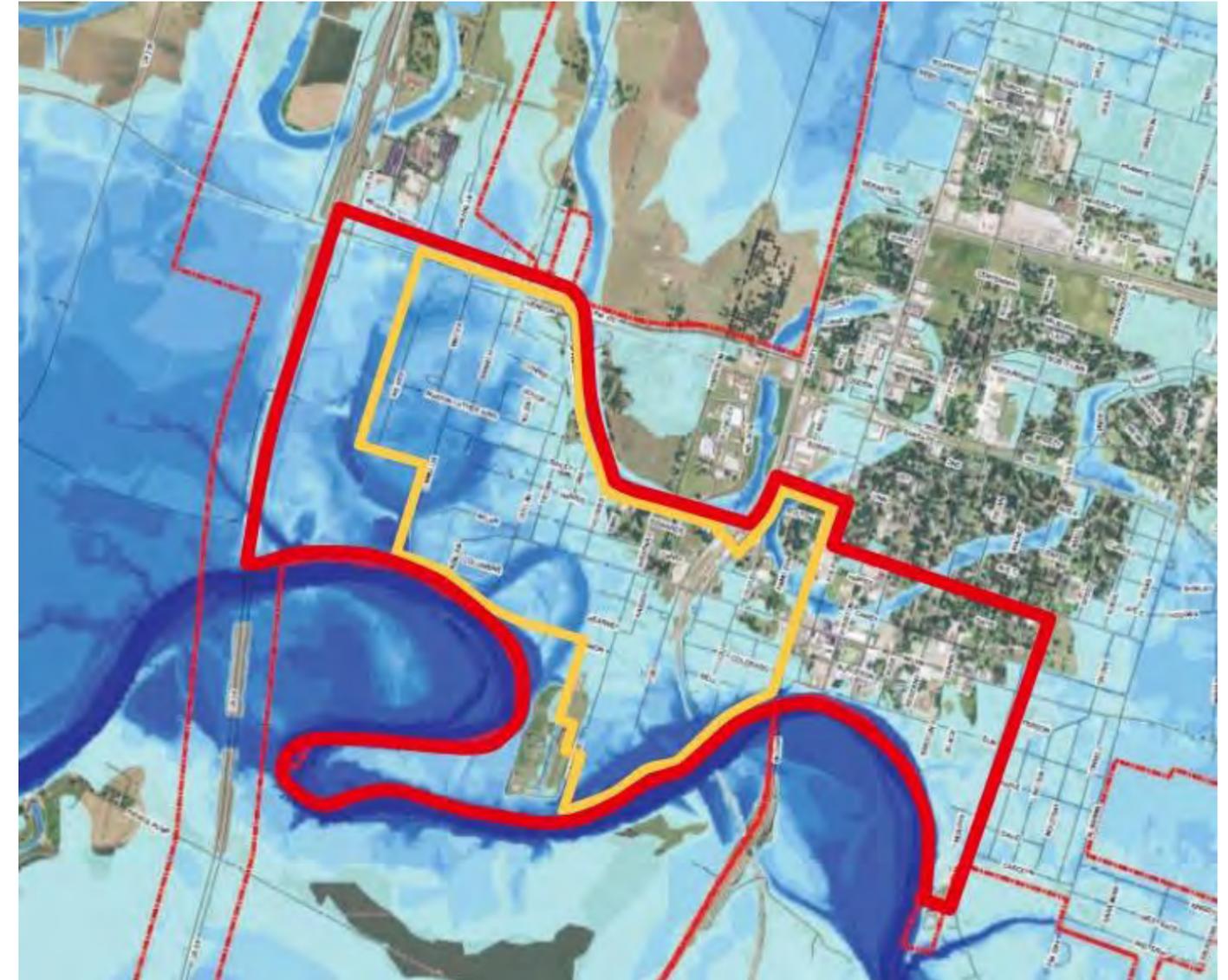
## Flood Hazard Zone



Map Source: Hazard Mitigation Plan 2016

- 1% Annual Chance Flood Hazard
- 0.2% Annual Chance Flood Hazard
- Study Area

## 100-Year Flood Depth

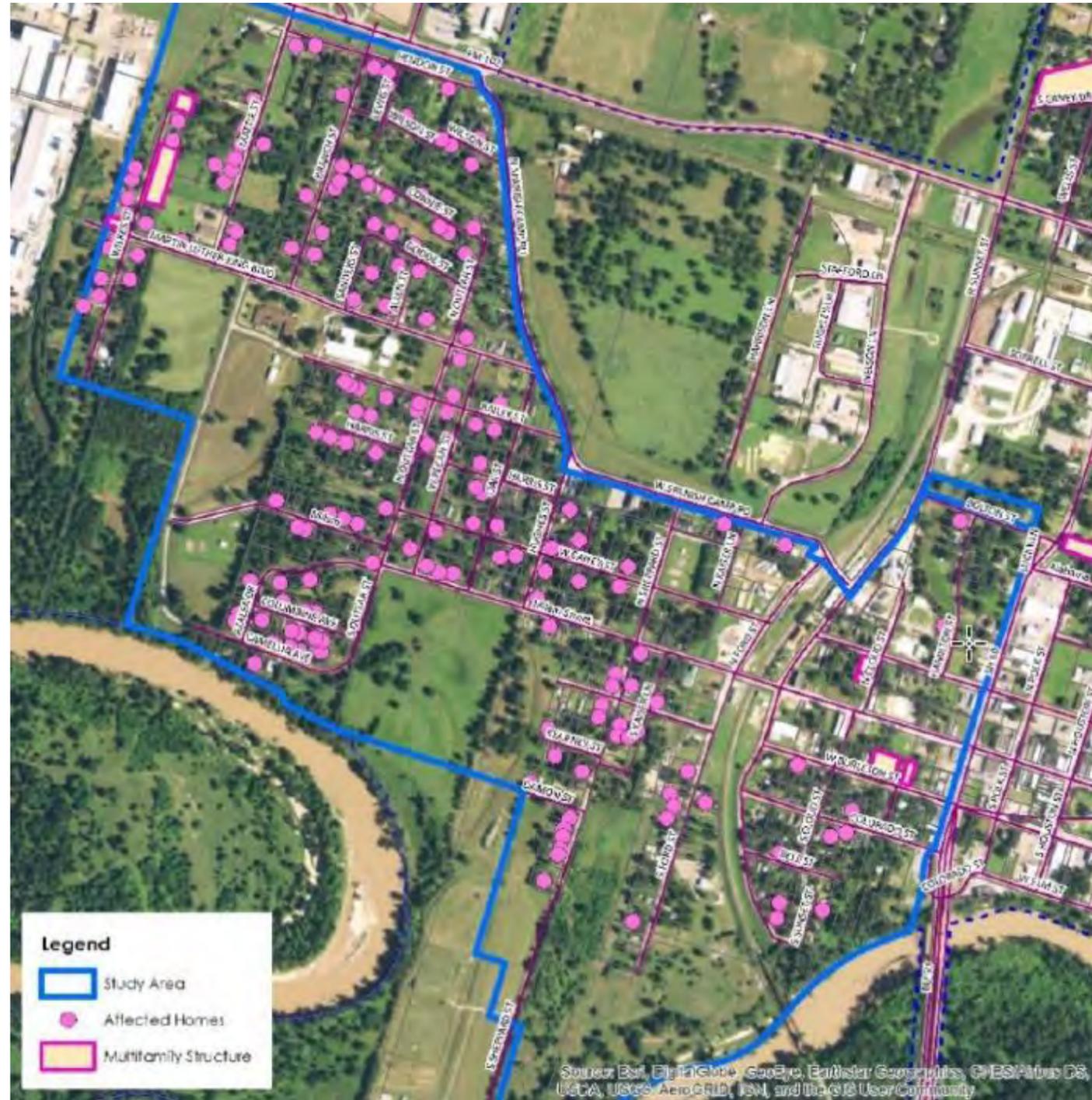


Map Source: Wharton Recovery Planning Assistance Team Final Report (Dec, 2019)

- 40 ft
- 0 ft
- West End Community
- Study Area

West End Community is the most vulnerable area within the City of Wharton

## West End Houses Affected by Hurricane Harvey



Data Source: Wharton 2018 Comprehensive Plan

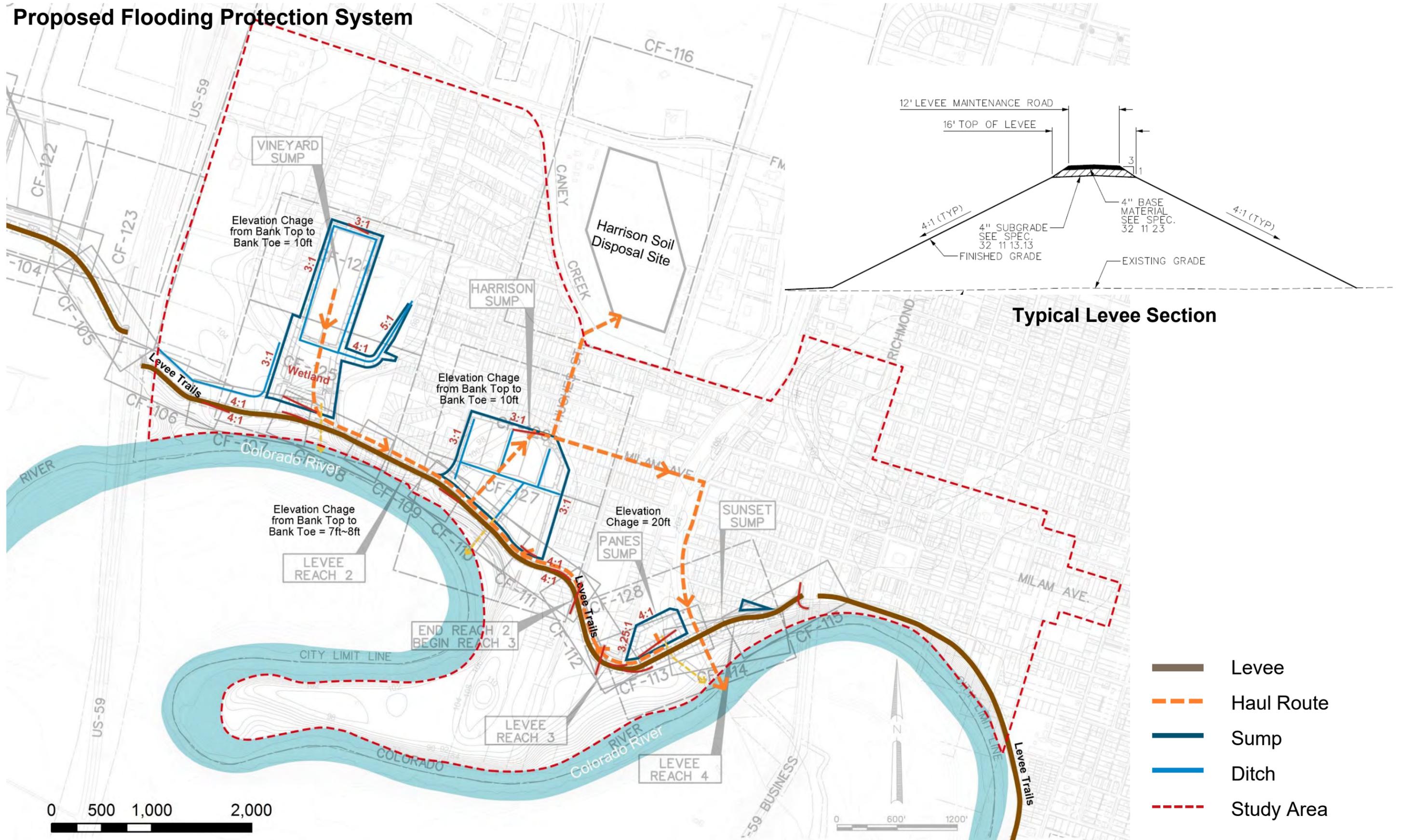
## Most Vulnerable Population

Jurisdiction (Percentage)	Youth Population (< 16)	Elderly Population (> 65)	Economically Disadvantage (Income < \$20,000)
City of East Bernard	28.08	15.05	5.68
City of El Campo	29.31	14.19	8.56
<b>City of Wharton</b>	<b>26.26</b>	<b>14.58</b>	<b>14.18</b>

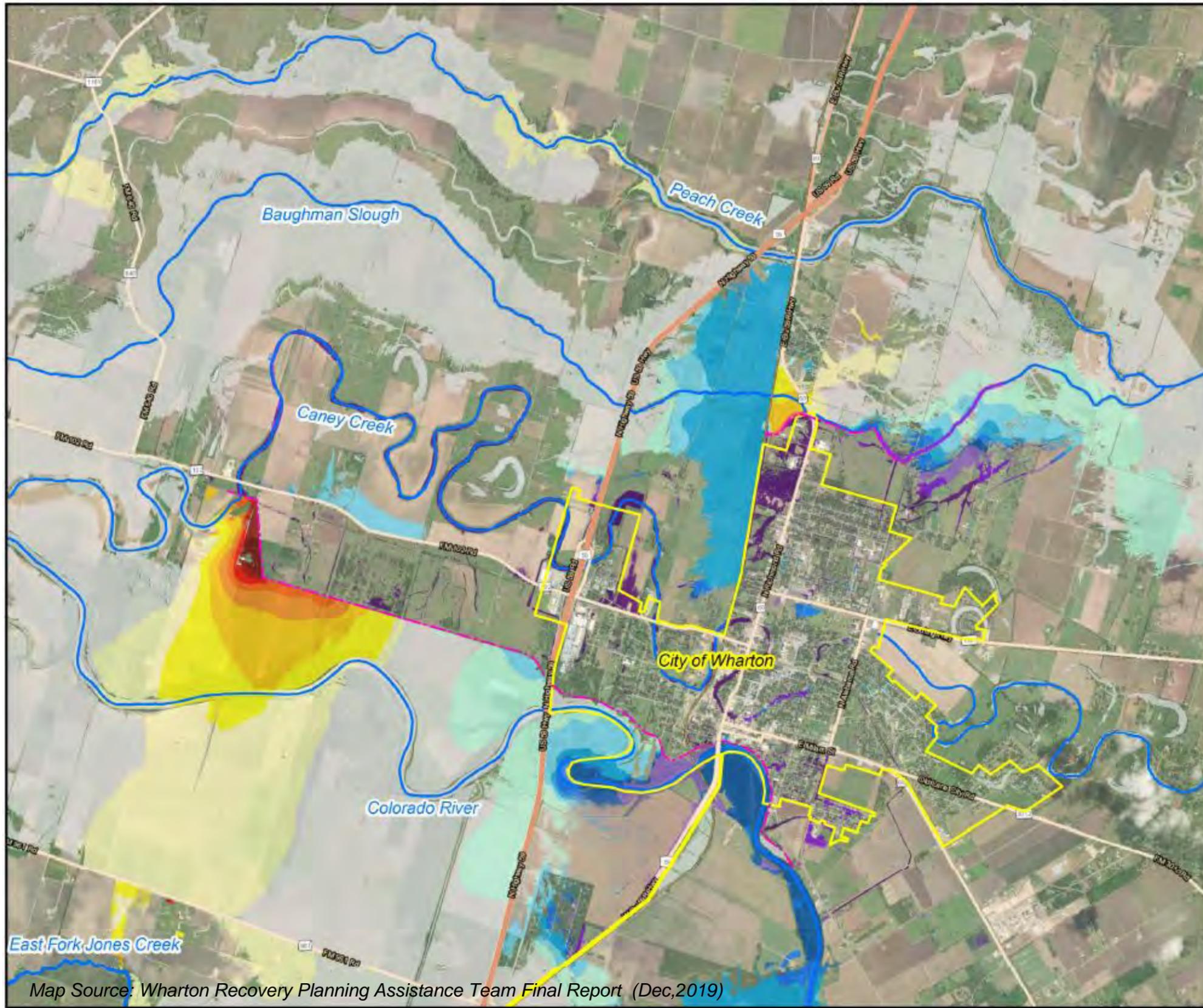
Data Source: Hazard Mitigation Plan 2016

There is approximately 40% percent of people in the City of Wharton are within vulnerable age. And the economical disadvantage percentage in the City of Wharton is much higher than in the other two cities.

# Proposed Flooding Protection System



# Proposed Flooding Protection Effect



US Army Corps of Engineers®

## Colorado River Flood Control Project 100-Year Water Surface Elevation (WSEL) Difference Mapping - All Phases Wharton, TX

### Legend

- Proposed Levees
- Proposed Channel Improvements
- City of Wharton
- Stream Centerlines

**Change in WSEL (ft)**

	- 0.1 - 0.1
	0.1 - 0.2
	0.2 - 0.3
	0.3 - 0.4
	0.4 - 0.5
	0.5 - 0.6
	0.6 - 0.8
	0.8 - 1
	1+

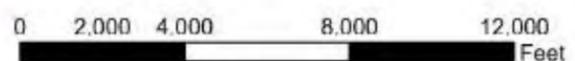
**Proposed minus Existing**

	< -1
	-1 - -0.8
	-0.8 - -0.6
	-0.6 - -0.5
	-0.5 - -0.4
	-0.4 - -0.3
	-0.3 - -0.2
	-0.2 - -0.1

Note: Mapping not shown in proposed sump areas



Imagery Source:  
ESRI World Imagery  
Service Layer Credits: Esri, HERE, Garmin, (c) OpenStreetMap contributors  
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus



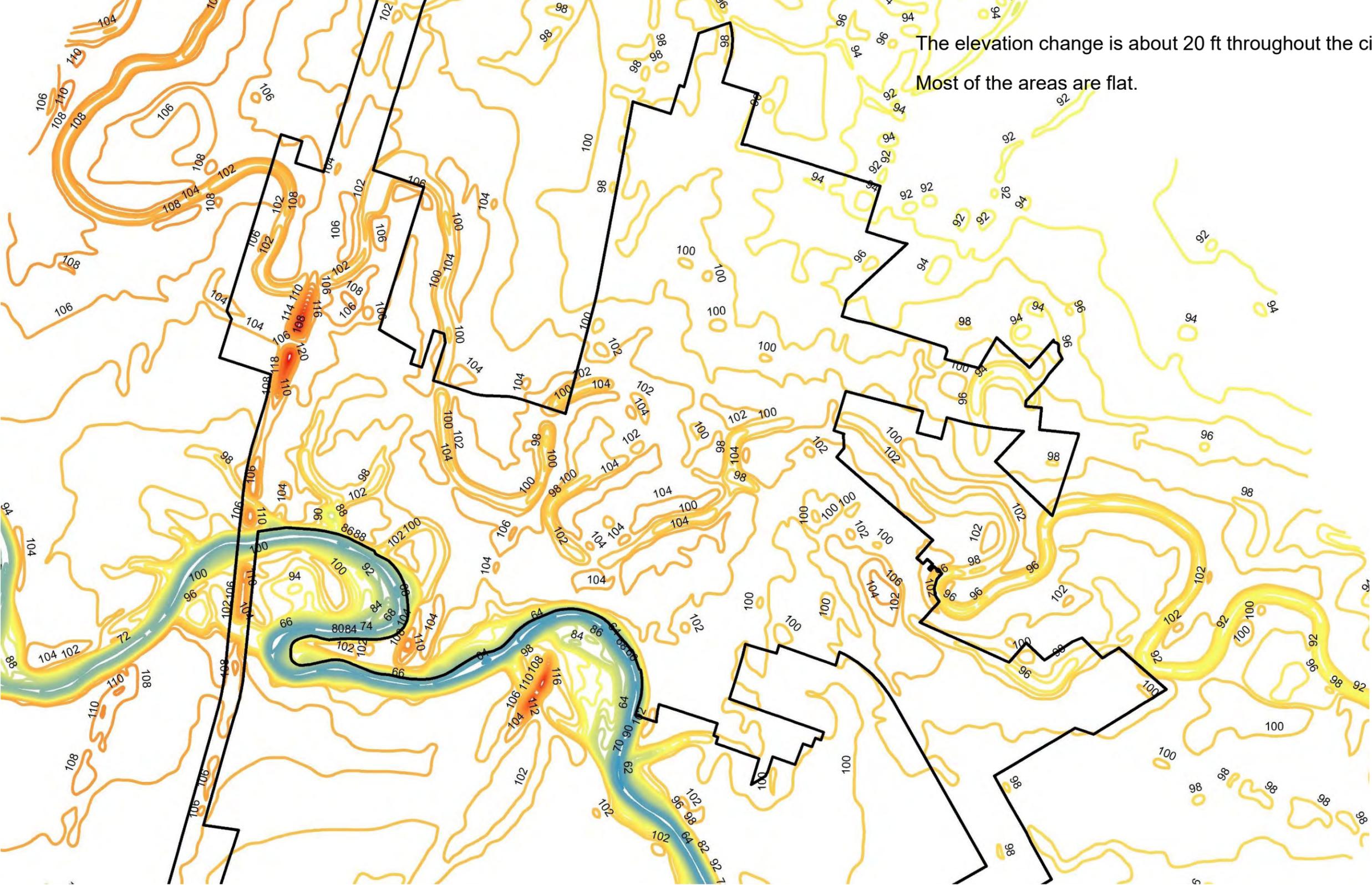
1 in = 4,000 feet

AVO 031244.L00  
October 2019



Map Source: Wharton Recovery Planning Assistance Team Final Report (Dec,2019)

# 3.7.4 Topography Contour Lines

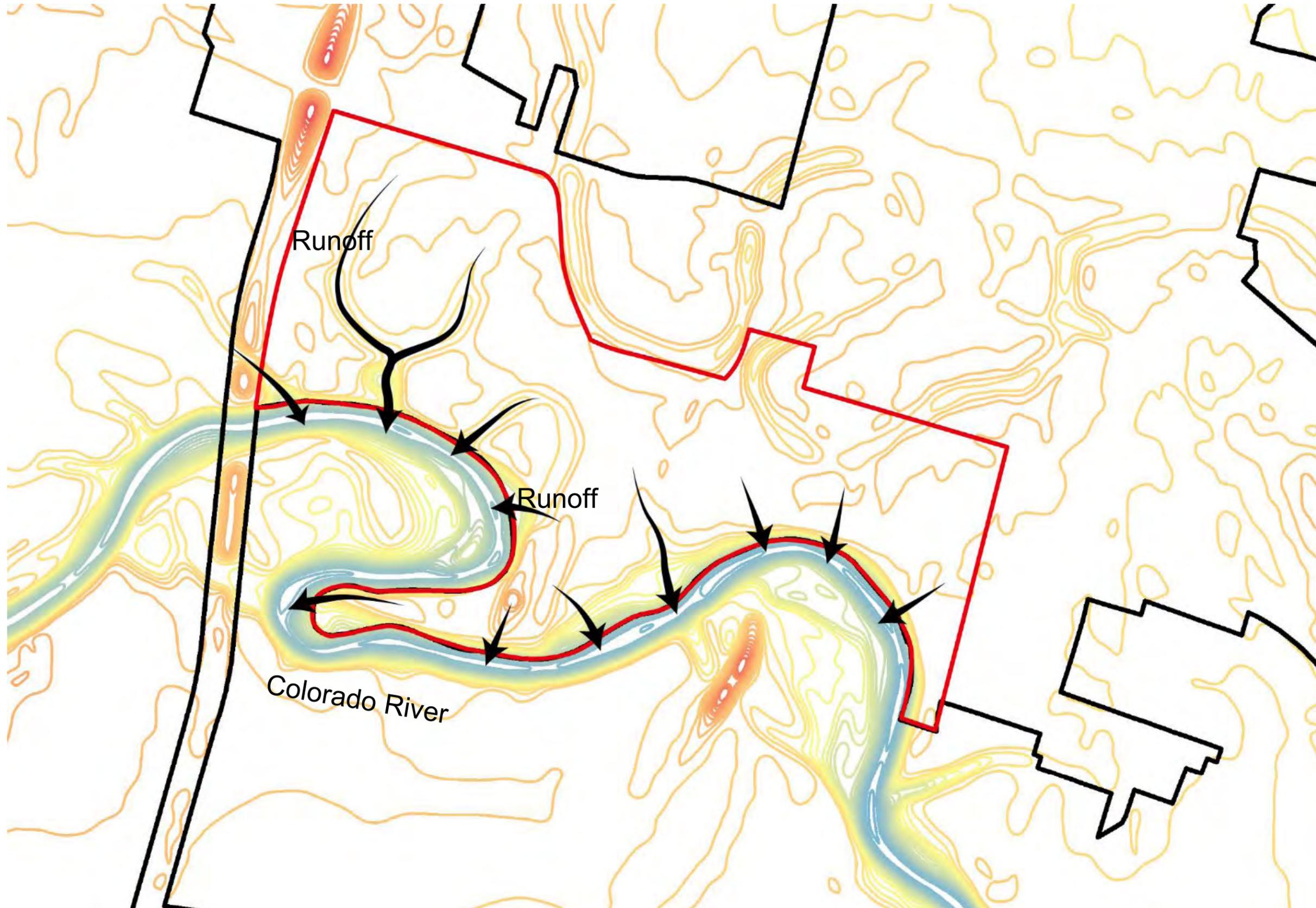


The elevation change is about 20 ft throughout the city.  
Most of the areas are flat.

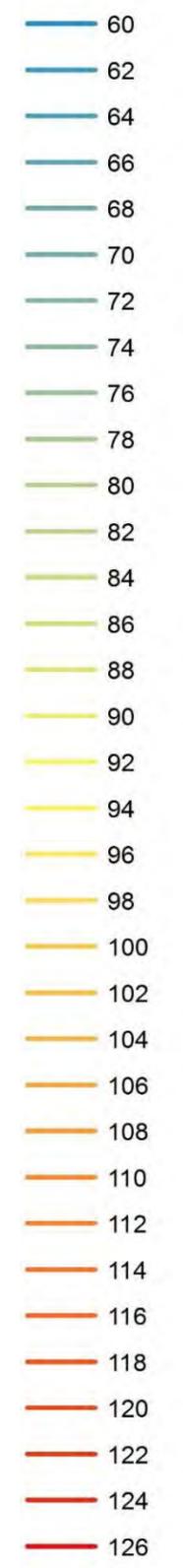
### Legend (ft)

- 60
- 62
- 64
- 66
- 68
- 70
- 72
- 74
- 76
- 78
- 80
- 82
- 84
- 86
- 88
- 90
- 92
- 94
- 96
- 98
- 100
- 102
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- 106
- 108
- 110
- 112
- 114
- 116
- 118
- 120
- 122
- 124
- 126

# Flow Direction

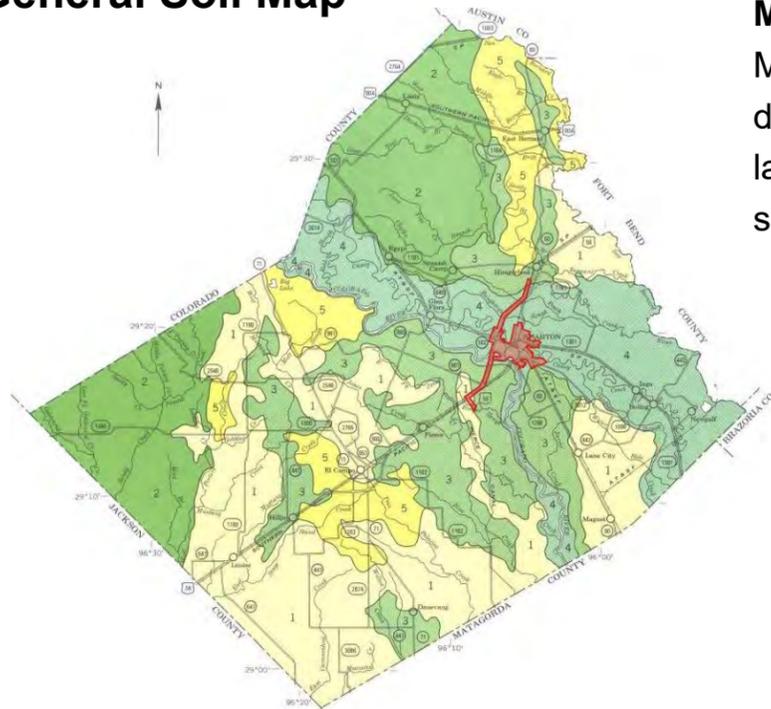


## Legend (ft)



## 3.7.5 Soil Condition

### General Soil Map



#### Miller-Norwood association:

Moderately well drained and well drained soils that have a surface layer and lower layers of clay and silt loam; on bottom lands.

#### Cn - Clemville-Norwood complex

- This complex consists mostly of **well-drained alluvial soils** on flood plains adjacent to major drainageways. The surface of these soils is nearly plane, but some areas have convex slopes
- **Runoff is slow** on the soils of this complex, and available water capacity is high. The soils are used mostly for **crops**, but a few areas are used for **pasture**.

#### Me - Miller clay

- It is **moderately well-drained** and adjacent to major **drainageways**. The areas are dissected by a network of very shallow and narrow low drainageways. The surface of this soil is mainly plane, but sloping areas are convex.
- Miller clay is used mostly for **crops**, but a few areas are used for **pasture**.

#### Mp - Miller clay, ponded

- This soil formed in clayey alluvium in oxbows and is **flooded frequently**. The oxbows are crescent-shaped and are remnants of old channels.
- The surface layer of this soil is calcareous, dark reddish-brown clay about 24 inches thick. Next are thick, mottled, clayey layers or stratified mottled layers of silt loam, clay, and silty clay loam.
- Miller clay, ponded, is used for **pasture** and as **wildlife refuge**. A few shallow depressions have been drained and are used for **crops**.

#### NoA - Norwood silt loam, 0 to 1 percent slopes

- It is adjacent to major streams and is dissected by a network of very shallow and narrow, low drainageways.
- **Runoff is slow** on this soil. This soil is used mostly for **crops**, but a few areas are used for pasture.

#### NoB - Norwood silt loam, 3 to 8 percent slopes

- This soil is along banks of old stream channels.
- **Runoff is rapid** on this Norwood soil, and the **hazard of erosion is severe** in the more sloping areas. If erosion is controlled and management is otherwise good, crops on this soil grow well. Most areas are used for **pasture**, but some are used for crops.

### Soil Unit



Five units in the city: NoA, NoB, Me, Mp, Cn

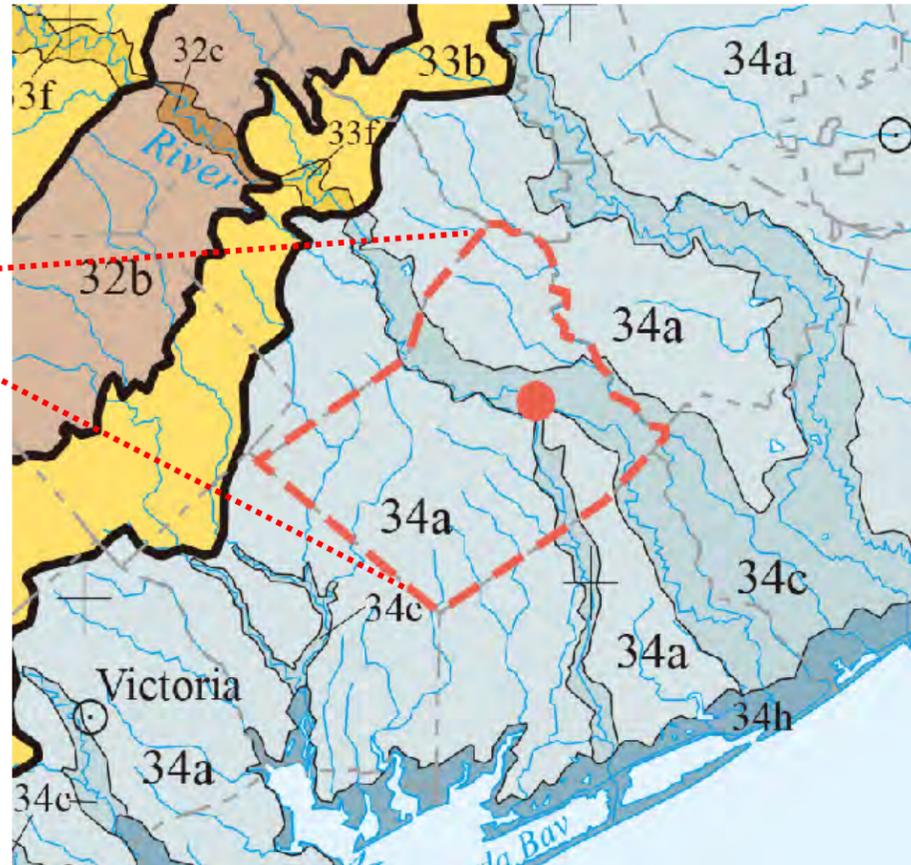
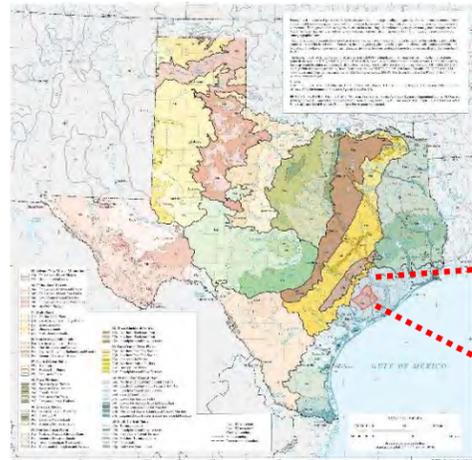
#### Legend

##### musym

As
BcA
BeA
Cn
EdA
Eh
LcA
Me
Mp
NoA
NoB
Nr
W

Map Source: Soil Survey of Wharton County, Texas. United States. Soil Conservation Service. 1974.

### 3.7.6 Ecoregion



#### City of Wharton

34 - Western Gulf Coastal Plain

34c - Floodplains and Low Terraces

### 34 Western Gulf Coastal Plain

The Western Gulf Coastal Plain is a relatively flat strip of land, generally 50 to 90 miles wide, adjacent to the Gulf of Mexico. The principal distinguishing characteristics of this ecoregion are its relatively **flat topography** and **mainly grassland** potential natural vegetation. Inland from this region the plains are older, more irregular, and have mostly **forest or savanna-type vegetation** potentials. Largely because of these characteristics, a higher percentage of the land is in cropland than in bordering ecological regions. **Rice, grain sorghum, cotton, and soybeans are the principal crops.** Urban and industrial land uses have expanded greatly in recent decades, and oil and gas production is common.

### 34c Floodplains and Low Terraces

Covering primarily the Holocene floodplain and low terrace deposits, the Floodplains and Low Terraces ecoregion, Bottomland forests of **pecan** (*Carya illinoensis*), **water oak** (*Quercus nigra*), **southern live oak** (*Q. virginiana*), and **elm** (*Ulmus* spp.), are typical, with some **baldcypress** (*Taxodium distichum*) on larger streams. On some of the terraces, **black hickory** (*Carya texana*), **post oak** (*Quercus stellata*) and **winged elm** (*Ulmus alata*) are found. Large portions of floodplain forest have been removed and land cover is now **a mix of forest, cropland, and pasture.**

Level IV Ecoregion	<b>34c. Floodplains and Low Terraces</b>
Area (sq. mi.)	1743
Physiography	Large river floodplains with sloughs, natural levees, and associated alluvial low terraces. Low gradient streams with sandy, silty, and clayey substrates.
Elevation / Local Relief (feet)	5-200 / 5-25
Surficial Geology; Bedrock Geology	Holocene alluvium and Holocene and Pleistocene terrace deposits of sand, silt, and clay.
Soil Order (Great Groups)	Vertisols (Hapluderts), Entisols (Fluvaquents), Mollisols (Haplustolls, Hapludolls), Inceptisols (Eutrudepts)
Common Soil Series	Pledger, Brazoria, Norwood, Asa, Ganado, Rydolph, Navaca, Navidad, Mequin, Sinton
Soil Temperature / Soil Moisture Regimes	Hyperthermic / Udic, Ustic, Aquic
Mean Annual Precipitation (in.)	31-48
Mean Annual Frost Free Days	260-300
Mean Temperature (F) (Jan. min/max; July min/max)	42/63; 74/93
Vegetation	Bottomland forests of pecan, American elm, cedar elm, live oak, water oak, ash, sugar hackberry, cottonwood, black willow, and some bald cypress on larger rivers and streams.
Land Use and Land Cover	Deciduous forest and woodland; cropland with corn, cotton, grain sorghum, and some pecan orchards; pasture and hayland; forested wetlands.

Map Source: <https://www.epa.gov/eco-research/ecoregion-download-files-state-region-6>

## Potential Plantation in the Ecoregion



**Pecan**  
*Carya illinoensis*



**American Elm**  
*Ulmus americana*



**Cedar Elm**  
*Ulmus crassifolia*



**Live Oak**  
*Quercus virginiana*



**Water Oak**  
*Quercus nigra*



**Ash**  
*Fraxinus*



**Sugar Hackberry**  
*Celtis laevigata*



**Cottonwood**  
*Populus*

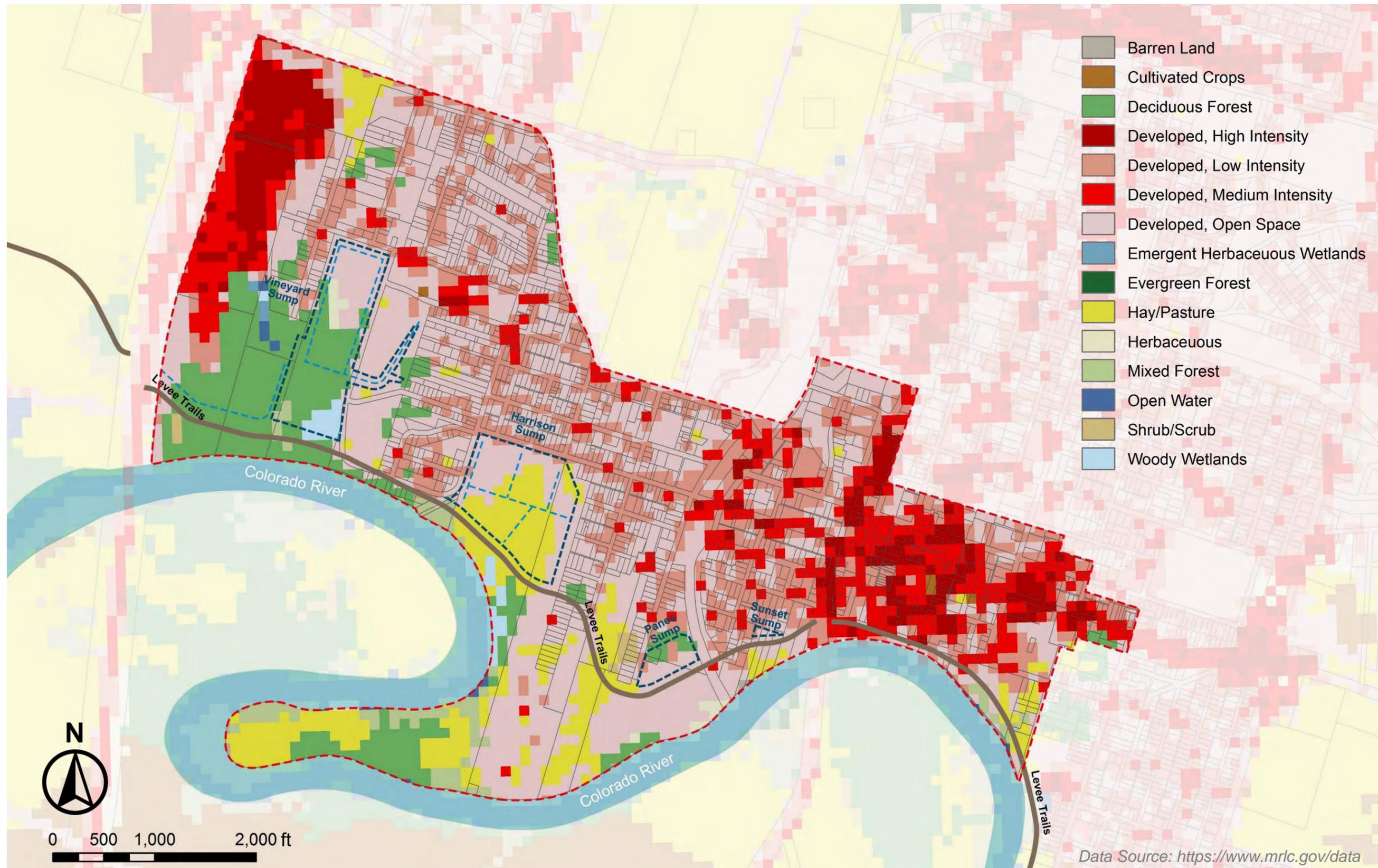


**Black willow**  
*Salix nigra*



**Bald Cypress**  
*Taxodium distichum*

### 3.7.7 Land Cover

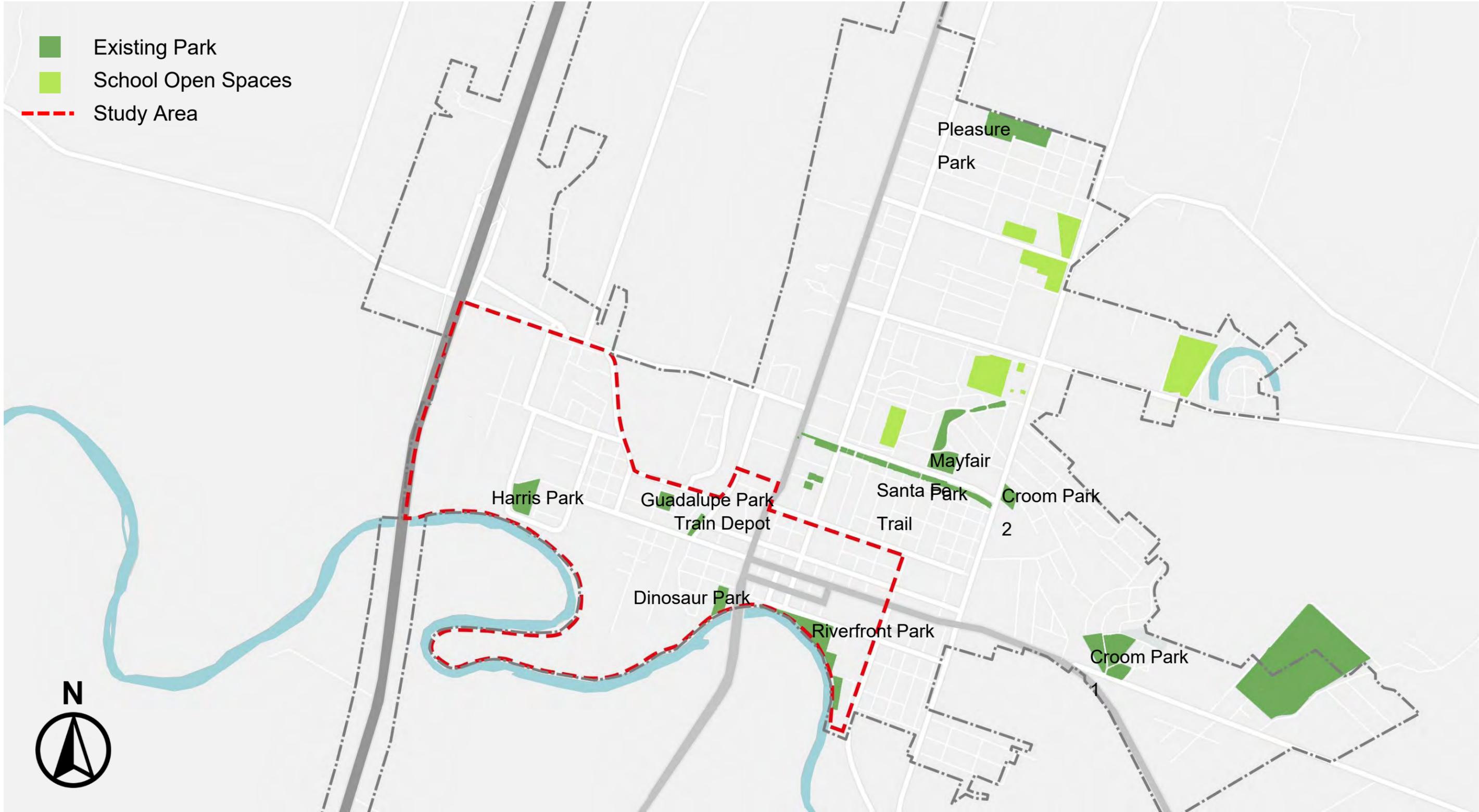


# 3.7.8 Tree Canopy



# 3.8 Recreation & Open Space Analysis

## 3.8.1 Existing Parks and Open Spaces



## Existing Parks and Service

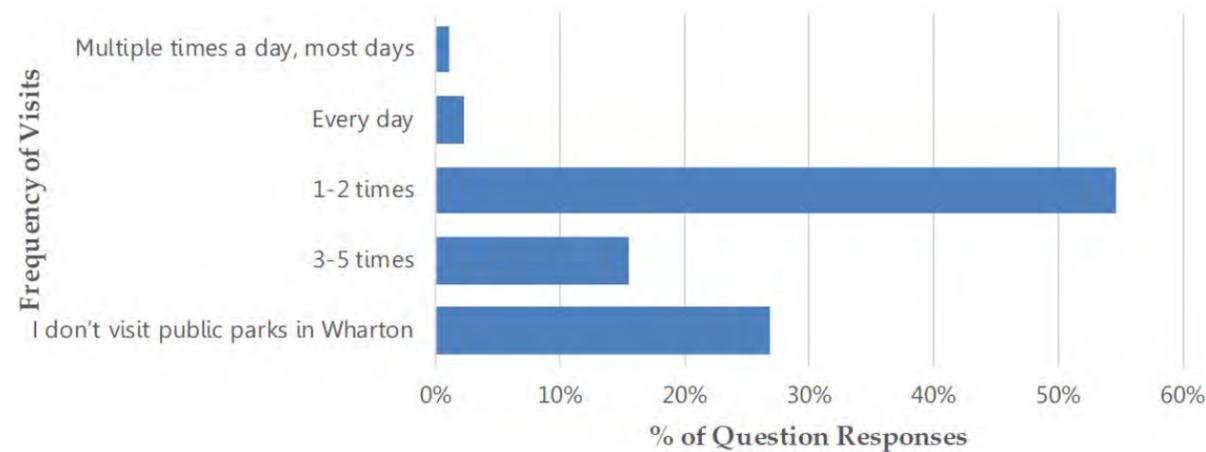
	Park Name	Type of Park	Area (Acres)	Households Served	Ball Field	Basketball Court	Playground	Picnic tables	Bar	Pavilions
1	Harris Park	Neighborhood	6.36	298	★	★★	★	★		
2	Guadalupe Park	Neighborhood	2.17	119		★	★	★		
3	Dinosaur Park	Neighborhood	2.96	260		★	★	★		
4	Riverfront Park	Neighborhood	12.32	445		★	★	★		
5	Train Depot	Neighborhood	1.20	143						
6	Croom Park 1	Neighborhood	9.96	602	★★★★★		★	★		
7	Croom Park 2	Neighborhood	2.19	215		★★	★	★		
8	Mayfair Park	Neighborhood	10.38	612	★			★	★	
9	Pleasure Park	Neighborhood	12.43	375	★			★		
10	Santa Fe Trail	Linear Park	9.09	N/A						★

- ★ Means the number of facilities. Most parks have multiple picnic tables.
- Parks from No.1 to No.5 are within the study area.

### 3.8.2 Parks & Recreation Survey

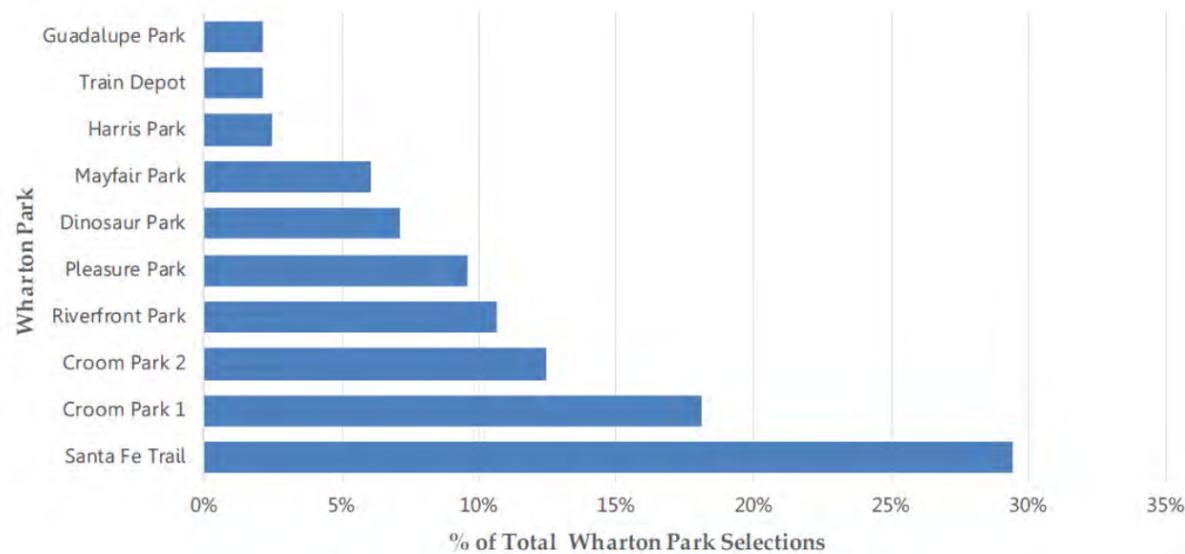
The survey was initially distributed to Wharton ISD students during March 2018 and made available to the general public in April 2018. The Parks Survey remained open until the end of May 2018. 194 respondents completed the Parks Survey.

#### The times of visiting a park a week



Most respondents report visiting a public park in Wharton (73%). Over 50% of the respondents visit parks one to two times a week.

#### Most commonly visited Wharton parks

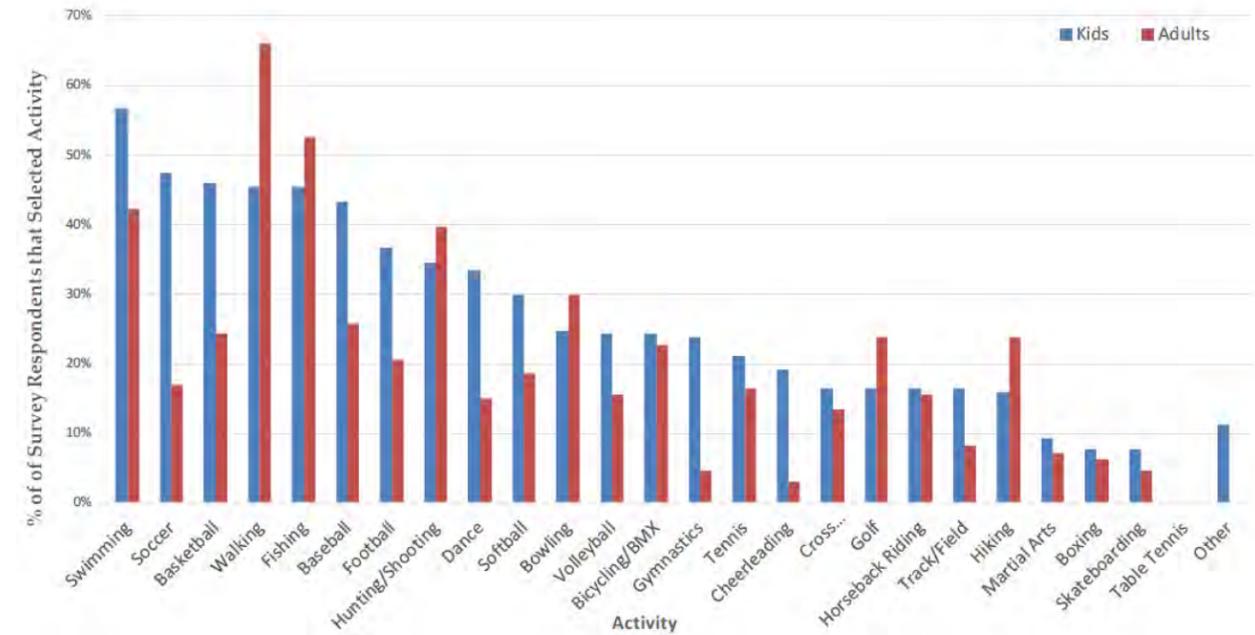


Santa Fe Trail is the most commonly visited Wharton park among survey respondents. The most popular park within the study area is Riverfront Park.

Data Source: Wharton 2018 Comprehensive Plan

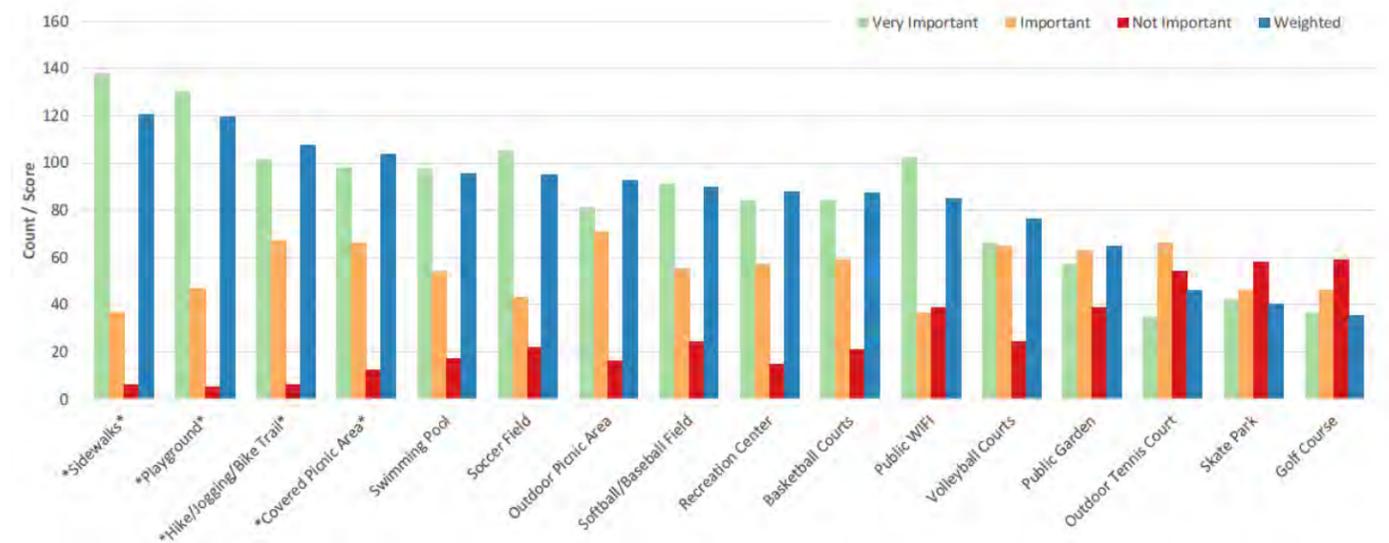
#### Top Activities for Children & Adults

The survey shows swimming, fishing, walking, and soccer are the most popular recreational activities among Wharton youth. The most popular youth team sports are soccer, basketball, and baseball. Walking, fishing, swimming, and hunting/shooting are the most popular adult activities. The most popular adult team sports are baseball, basketball, and football.

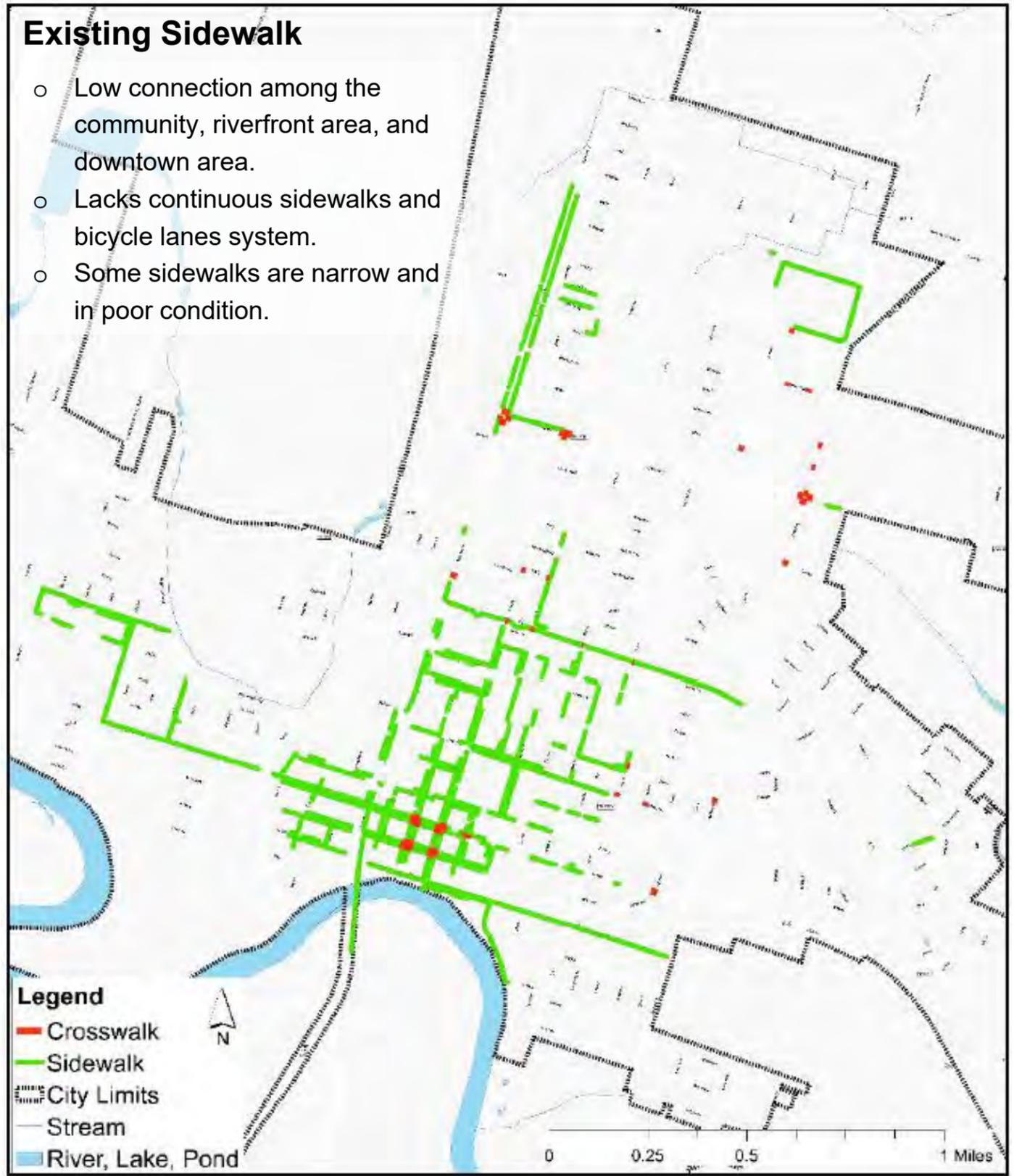


#### Additional Facilities Wanted

The survey asked respondents to identify and rank additional recreational facilities in terms of importance and priority. The top important facilities are sidewalks, playgrounds, hike/jogging/bike trail; and a covered picnic area.

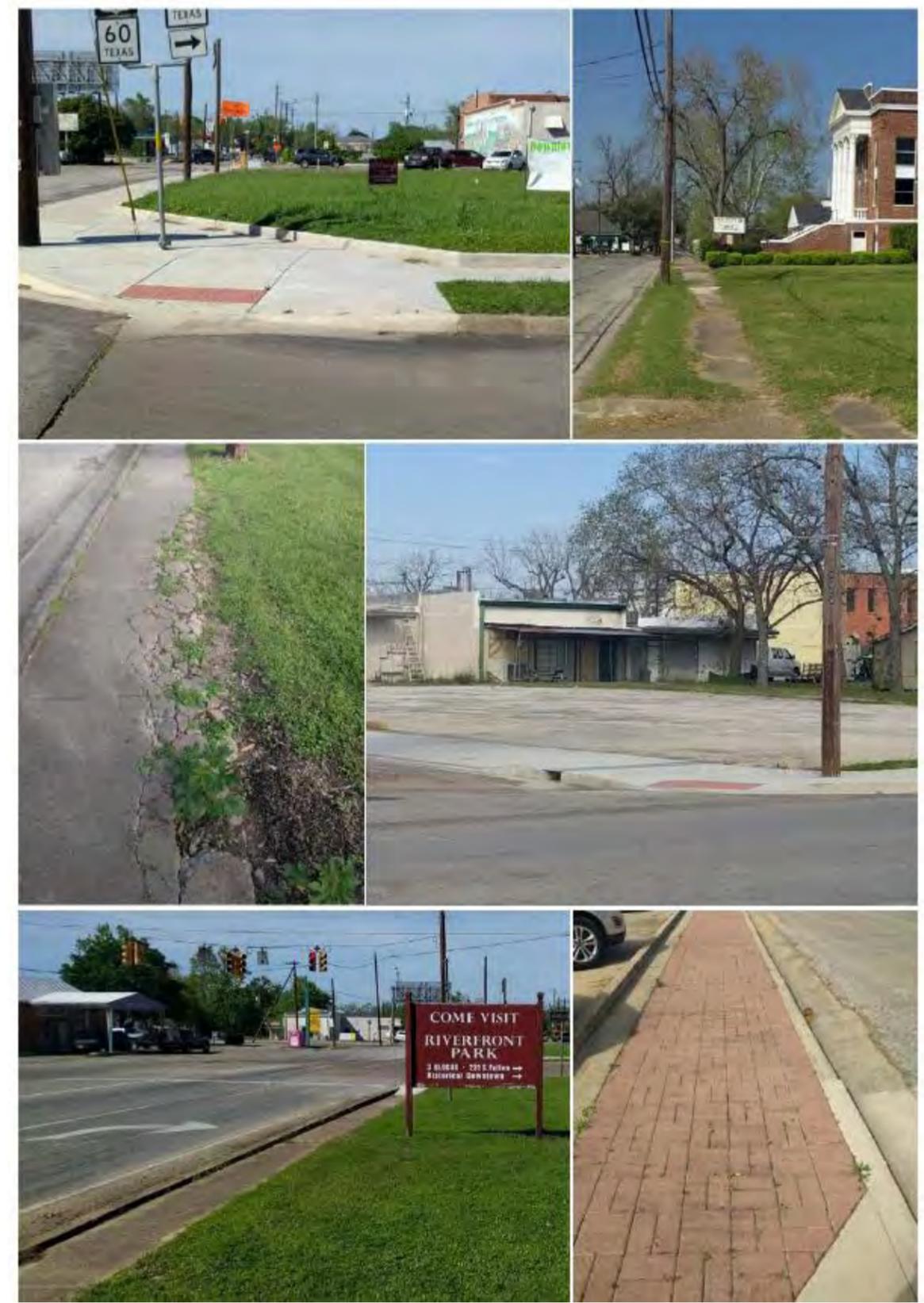


### 3.8.3 Existing Sidewalk Condition



Map Source: Wharton 2018 Comprehensive Plan

### Sidewalk Condition



### 3.8.4 Recommended Connectivity Plan

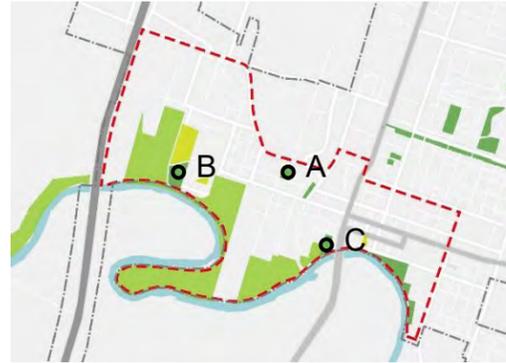


# 3.9 Visual Survey

## Parks



A. Guadalupe Park



B. Harris Park



C. Dinosaur Park

## Train Depot



The **Train Depot** is a neighborhood park located in central Wharton at the intersection of East Milam Street and South Sunset Street. The park consists of a winding, **0.1-mile path lined with trees and benches** and illuminated by decorative lighting at night. *Map Source: <https://www.google.com/maps/>*

## Public Buildings



A. Wharton County Courthouse



B. Dawson Community Resource Center



C. Wharton City Utilities

## Roads



A. TX-60 (Principle Arterial)



B. E Milan St (Minor Arterial)



C. W Milan St (Major Collector)

## Riverfront Area



A. Riverfront Park



B



C

## Murals



Map Source: Wharton 2018 Comprehensive Plan

## 3.10 Summary

### Strengths & Opportunities

- Location: the City of Wharton is within a 1-hour drive circle of Houston, which has the potential to attract tourism.
- Land Use: Most of the undeveloped areas along the Colorado River will transfer to recreational/open space in the future.
- Ownership: Open spaces along the river will be owned by the city, which could be leveraged for development.
- Population: The population of Wharton is forecasted to increase in the next 20 years.
- Culture: Have rich local agricultural history and production.

### Weakness & Threats

- Demography: There are a higher percentage of economically disadvantaged families, senior people(>65) and children(<17).
- Connectivity: Low connection among the community, riverfront area, and downtown area.
- Walkability: Lack of continuous sidewalks and bike lane system.
- Flooding: Almost all study area is under 100-year flood plain.

### Community Needs

- General Survey: Recreational spaces, business & employment, public service.
- Parks & Recreational survey: sidewalks, playgrounds, hike/jogging/bike trails, sports fields.

# 4 Development Program

4.1 Project mission statement	45
4.2 Goals and Objectives	45
4.3 Design program matrix	45
4.4 Designed Spaces	46-49

## 4.1 Mission Statement

To propose a levee green space along the bank of the Colorado River in the city of Wharton, encompassing recreational open spaces and flood defense facilities to improve the ecological and social resilience, stimulate local businesses, and improve the living quality for residents.

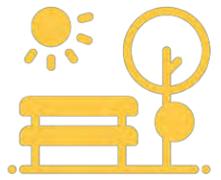
## 4.2 Goals & Objectives

### Ecology



- Develop greenway corridor along Colorado River to address the flooding issue
- Apply flood mitigation and stormwater management facilities such as sump, retention/detention pond in open spaces
- Design rain gardens and bioswales along trails
- Increase public awareness about the basic knowledge about flood control and stormwater management

### Recreation



- Develop a trail system to meet the recreational needs of the local residents and to improve the connectivity of the community.
- Improve recreational facilities such as community parks, riverfront parks, community gardens, and sports facilities.

### Society and Economy



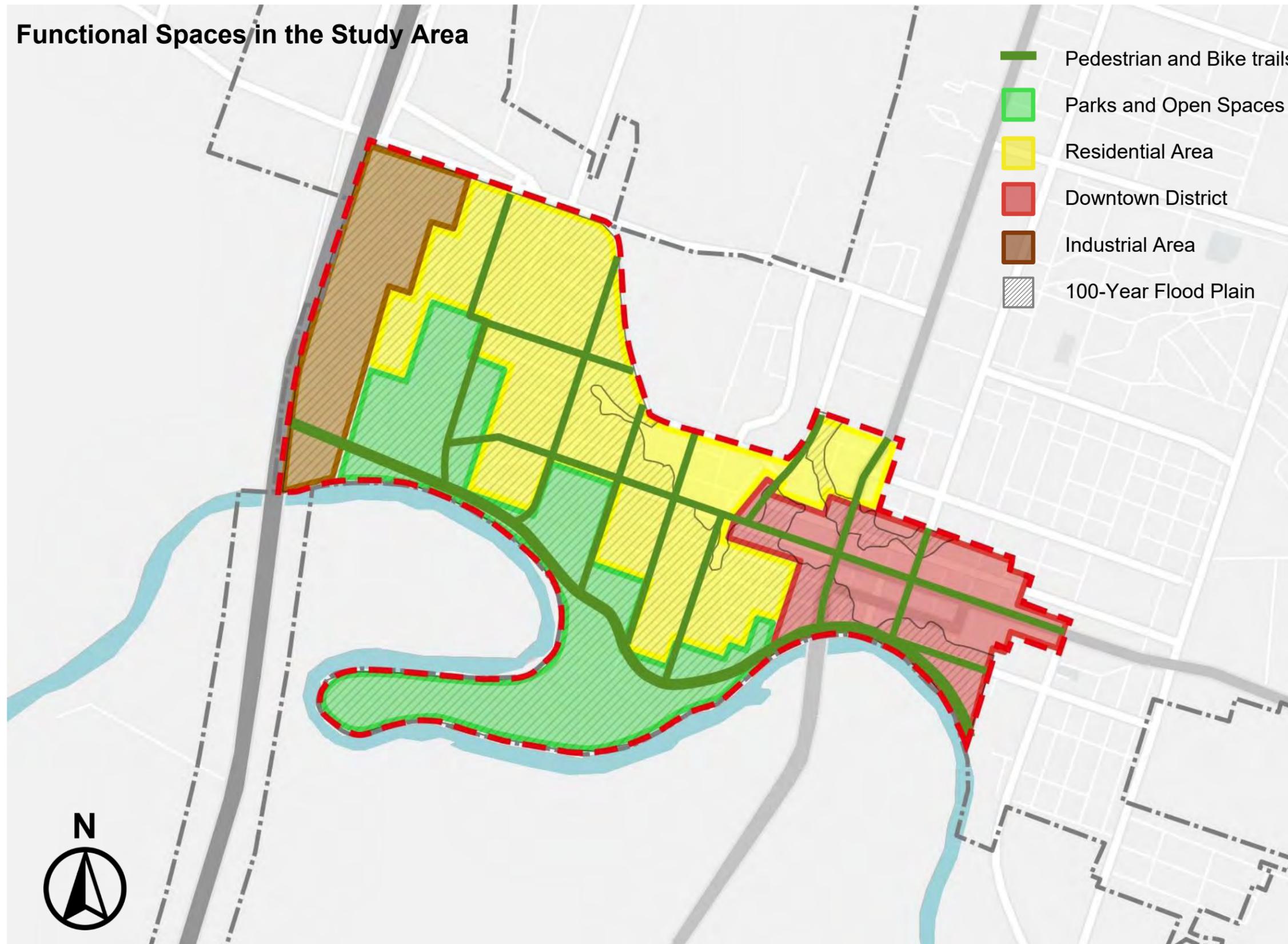
- Promote walkable/bikeable circulations within the community and along the river.
- Create recreational spaces to attract businesses and tourism
- Protect local historical and cultural sites such as the train depot and some old buildings.

## 4.3 Design Program Matrix

Users		Activities	Spaces	Elements
RESIDENTS	Children & Teenagers	<ul style="list-style-type: none"> <li>• Learning</li> <li>• Play</li> <li>• Gathering</li> </ul>	<ul style="list-style-type: none"> <li>• Playing Area</li> <li>• Sports Field</li> <li>• Plaza</li> <li>• Park</li> <li>• Study Area</li> </ul>	<ul style="list-style-type: none"> <li>• Play Ground</li> <li>• Swimming Pool</li> <li>• Soccer Field</li> <li>• Baseball Field</li> <li>• Recreation Center</li> <li>• Education Institute</li> </ul>
	Middle Ages	<ul style="list-style-type: none"> <li>• Working</li> <li>• Shopping</li> <li>• Gathering</li> <li>• Entertainment</li> <li>• Exercise</li> <li>• Art and Music activities</li> <li>• Night Life</li> </ul>	<ul style="list-style-type: none"> <li>• Entertainment Space</li> <li>• Sports Field</li> <li>• Shopping Area</li> <li>• Food Street</li> <li>• Plaza</li> <li>• Park</li> </ul>	<ul style="list-style-type: none"> <li>• Bike and Hike Trails</li> <li>• Retail / Shopping Mall</li> <li>• Restaurant</li> <li>• Coffee Shop</li> <li>• Picnic Area</li> <li>• Bar</li> <li>• Book Store</li> <li>• Live House</li> </ul>
	Senior People	<ul style="list-style-type: none"> <li>• Health Care</li> <li>• Gathering</li> <li>• Exercise</li> <li>• Entertainment</li> <li>• Learning</li> </ul>	<ul style="list-style-type: none"> <li>• Wellness Space</li> <li>• Shopping Area</li> <li>• Plaza</li> <li>• Park</li> </ul>	<ul style="list-style-type: none"> <li>• Community Center</li> <li>• Small Clinic / Pharmacy</li> <li>• Retail / Shopping Mall</li> <li>• Life-long Learning Center</li> <li>• Edible Garden</li> </ul>
VISITORS	Visitors	<ul style="list-style-type: none"> <li>• Business</li> <li>• Visit Friends / Families</li> <li>• Travel</li> </ul>	<ul style="list-style-type: none"> <li>• Commercial Area</li> <li>• Food Street</li> <li>• Parking Space</li> <li>• Retail</li> <li>• Entertainment Space</li> </ul>	<ul style="list-style-type: none"> <li>• Hotel</li> <li>• Office</li> <li>• Restaurant</li> <li>• Coffee Shop</li> <li>• Bar</li> </ul>

## 4.4 Designed Spaces

Functional Spaces in the Study Area



## 4.4.1 Parks and Open Spaces



### Purpose

- Mitigate the flooding issue along the Colorado River
- Build up a bike/pedestrian network to connect the neighborhood, waterfront area, and central business district.
- Provide various activity spaces for residents

### Requirement

- Establish a trail network along the river and extend into the community.
- Build up stormwater management facilities including levee, retention/detention pond, and rain garden.
- Provide facilities such as hike and bike trails, playgrounds, exercise-scape, nature piers, boat ramp, amphitheater, and sports fields.



Hike and bike trails

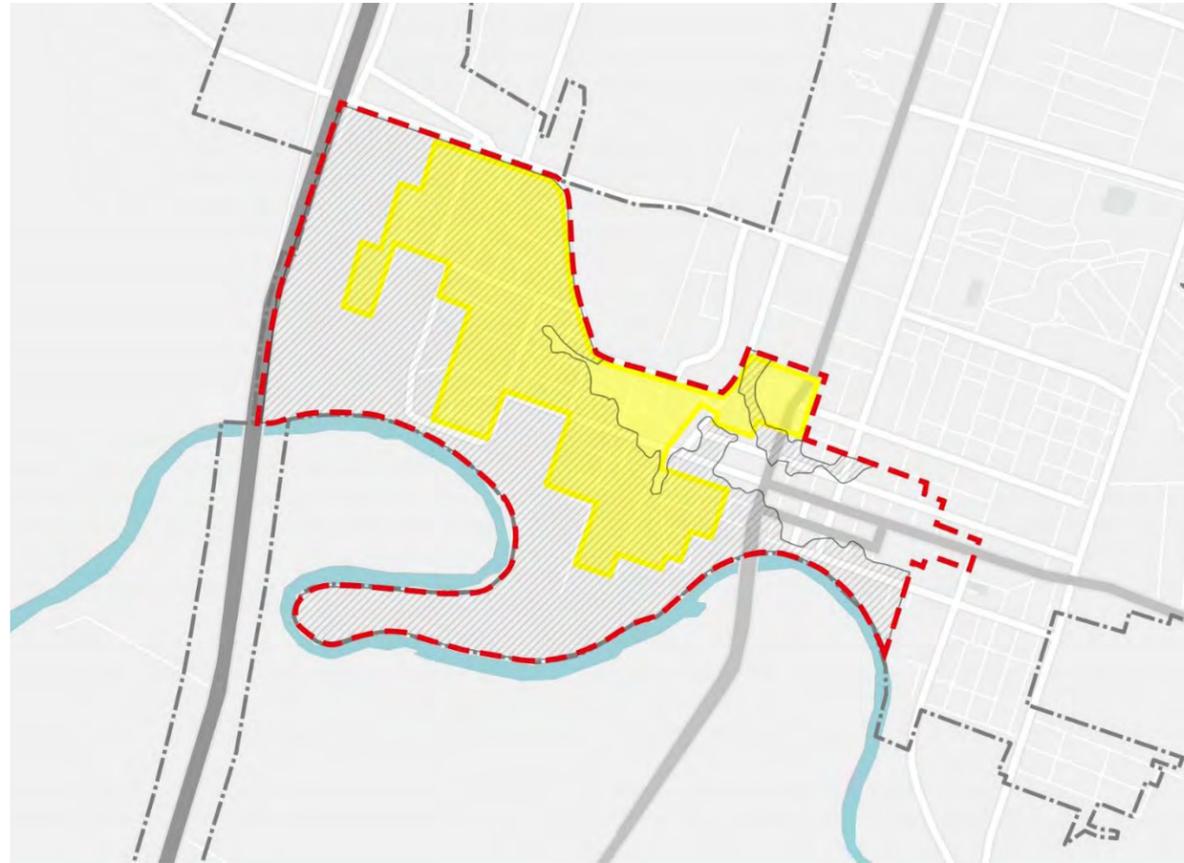


Amphitheater



Sports fields

## 4.4.2 Residential Area



### Purpose

- Provide healthy and safe living conditions.
- Create various gathering and open spaces for residents
- Build up a connection with the riverfront area

### Requirement

- Provide service facilities such as health care center, pharmacy, retail, community center.
- Create activity spaces such as the pocket park, plaza, and exercise scape.
- Apply low impact development for stormwater management such as pervious pavement, bio-swale, and rain garden.
- Consider intergenerational design and activity spaces.



Pocket Park



Community Center



Rain Garden

## 4.4.3 Downtown District



### Purpose

- Stimulate the development of local business and economy
- Attract people outside the City of Wharton
- Provide entertainment and shopping area for residents and visitors
- Provide office, hotel, and social areas for businessman

### Requirement

- Provide food street including restaurant, coffee shop, bar, and food trunk.
- Provide retail and shopping areas such as grocery and clothing stores, department stores, and farm stands.
- Build up a connection with the riverfront area.
- Preserve historical buildings, murals, and sites.



Food Street



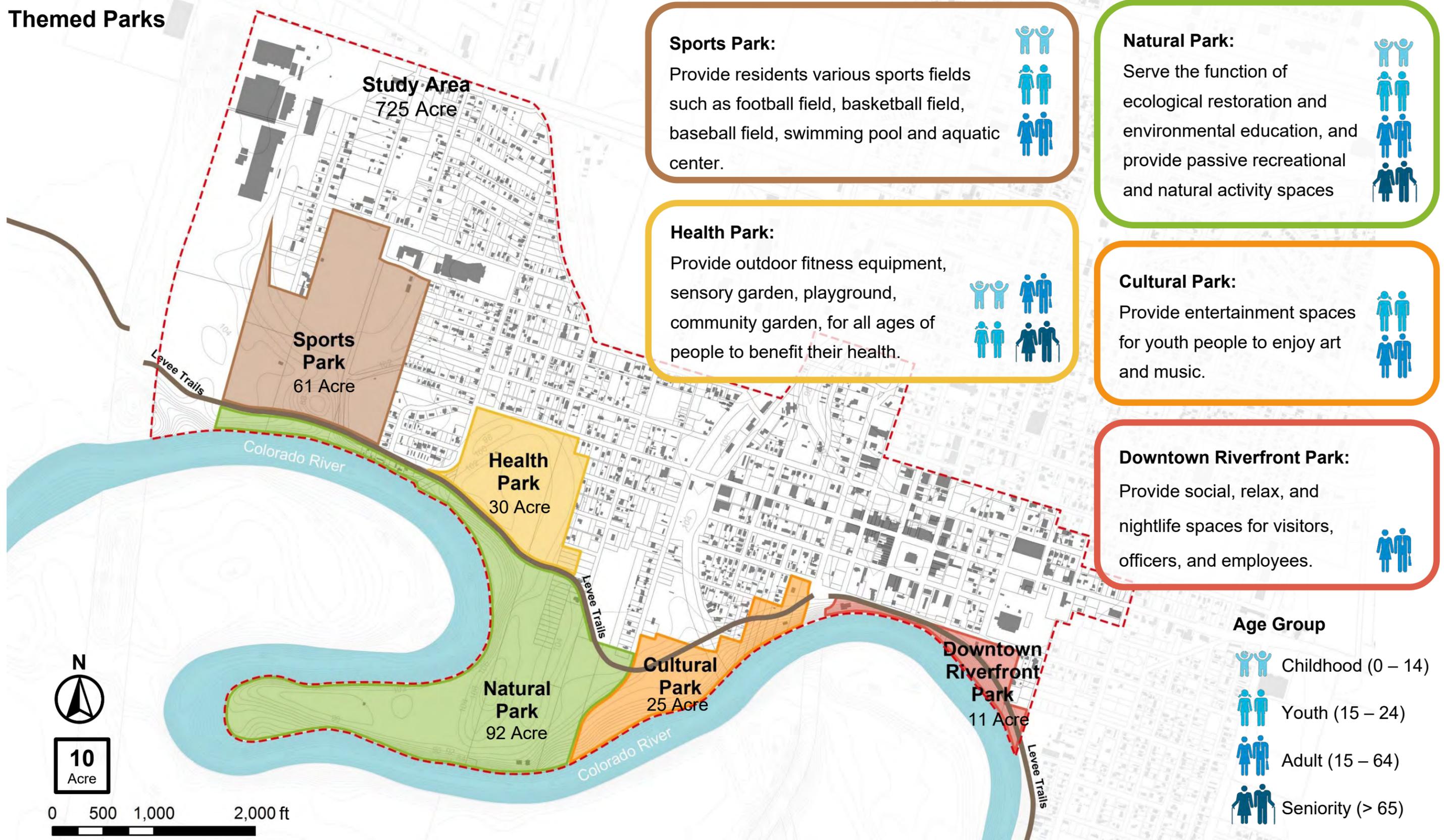
Shopping Area

# 5 Master Plan

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5.4 Master Plan	54-59

# 5.1 Master Plan Concept

## Themed Parks



**Sports Park:**  
Provide residents various sports fields such as football field, basketball field, baseball field, swimming pool and aquatic center.

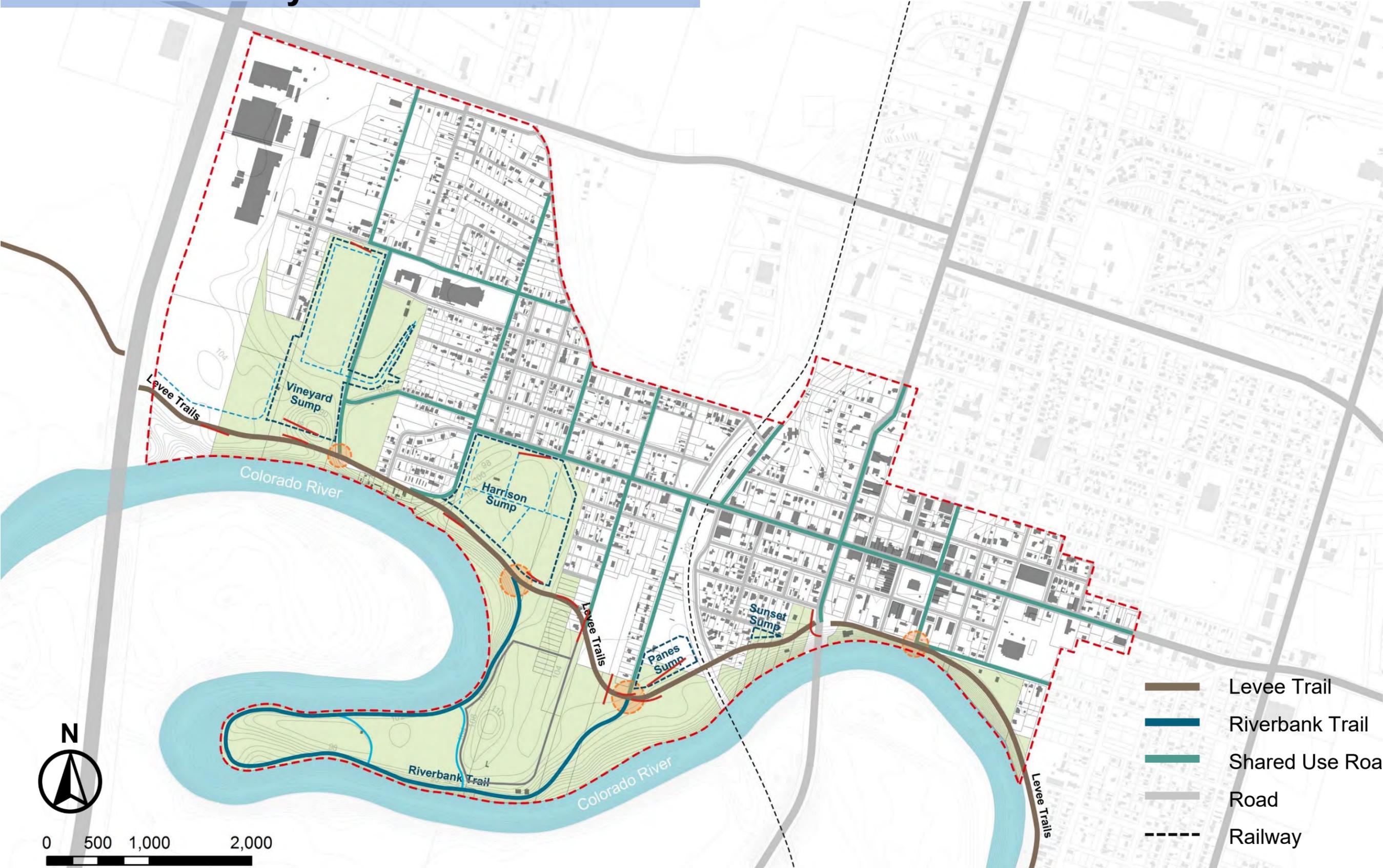
**Natural Park:**  
Serve the function of ecological restoration and environmental education, and provide passive recreational and natural activity spaces

**Health Park:**  
Provide outdoor fitness equipment, sensory garden, playground, community garden, for all ages of people to benefit their health.

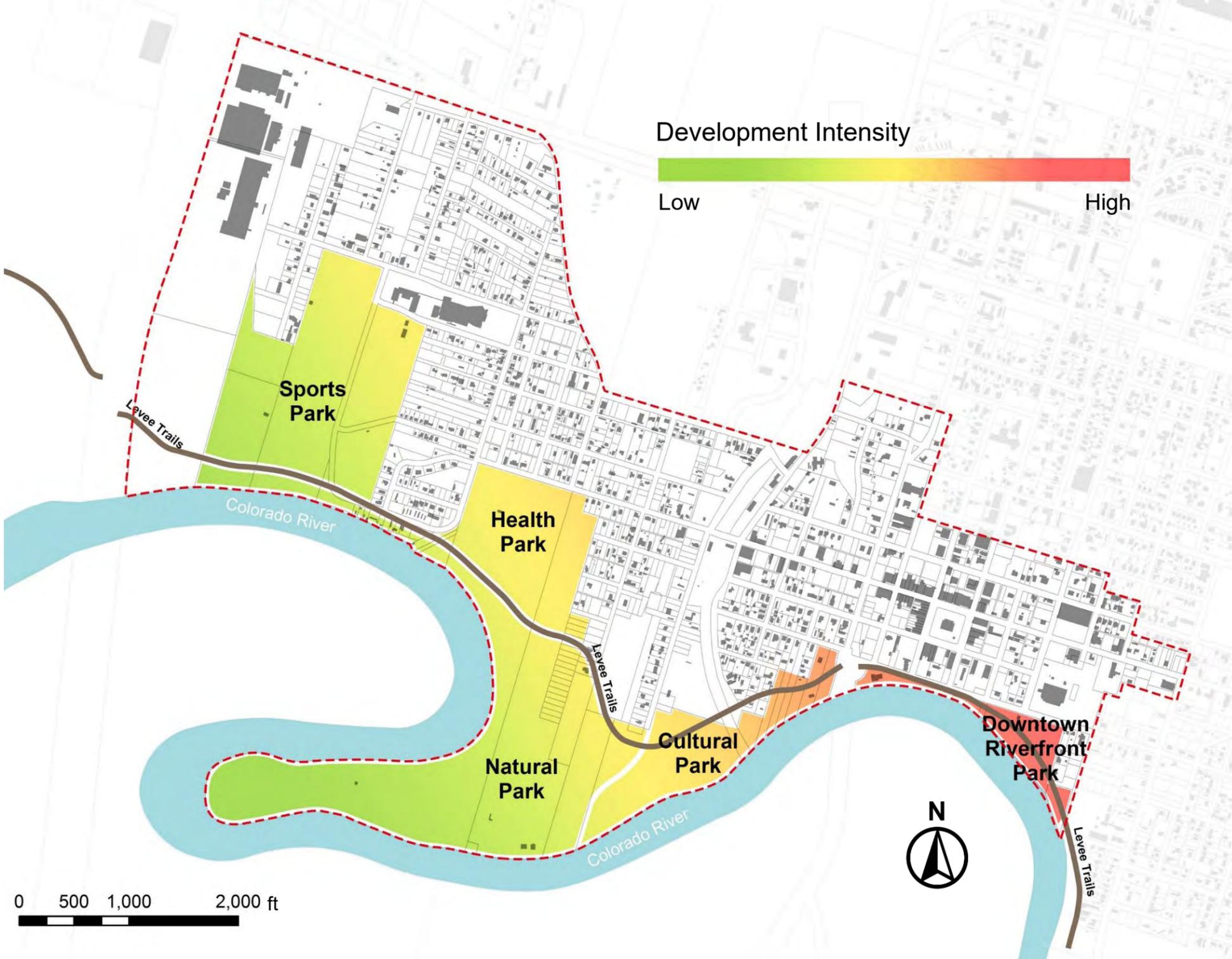
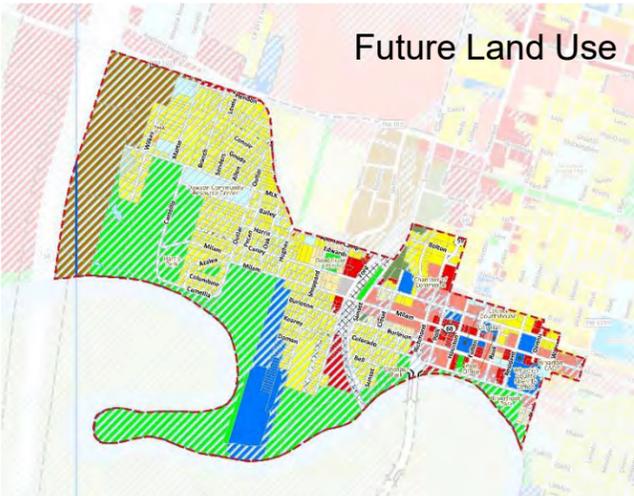
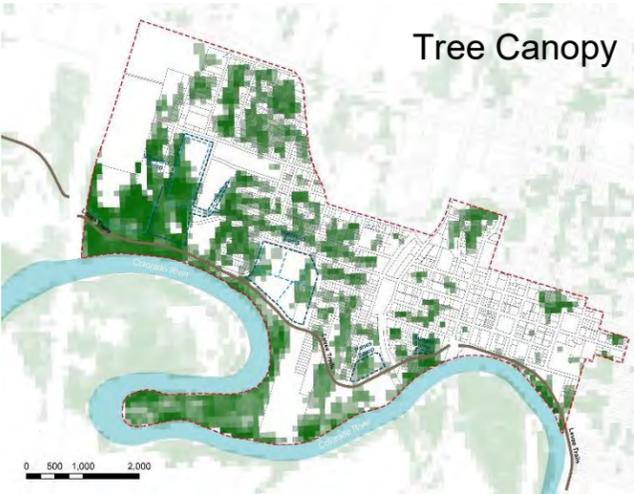
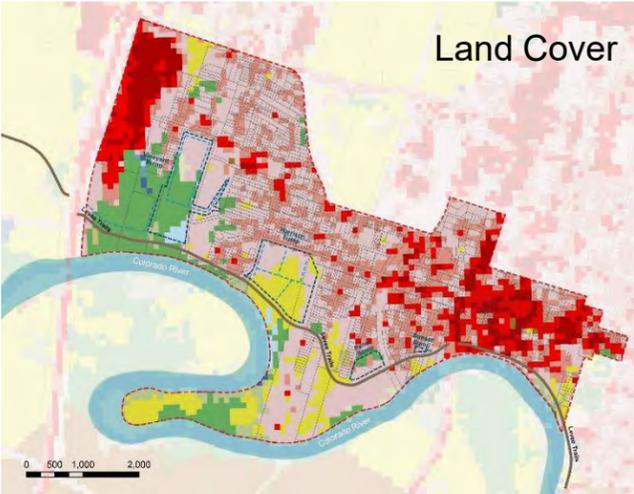
**Cultural Park:**  
Provide entertainment spaces for youth people to enjoy art and music.

**Downtown Riverfront Park:**  
Provide social, relax, and nightlife spaces for visitors, officers, and employees.

# 5.2 Circulation System

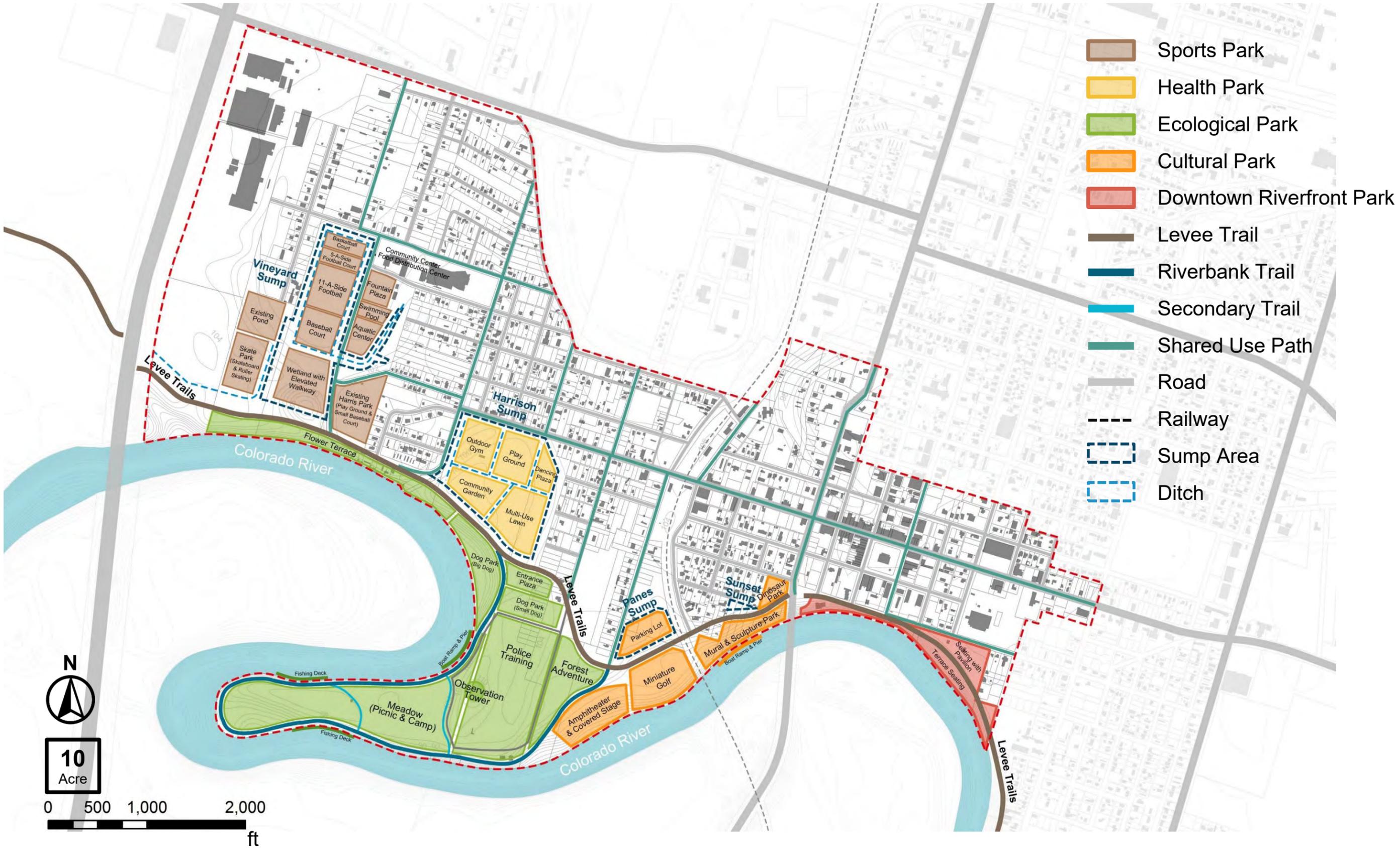


# 5.3 Development Intensity

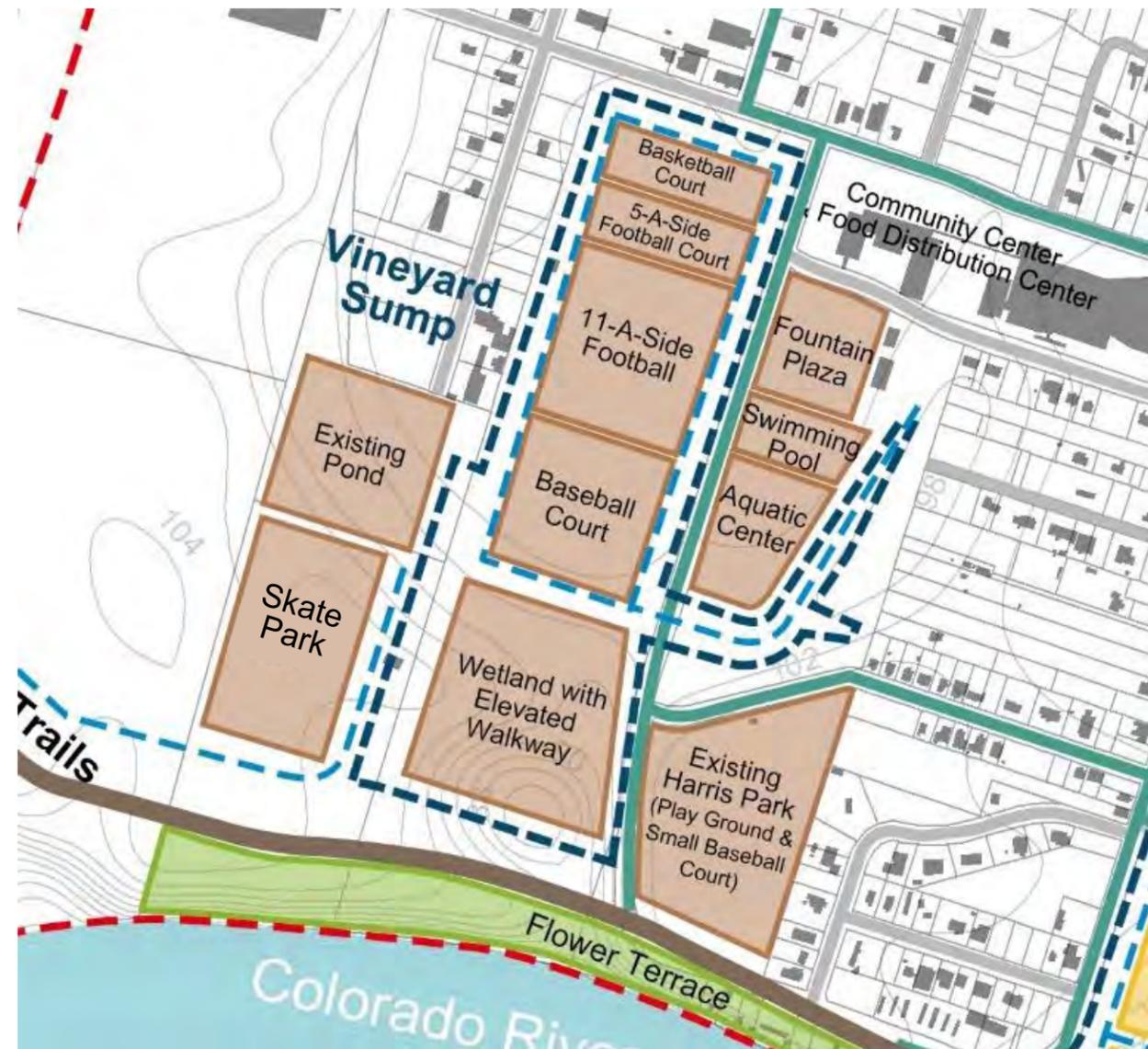


According to the existing land cover, tree canopy, and future land use, the development intensity decreases from north to south, and from east to west.

# 5.4 Master Plan



## 5.4.1 Sports Park



- **Sports Courts:** Within the sump area, it will include five basketball court, three 5-a-side football court, one 11-a-side football court, and one standard baseball courts.
- **Wetland with Elevated Walkway:** The wetland is located at the lowest elevation within the Vineyard Sump. The elevated walkway will be connected with the levee trails. In addition to recreational functions, it also could educate visitors about wetland, levees, and sumps.
- **Fountain Plaza:** Located in front of the community center and food distribution center, providing a gathering and ceremony space for residents.
- **Swimming Pool and Aquatic Center:** Swimming is the most popular activity for kids and among the top 3 popular activities for adults. An outdoor Olympic-size swimming pool (50m /164ft) will meet the needs of residents. The aquatic center will include some equipment such as water slides, splash pad, and water playground. The swimming pool and water park are designed outside the sump to avoid maintenance problems.
- **Existing Harris Park:** It includes a baseball court, two small basketball court, and a playground. This park could be reserved.
- **Skate Park:** A space for playing skateboard and roller skating. It is mainly designed for teenagers and youth.



Wetland with Elevated Walkway



Skate Park

## 5.4.2 Health Park



0 250 500 1000 Ft



- **Outdoor Gym:** Provide some fitness equipment for people to do exercise. It is mainly designed for senior people.
- **Playground:** It is a playing space for kids, including recreational equipment such as the seesaw, swing, slide, sandbox.
- **Plaza:** It is a plaza with hard pavement, mainly used for dancing
- **Community Garden:** The City of Wharton was first developed for agriculture. The community garden will be a place that could educate people about good nutrition and ecology, present the agricultural history of Wharton, strengthen community spirit, provide organic food, and serve as a gathering place for the community.
- **Multi-Used Lawn:** an open space for people to do exercise, relax, or gathering. They could bring a mat to do yoga.

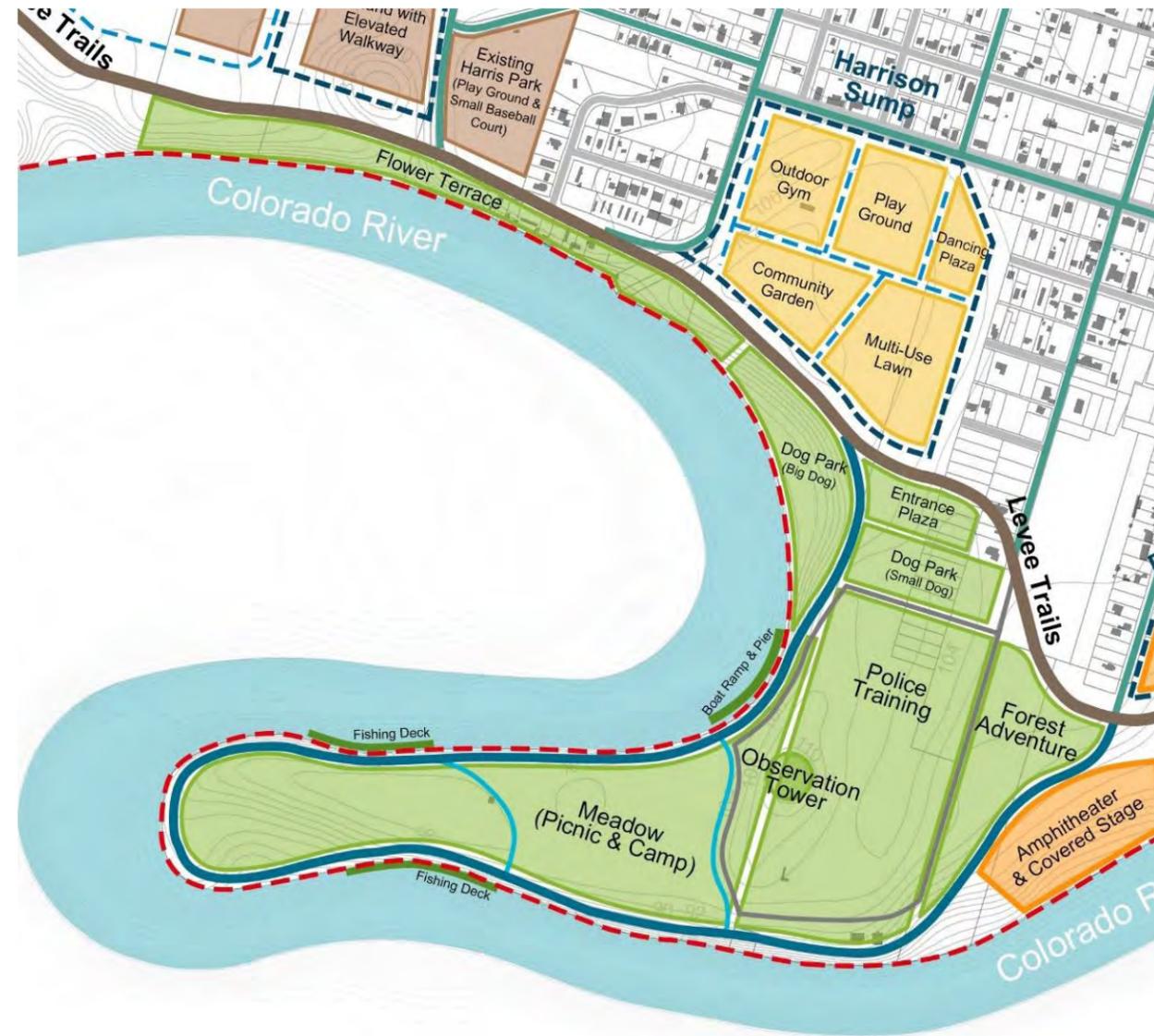


Outdoor Gym



Community Garden

## 5.4.3 Natural Park



- **Riverbank Trail:** Connect with the levee trails and provide a route along the river for people to walk, jog and bike. The secondary path is created along the contour line, which will form several loops.
- **Flower Terrace:** Take advantage of the existing topography to create a flower terrace along the river to bring scenery and fragrance.
- **Dog Park:** Big and small dogs have separate playing areas. The park for small dogs will include several playing equipment. And the park for big dogs is close to the river.
- **Police Training:** Preserve the existing training field. It will include the police training, fire fighting training, and a shooting range.
- **Observation Tower:** Provide a high point for visitors to have a good view of riverfront scenery.
- **Boat Ramp & Pier:** a place for the boat anchor and boat racing.
- **The Road for Vehicle:** Part of the road in the east of police training is existing. The road is extended and formed a loop, mainly used for transferring boats and emergency rescue.
- **Grassland:** It could be used for ecological restoration and environmental education.
- **Fishing Deck:** Fishing is among the top 5 popular activities for both kids and adults. The fishing deck will be placed along the Colorado River. The existing tree could provide shade.
- **Forest Adventure:** take advantage of the existing trees to build an adventure place for climbing, exercising, and training.



Dog Park (Big Dog)



Forest Adventure



Fishing Deck

## 5.4.4 Cultural Park



- **Parking Lot:** There is an intersection of the shared use road, levee trails, and riverbank trail. It will provide a parking space for visitors.
- **Amphitheater & Stage:** It will include some terrace seating on the meadow to view the river scenery.
- **Mural & Sculpture Park:** Several murals are located throughout the City of Wharton, which is an identifying characteristic of the city. Artists and residents can paint murals on the walls of the mural park. It could be used to attract businesses and residents and build community pride.
- **Dinosaur Park:** Preserve the existing Dinosaur Park.

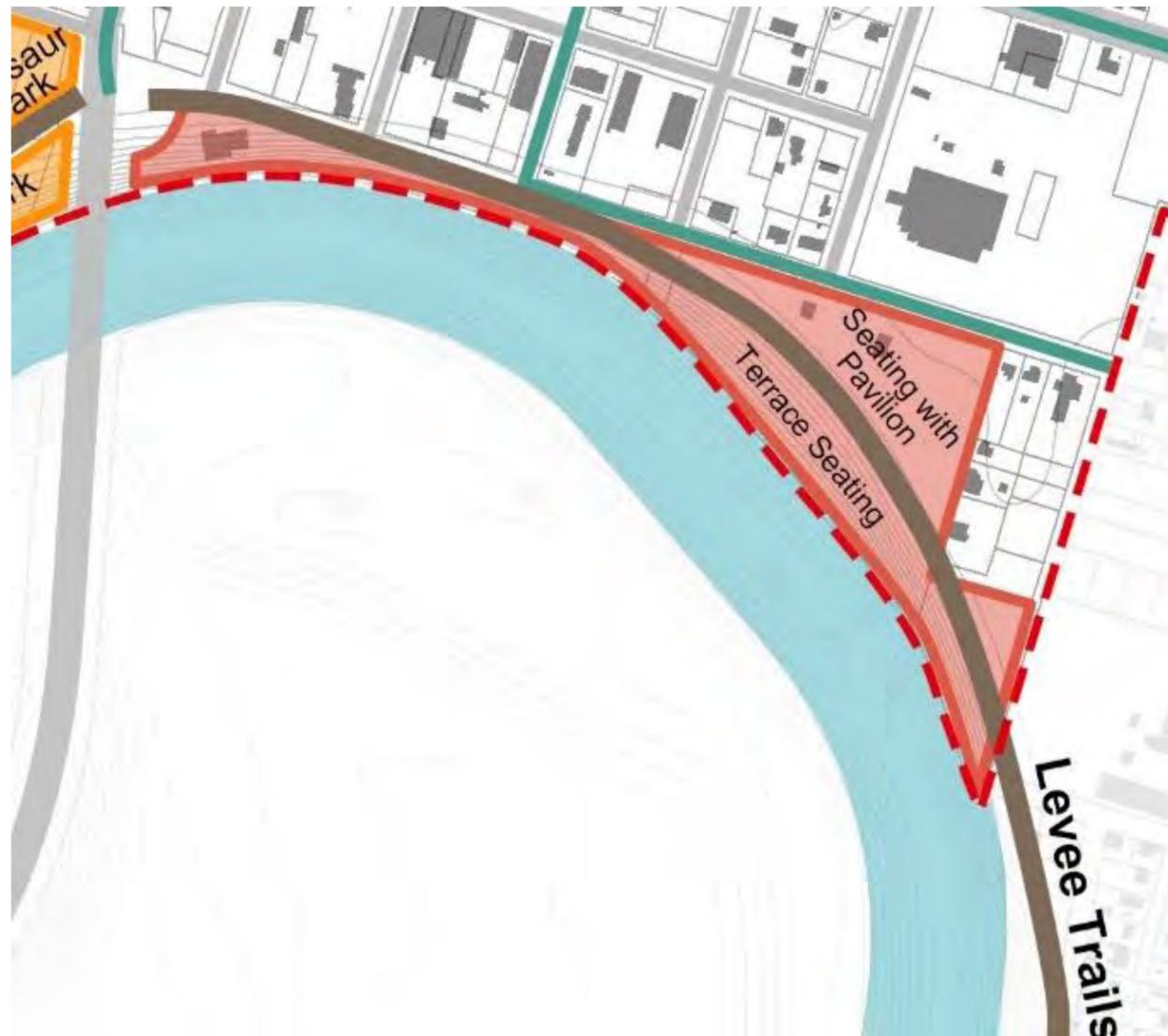


Amphitheater



Mural Park

## 5.4.5 Downtown Riverfront Park



0 250 500 1000 Ft



- **Seating with Pavilion:** Provide social, relax, and nightlife spaces for visitors, officers, and employees. The overhead structure will provide shade for people.
- **Terrace Seating:** For people to sit, relax and view the scenery of the Colorado River.
- **Potential Activities:** farmer market, food festival, beer festival, outdoor cooking and barbeque, and wedding celebration.



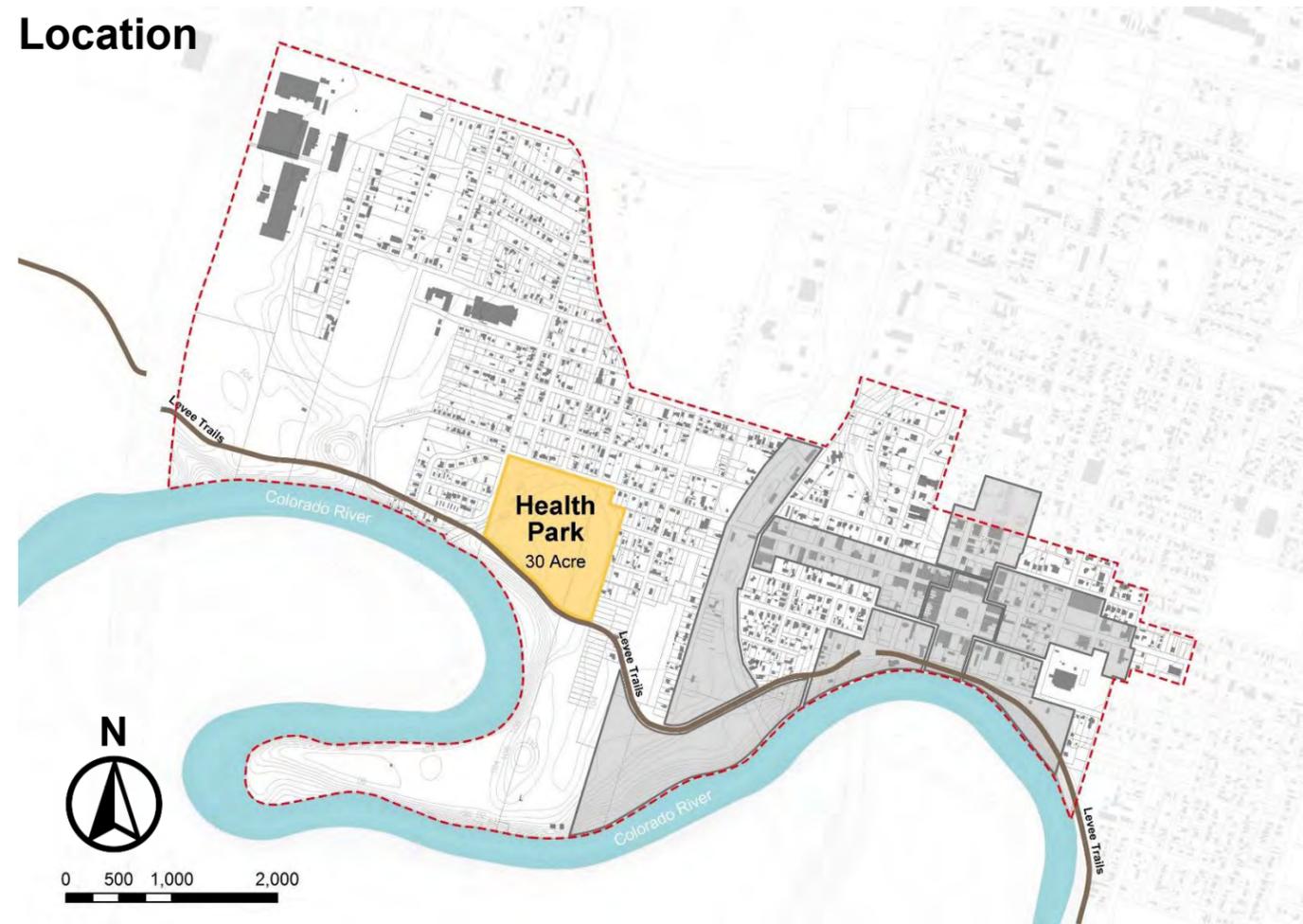
Seating with Overhead Structure

# 6 Detailed Design - Health Park

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# 6.1 Health Park Design Concept

## Location



The location of the Health Park is adjacent to the West End Community. It is the second large detention area of the levee and sump system.

## Design Concept

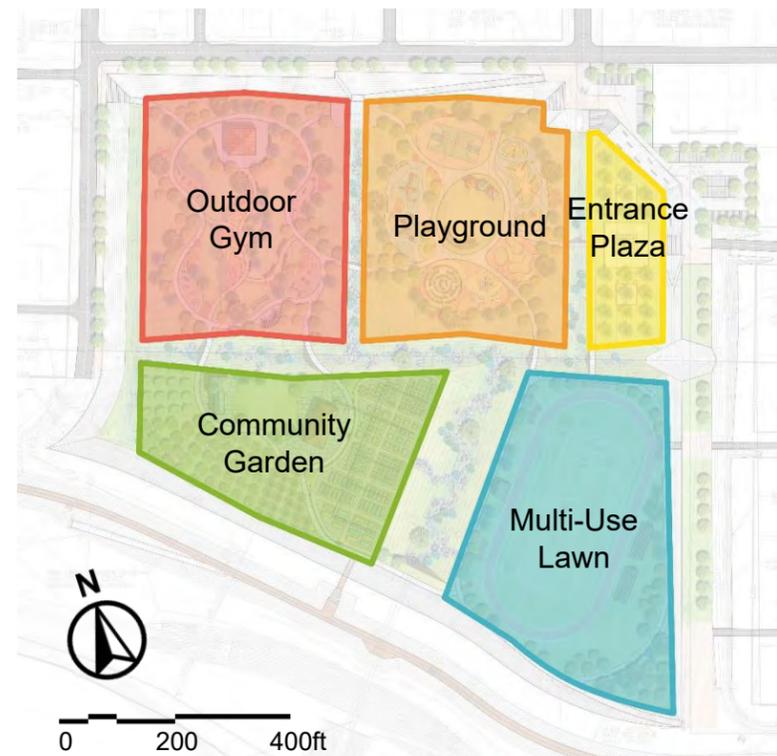
- Create a multi-functional stormwater detention area
- Design for all to make a community park
- Create a holistic health park providing multiple activity spaces to benefit both the physical and mental health of residents
- Naturalize and beautify drainage system through landscape strategies
- Minimize cost by respecting proposed engineering design of levee system



## Sump Design



## Bubble Diagram



According to the engineering document of sump design, the Health Park is separated by the ditches into five themed areas: Outdoor gym, playground, entrance plaza, community garden, and multi-use lawn.

# 6.2 Site Plan

## Legend

Outdoor Gym	① Senior Fitness Facilities
	② Trail Fitness Stations
	③ Flower Garden
	④ Fragrant Garden with Foot Health Walk
	⑤ Tactile Wall
	⑥ Sound Garden
Play Ground	⑦ Water Park
	⑧ Swing
	⑨ School-Age Play Structure
	⑩ Open Lawn
	⑪ Pavilion
	⑫ Turf Slope with Slides and Climbers
	⑬ Sand Garden Play Area
	⑭ Maze
	⑮ Climb Structure
	Entrance Plaza
⑰ Fountain with Sculpture	
Community Garden	⑱ Orchard
	⑲ Green House with Restroom
	⑳ Open Lawn
	㉑ Event Plaza
	㉒ Pavilion with Storage
Multi-Use Lawn	㉓ Community Garden
	㉔ Covered Stage
	㉕ Running Track
	㉖ Casual Football Field
	㉗ Spectators Stand
Other	㉘ Ramp (ADA Standard)
	㉙ Entrance Plaza with Parking Lots
	㉚ Rain Garden Adventure



# 6.3 Outdoor Gym

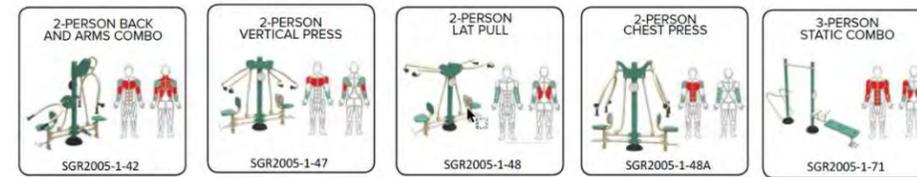
## Site Plan



## Fitness Trail Stations

Incorporating the multi-user elements such as Greenfields' new 10-Person Static Combo and 4-Person Lower Body Combo, this 55-user cluster makes maximum use of space to provide a vast array of fitness apparatuses to trail users.

### ① Trail Station 1



### ② Trail Station 2



### ③ Trail Station 3



### ④ Trail Station 4



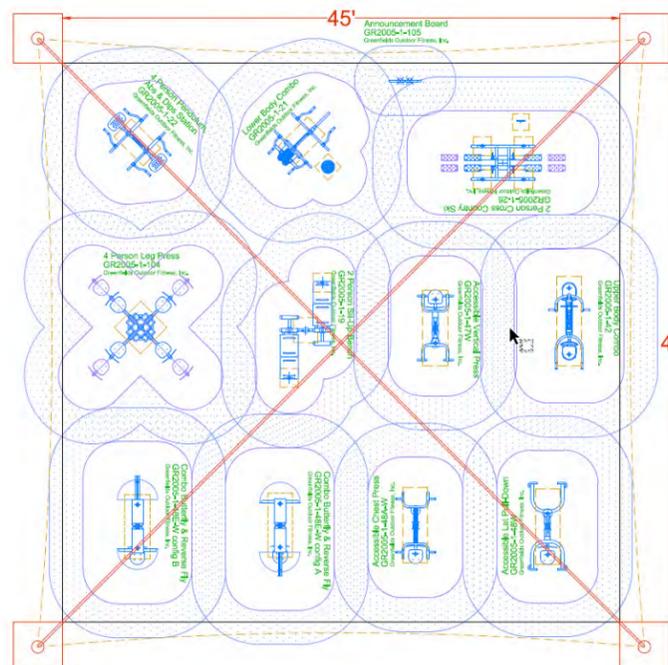
## Senior Fitness Station

### ⑤ Senior Fitness Facilities



The Accessible Senior Facilities features 11 units that accommodate 28 users, including five in wheelchairs. An inviting, low-impact, and social addition to any outdoor space, this package creates a fun and unthreatening environment for seniors to exercise.

### Proposed Plan



Fitness Equipment Company



Source: <https://gfoutdoorfitness.com/fitness-packages/>

## Senior Fitness Station

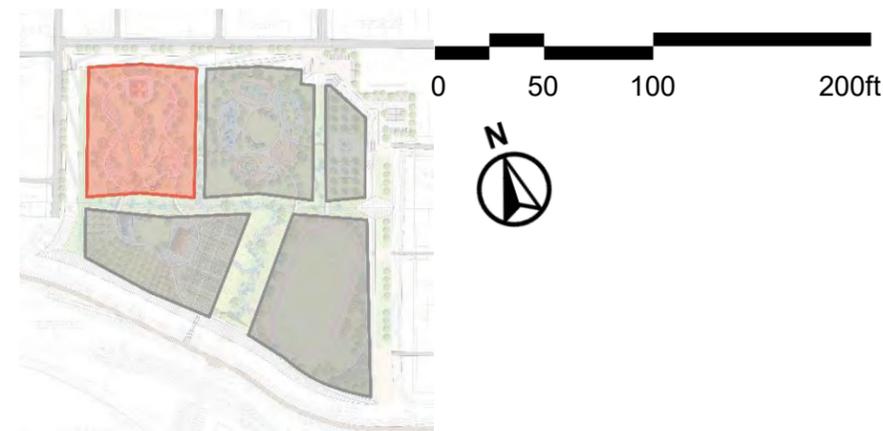


## Fitness Trail Station



# 6.4 Sensory Garden

## Site Plan



## Five Senses



Sight

①

**Flower Garden:** Plant flowers with different colors and different bloom times. Bright colors could stimulate people's eyes.



Smell

③

**Fragrant Garden:** It includes shrubs and trees that have fragrant flowers, leaves, or berries.



Taste

⑤

**Orchard:** Extend the sensory garden path into the orchard. It includes fruit trees such as apple, orange, grape, and pear.



Touch

②

**Tactile Wall:** The wall contains various textures, such as wood, cotton, and pebble, to provide different feelings.

**Barefoot Path:** Walking on pebbles could benefit health.



Hearing

④

**Wind Chime:** It will provide a melodious sound when the wind blows. People could also interact with it to make a sound.



Picture Source: <https://www.google.com/imghp?hl=en&tab=ri&authuser=0&ogbl>

## Flower Garden



## Tactile Wall



# Sound Garden

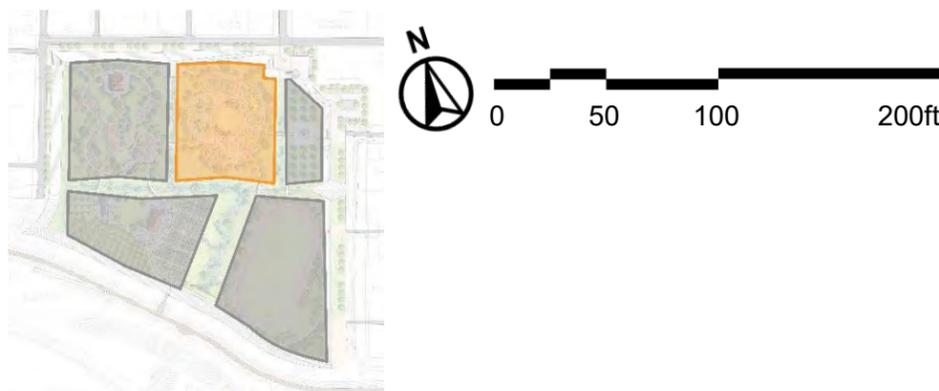


## Fragrant Garden & Bare Foot Path

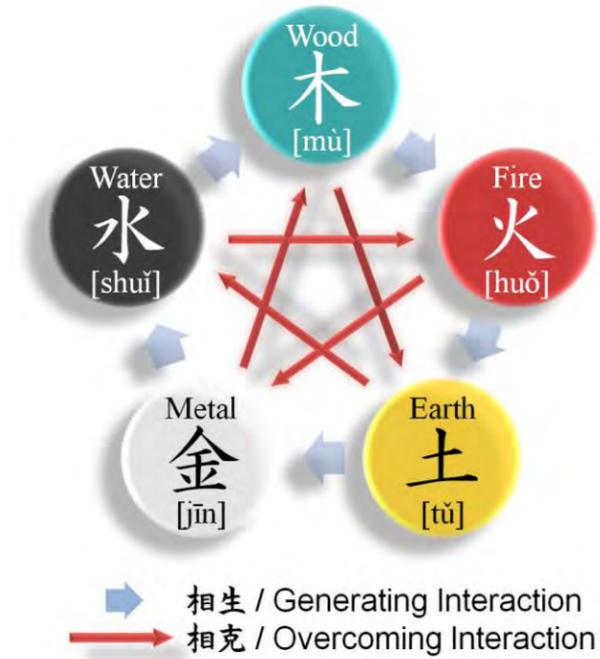


# 6.5 Playground

## Site Plan



## Design Concept



Wuxing (Five Phases), is a traditional Chinese philosophy that was used for describing interactions and relationships between phenomena. The material and color using in the five areas of the playground reflect this design concept.

## Reference Picture



① Water Park



② Swing



③ Playground Facilities



④ Maze



⑤ Climb Structure



⑥ Sand Garden & Fire Pit



⑦ Turf Slope with Slides

Picture Source: <https://www.google.com/imghp?hl=en&tab=ri&authuser=0&ogbl>

## Playground Facilities



## Artificial Turf Slope



# Maze



# Water Park

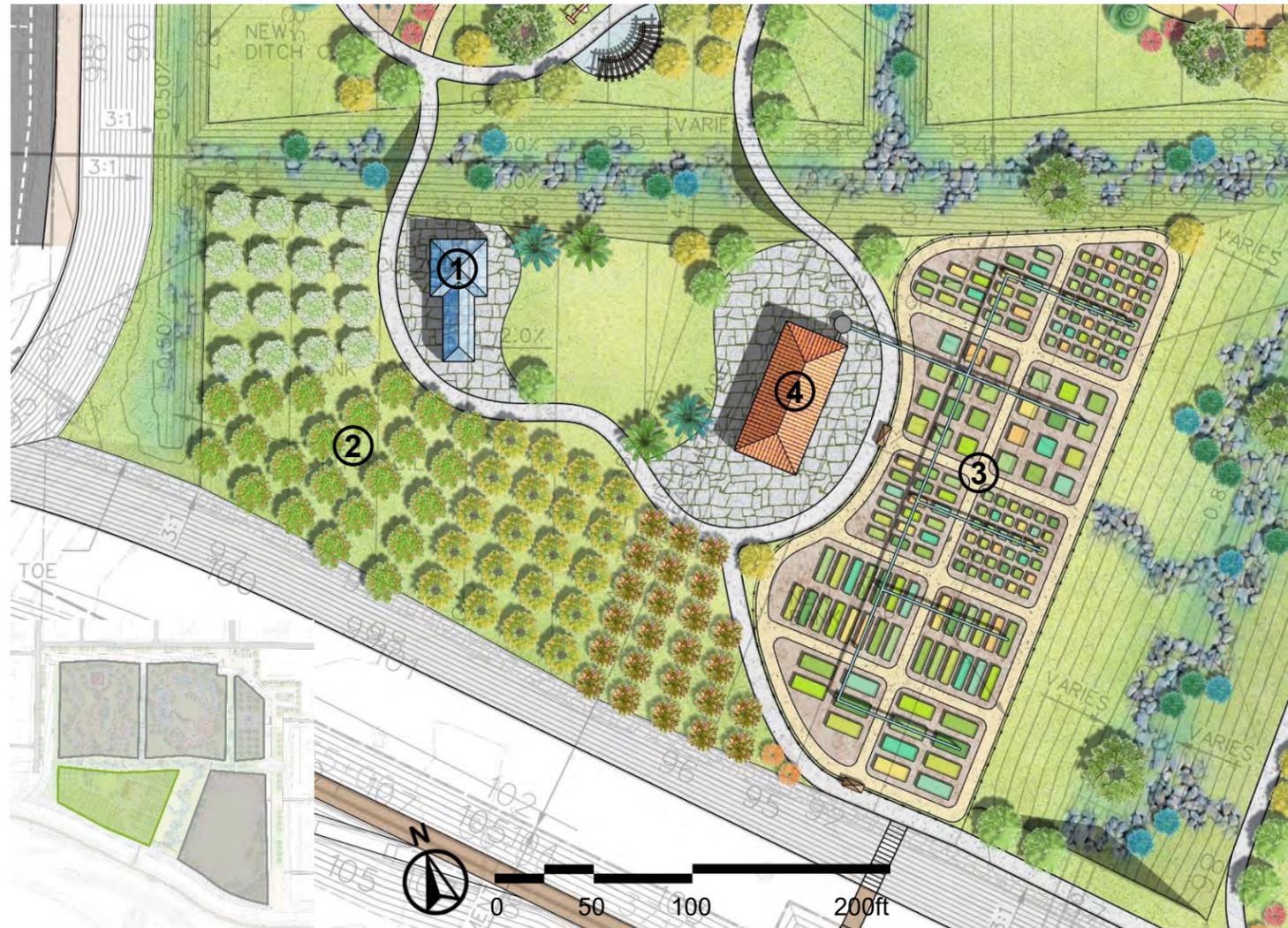


## Fire Pit Night View



## 6.6 Community Garden

### Site Plan



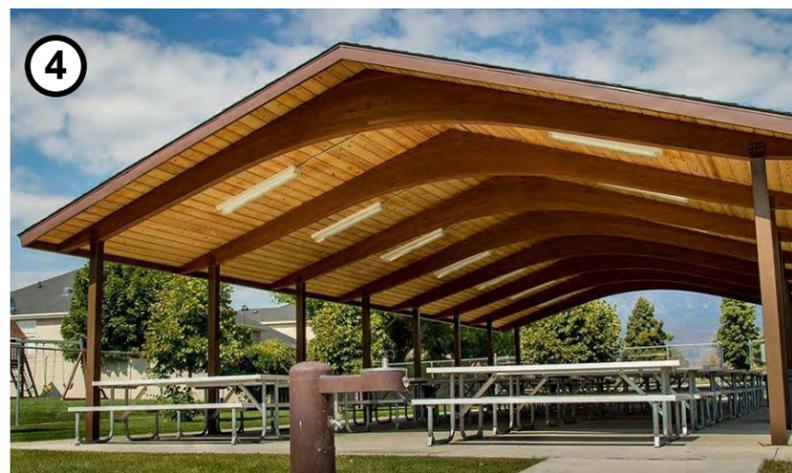
**Green House:** It could be used to cultivate fruits, vegetables, and flowers that need specific temperature, humidity, and light.



**Orchard:** It is laid out in radial lines. Four typical fruit trees in Texas are planted: pear, apple, orange, and blackberry. The orchard will provide both edible fruit and attractive colors.



**Community Garden:** Residents can cultivate vegetables in this garden. It includes four scales of planting bed: 5'x5', 5'x10', 5'x20' 10'x10'. The irrigation system is the aqueduct. The rainwater from the pavilion roof will be collected in a tank and transferred through overhead channels.

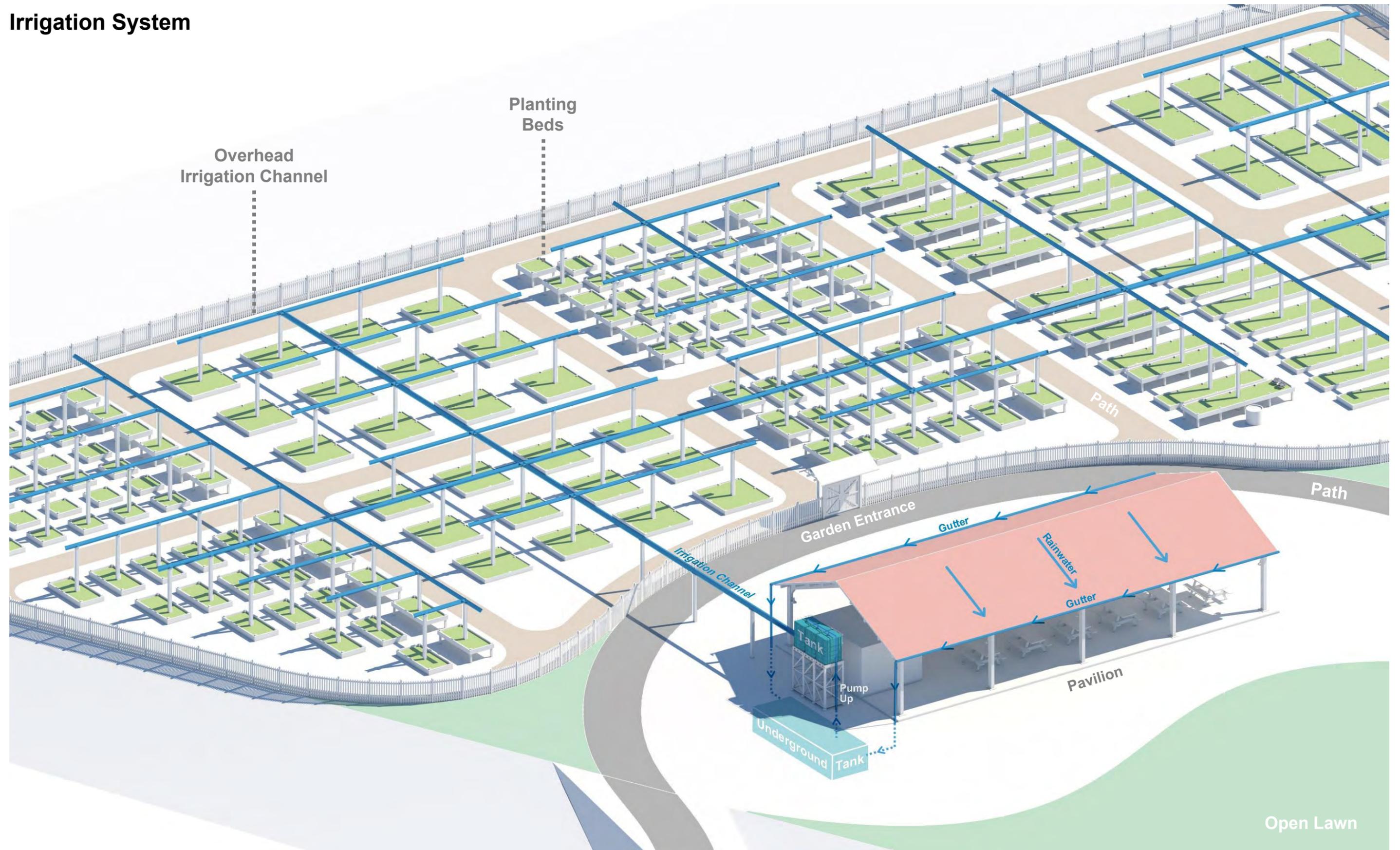


**Pavilion with Storage:** It includes some tables and seating to provide a rest space for people. And the storage could store farming tools and event facilities.

**Open Lawn & Plaza:** It is a multi-use activity space for a picnic, farm market, and ceremony.

Picture Source: <https://www.google.com/imghp?hl=en&tab=ri&authuser=0&ogbl>

# Irrigation System



Community Garden



# Orchard



# Open Lawn

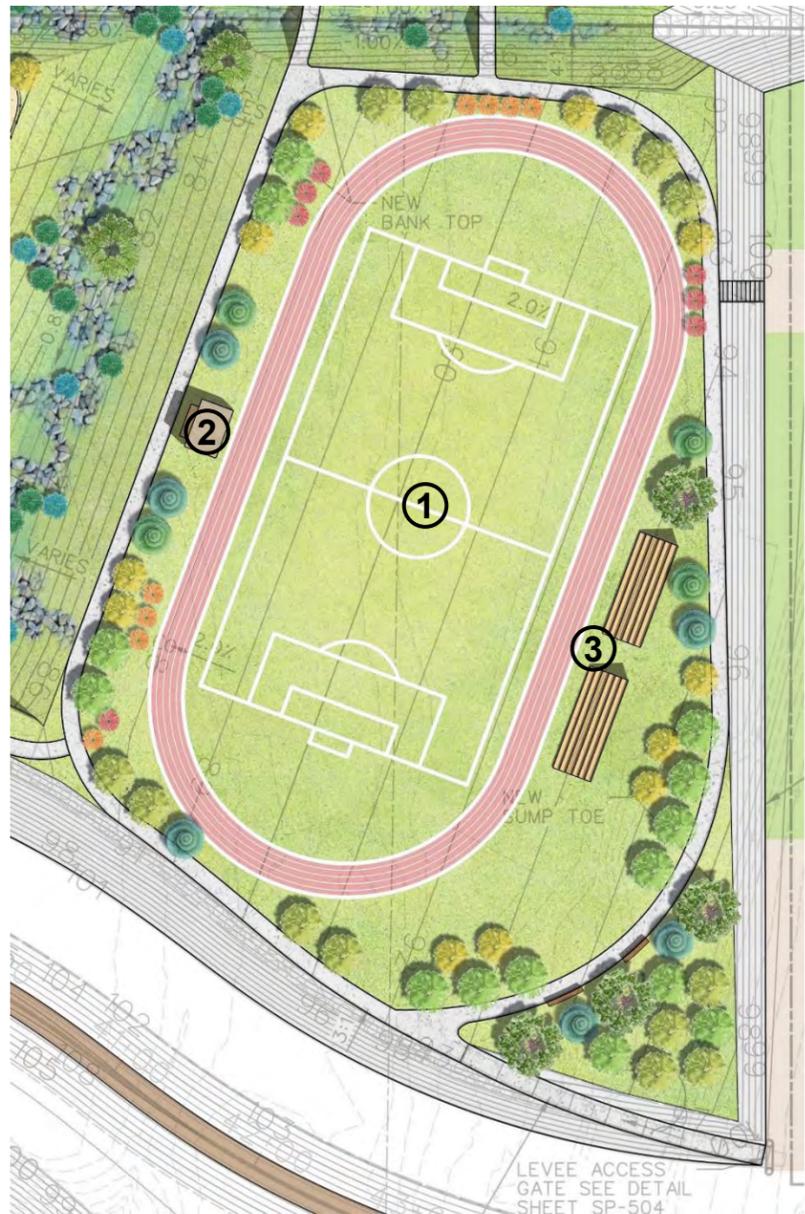


# Pavilion



## 6.7 Multi-function Lawn

### Site Plan



① Track & Football Court



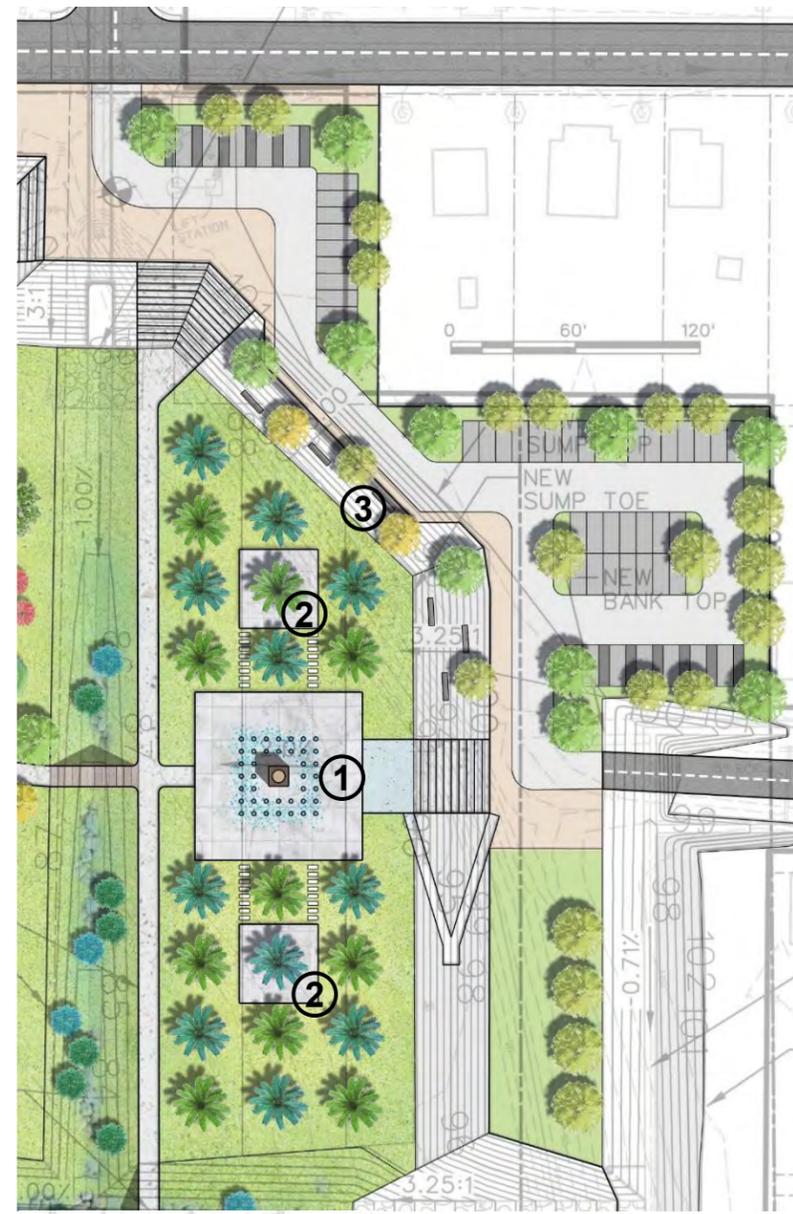
② Stage



③ Spectators Stand

## 6.8 Entrance Plaza

### Site Plan



① Fountain Plaza



② Tree Grid Plaza



③ Turf Slope Seats

Picture Source: <https://www.google.com/imghp?hl=en&tab=ri&authuser=0&ogbl>

Performance Stage



**Fountain Plaza**



Tree Grid Plaza

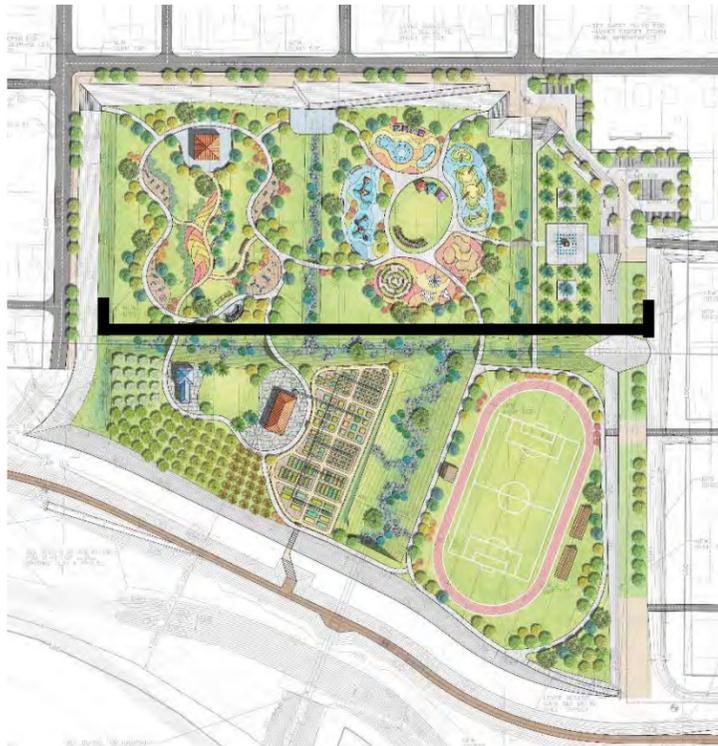


**Raingarden Adventure Trail**

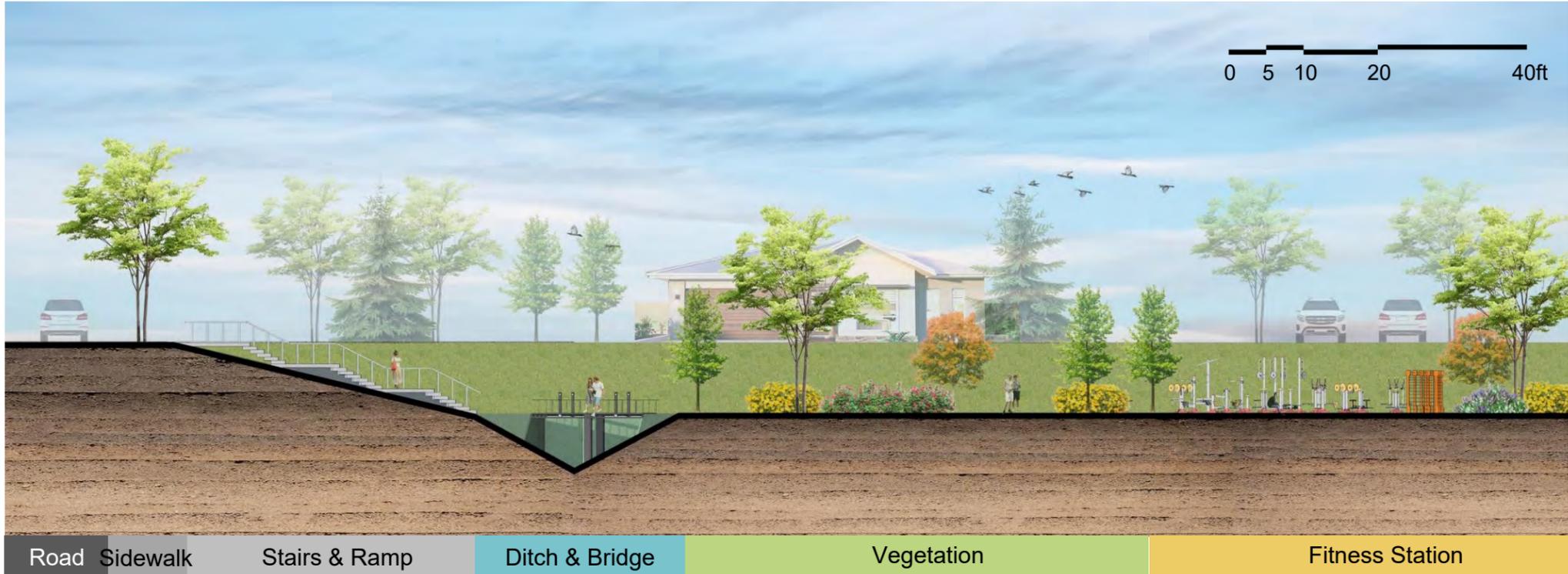


# 6.9 Section

## Section Key



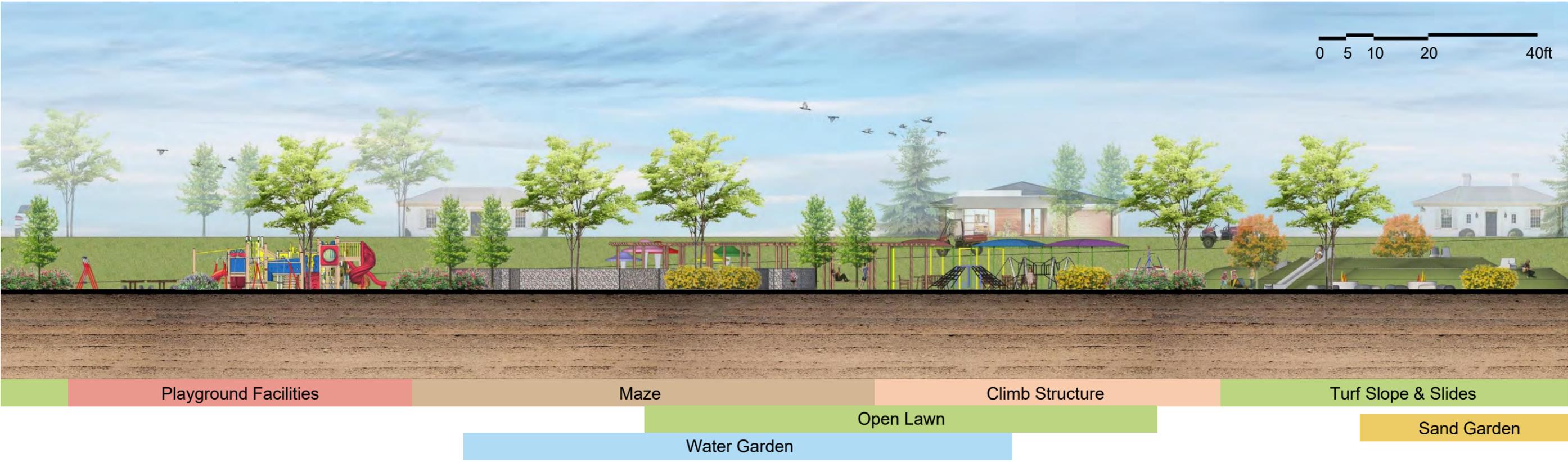
## Entrance & Outdoor Gym



## Outdoor Gym & Sensory Garden



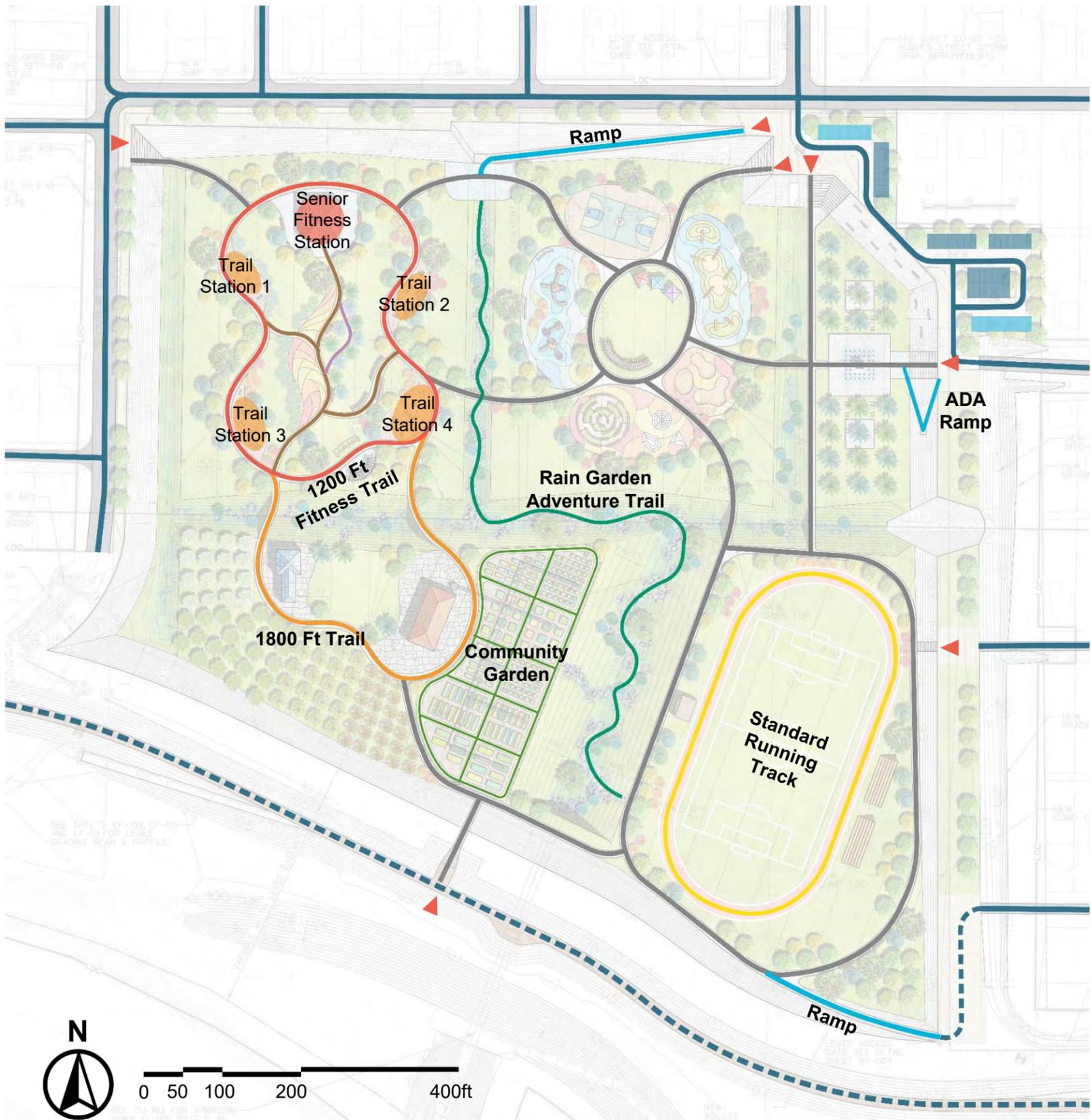
**Playground**



**Plaza & Entrance**

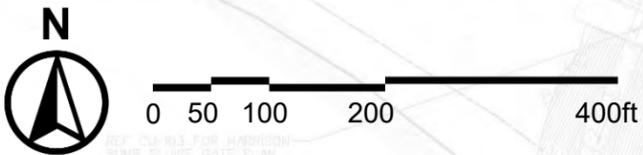


# 6.10 Trail System

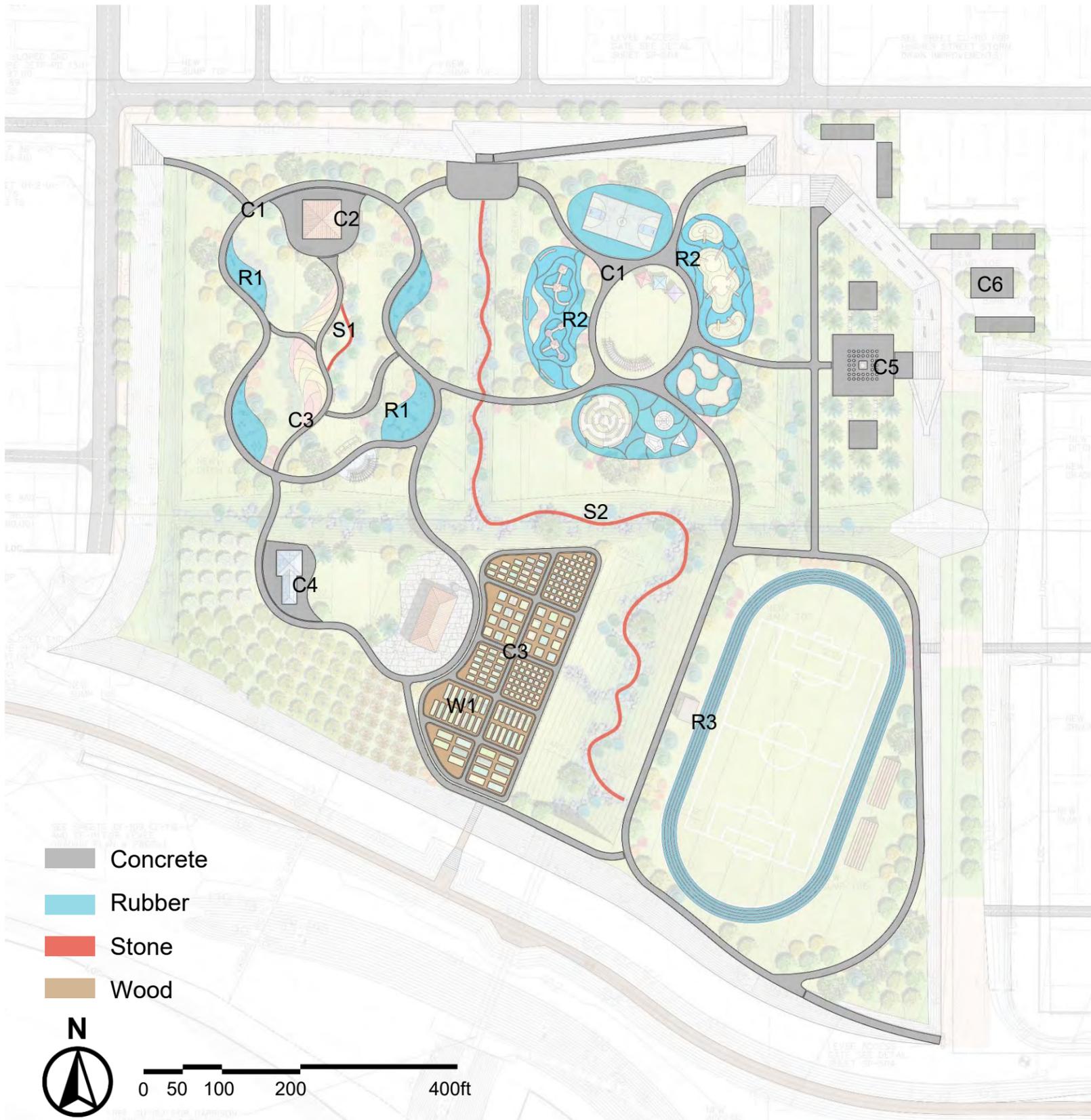


## Legend

-  Entrance
-  Path
-  Fitness Trail (1200 Ft)
-  Fitness Trail (1800 Ft)
-  Standard Running Track
-  Community Garden Trail
-  Rain Garden Adventure Trail
-  Ramp
-  Road
-  Senior Fitness Station
-  Trail Fitness Station
-  Standard Parking
-  Wheelchair Accessible Parking



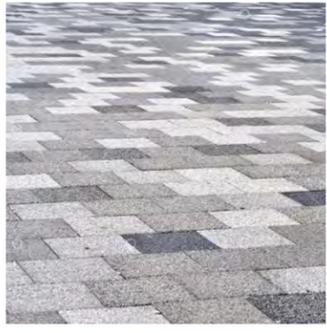
# 6.11 Hardscape Surface Material



## Concrete



C1



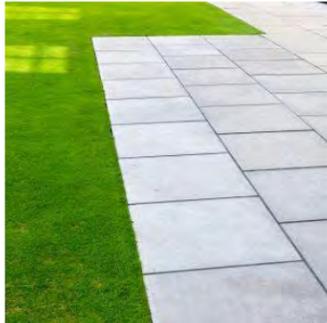
C2



C3



C4



C5



C6

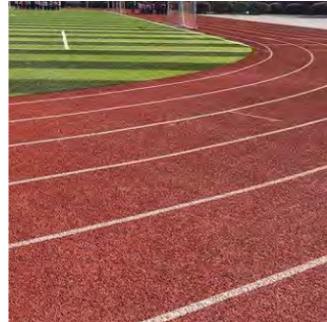
## Rubber



R1



R2



R3

## Stone



S1



S2

## Wood



W1

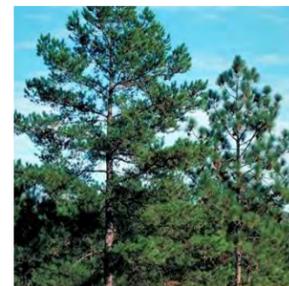
Picture Source: <https://www.google.com/imghp?hl=en&tab=ri&authuser=0&ogbl>

# 6.12 Planting Schedule

## Pine Trees



**Eastern red cedar**  
*Juniperus virginiana*



**Short-leaf pine**  
*Pinus echinata*



**Loblolly pine**  
*Pinus taeda*

## Trees with Special Colors



**Flameleaf sumac**  
*Rhus copallinum*



**Huisache**  
*Acacia farnesiana*

## Deciduous Trees



**Water Oak**  
*Quercus nigra*



**Cedar Elm**  
*Ulmus crassifolia*



**Black willow**  
*Salix nigra*

## Fragrant Trees



**Fragrant Sumac**  
*Rhus aromatica*



**Texas Mock Orange**  
*Philadelphus texensis*



**Brownfoot**  
*Acourtia wrightii*

## Palm Trees



**Mexican fan palm**  
*Washingtonia robusta*



**Palmetto Palm**  
*Sabal palmetto*

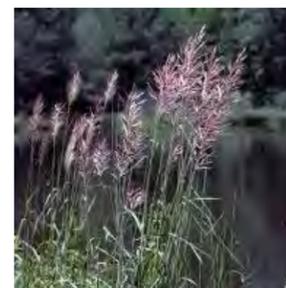
## Grass



**Gulf cordgrass**  
*Spartina spartinae*



**Big bluestem**  
*Andropogon gerardi*



**Sugarcane plumegrass**  
*Saccharum giganteum*

## Wildflowers



**Lance-leaf coreopsis**  
*Coreopsis lanceolata*



**Coralbean**  
*Erythrina herbacea*



**Meadow pink**  
*Sabatia campestris*

## Fruit Trees



**European pear**  
*Pyrus communis*



**Red Delicious**  
*Malus domestica*

## Shrubs



**American Beautyberry**  
*Callicarpa americana*



**Buttonbush**  
*Cephalanthus occidentalis*



**Dwarf Palmetto**  
*Sabal minor*



**Lance-leaf coreopsis**  
*Coreopsis lanceolata*



**Spider lily**  
*Lycoris radiata*



**Turk's cap**  
*Malvaviscus arboreus*



**Citrus**  
*Disambiguation*  
<https://www.google.com/imghp?hl=en&tab=ri&authuser=0&ogbl>



**Blackberry**  
*Rubus*

# 7 Summary & Conclusion

7.1 Design Strategies

94

7.2 Lessons Learned

95

## 7.1 Design Strategies

### 1. Strategies for Ecological Resilience Improvement

In summary, the following design approaches were employed to improve ecological resilience:

- Follow the existing topography and proposed levee system design to minimize the cost, reduce cut and fill, and respect the engineering design.
- Take advantage of the proposed sumps to propose multi-functional spaces. Some themed parks can be used as recreational spaces for residents on regular days and serve as detention areas when there is a big storm.
- Apply low-impact development techniques including rain gardens, pervious pavement, rainwater harvest roof, and detention ponds to reduce runoff.
- Use recycled materials to save costs. Use the gabion wall to form the maze in the playground. The wirework containers can be filled with rock, broken concrete, or some recycled materials.
- Apply low-maintenance facilities. Propose more temporary structures rather than permanent structures in the sump area to minimize maintenance costs after inundation. Use artificial turf slope rather than natural turf to make routine maintenance simple.
- Naturalize and beautify drainage systems through landscape strategies. Plant enough vegetation to soften the engineering sump terrain.
- Use native and appropriate plant species. Select vegetations according to the hardiness zone, adaptability, and aesthetic appeal. Consider using plant materials with seasonal interest, such as special colors, flowering, and fragrance. Give priority to moisture tolerant vegetation in the sump and ditches area.

### 2. Strategies for Social Resilience Improvement

In summary, the following design approaches were utilized to achieve social resilience:

- Propose several programs to design for people of all age. There are playground areas for children, various sports fields for teenagers, and an outdoor gym and sensory garden for senior people. The site also provides recreational spaces for family activities, such as the community garden, dog park, and amphitheater.
- Build up continuous trails and a walkway system to give residents easy access to riverfront area, parks and facilities.
- Integrate educational function with recreational spaces. For example, people can learn about ecological restoration and native plant species in the preserved natural park. The community garden will be a place that educates people about good nutrition and planting techniques. Also, visitors can learn about the flood protection strategies and wetland ecosystem from the wetland area within the sump.
- Preserve the historical buildings and strengthen the identity of the city. Propose the mural park to present the local culture identity and increase the sense of community pride.

## 7.2 Lessons Learned

### 1. The Process of Service-Learning Project & Community Engagement

The involvement of community members helps us focus on the key issues and solutions we need to pay more attention to. First, we conducted an online survey to learn about resident's expectations of the recreational spaces and the downtown area. Second, we visited the site and communicated with local community leaders. Third, a visual design charrette with the focus group was held to help us form the design program. Fourth, the mid-term and final review was directly presented to the local people and gained feedback from them. Fifth, the design of target areas will be shown on the Social Pinpoint website. The local residents can view our design and leave their comments about what they like and what can be improved. Finally, I will refine the project package according to the feedback.

### 2. Multiple Levels of Design

This project gives me an opportunity to practice from master plan scale to site plan scale. At different design levels, different issues should be addressed. At the master plan level, I need to consider regional context, city-wide connectivity, and programming. At the site plan scale, more detailed factors such as the materials of pavement and facilities, the buildability of structures, and the cost effect need to be considered.

### 3. Software & Illustration Skills

During this project, I incorporated various computer software in different stages. For instance, I used digital painting to develop draft version of master plan & site plan, and used Lumion to make animation, and then used Adobe Premiere to edit the video and add some effects. I also learned about creating the Social Pinpoint website to engage community.