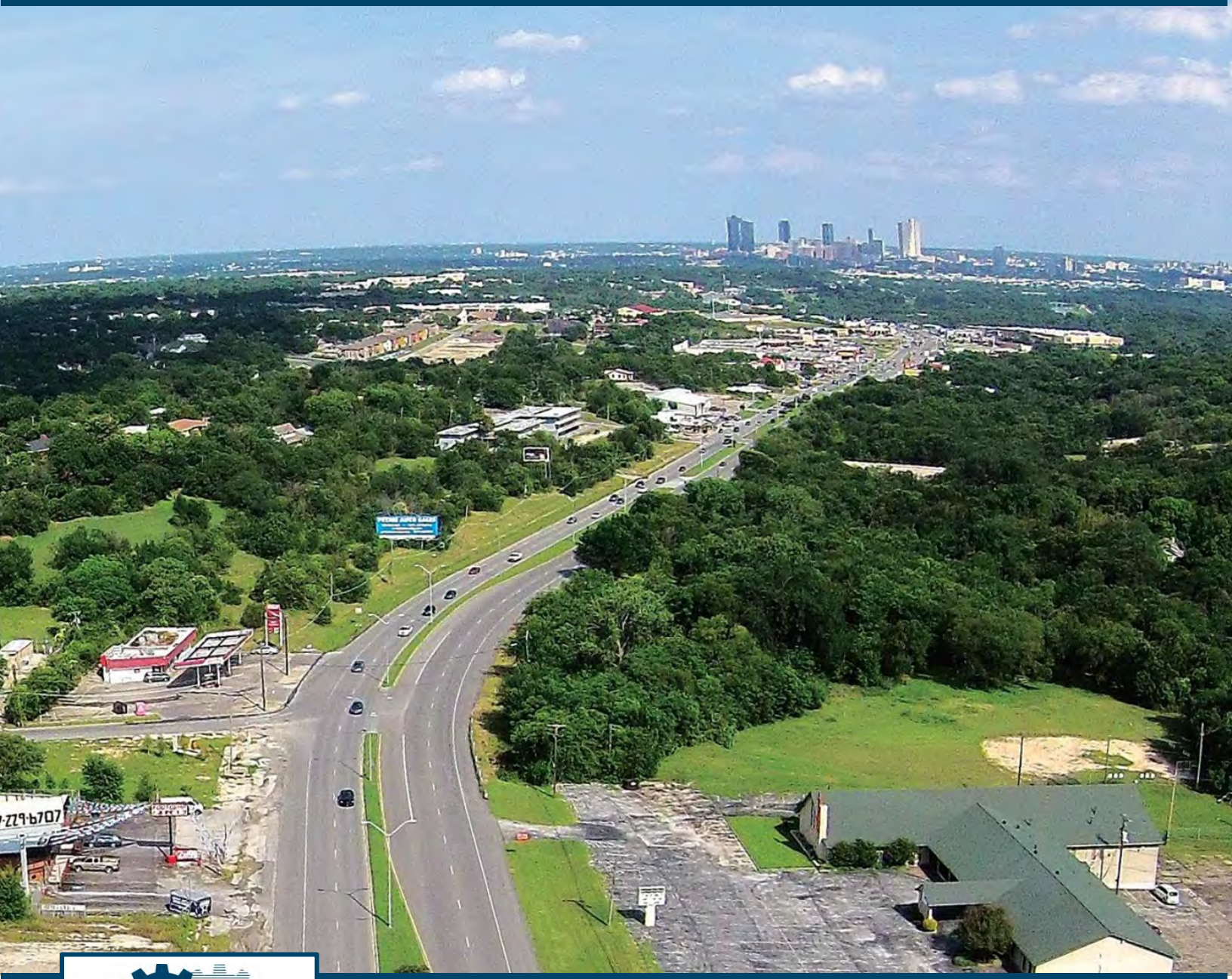
SH 199 Corridor Master Plan
Volume I – Final Report



North Central Texas Council of Governments

September 2017

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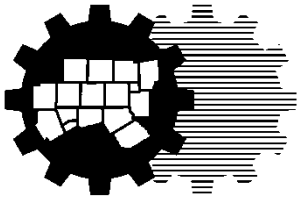
What is NCTCOG?

The North Central Texas Council of Governments is a voluntary association of cities, counties, school districts, and special districts which was established in January 1966 to assist local governments in **planning** for common needs, **cooperating** for mutual benefit, and **coordinating** for sound regional development.

It serves a 16-county metropolitan region centered around the two urban centers of Dallas and Fort Worth. Currently the Council has **236 members**, including 16 counties, 168 cities, 24 independent school districts, and 28 special districts. The area of the region is approximately **12,800 square miles**, which is larger than nine states, and the population of the region is over **6.5 million**, which is larger than 38 states.

NCTCOG's structure is relatively simple; each member government appoints a voting representative from the governing body. These voting representatives make up the **General Assembly** which annually elects a 15-member Executive Board. The **Executive Board** is supported by policy development, technical advisory, and study committees, as well as a professional staff of 362.



NCTCOG's offices are located in Arlington in the Centerpoint Two Building at 616 Six Flags Drive (approximately one-half mile south of the main entrance to Six Flags Over Texas).

North Central Texas Council of Governments
P. O. Box 5888
Arlington, Texas 76005-5888
(817) 640-3300

NCTCOG's Department of Transportation

Since 1974, NCTCOG has served as the Metropolitan Planning Organization (MPO) for transportation for the Dallas-Fort Worth area. NCTCOG's Department of Transportation is responsible for the regional planning process for all modes of transportation. The department provides technical support and staff assistance to the Regional Transportation Council and its technical committees, which compose the MPO policy-making structure. In addition, the department provides technical assistance to the local governments of North Central Texas in planning, coordinating, and implementing transportation decisions.

Prepared in cooperation with the Texas Department of Transportation and the US Department of Transportation, Federal Highway Administration, and Federal Transit Administration.

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FOREWORD

This report for the SH 199 Corridor Master Plan has been prepared in accordance with current regulations and best planning practices. The structure of this document includes four volumes.

Volume I – Final Report includes an executive summary and seven sections.

- Executive Summary: Provides a summary of the study recommendations.
- Section 1 – Introduction: Describes the study area, study purpose and approach, and previous and related studies.
- Section 2 – Existing Conditions: Presents an overview of the existing social, economic, and physical conditions in the corridor. This section includes a description of the transportation facilities in the study area.
- Section 3 – Economic Market Analysis: Provides a summary of the market-based analysis performed to analyze the potential economic development that may be associated with the recommended improvements to the corridor.
- Section 4 – Future Traffic Conditions Analysis: Summarizes the development of future traffic volumes, analysis of alternatives, and level of service in the year 2040.
- Section 5 – Design Recommendations: Describes the design in terms of roadway elements, intersection design, access, bicycle and pedestrian accommodations, transit operations, utilities, drainage, and urban design.
- Section 6 – Public and Stakeholder Involvement: Summarizes the agency coordination and public involvement efforts conducted during the SH 199 Corridor Master Plan process.
- Section 7 - Recommendations: Documents the recommendations for the SH 199 Master Plan Corridor Study and outlines the next steps in the project development process.

This report is supported by three other volumes that include more detailed information and mapping for the reader to reference.

- Volume II - Mapping includes the mapping of the social, economic, natural environment, and other physical conditions within the study area.
- Volume III – Public and Stakeholder Involvement documents the meetings and coordination efforts associated with the study, along with comments received from the public and stakeholders.
- Volume IV – Technical Memorandums includes a compilation of the 18 technical memorandums developed during the SH 199 Corridor Master Plan.

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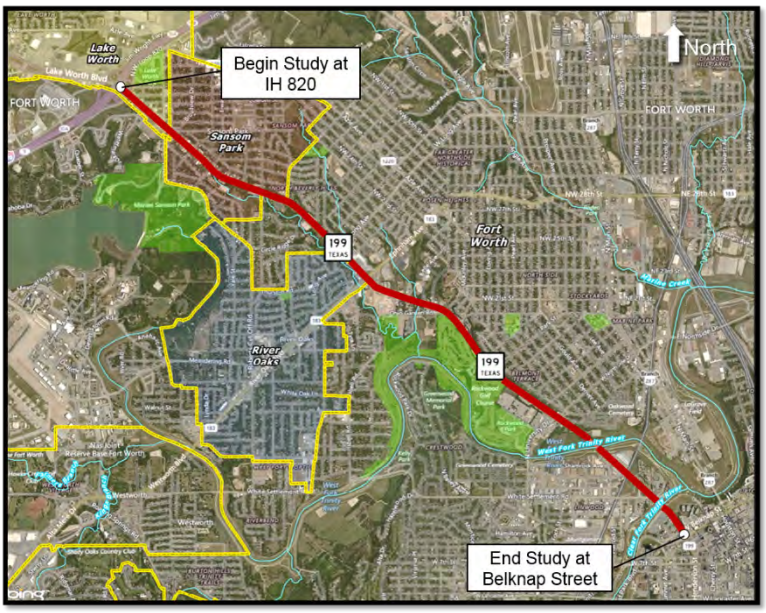
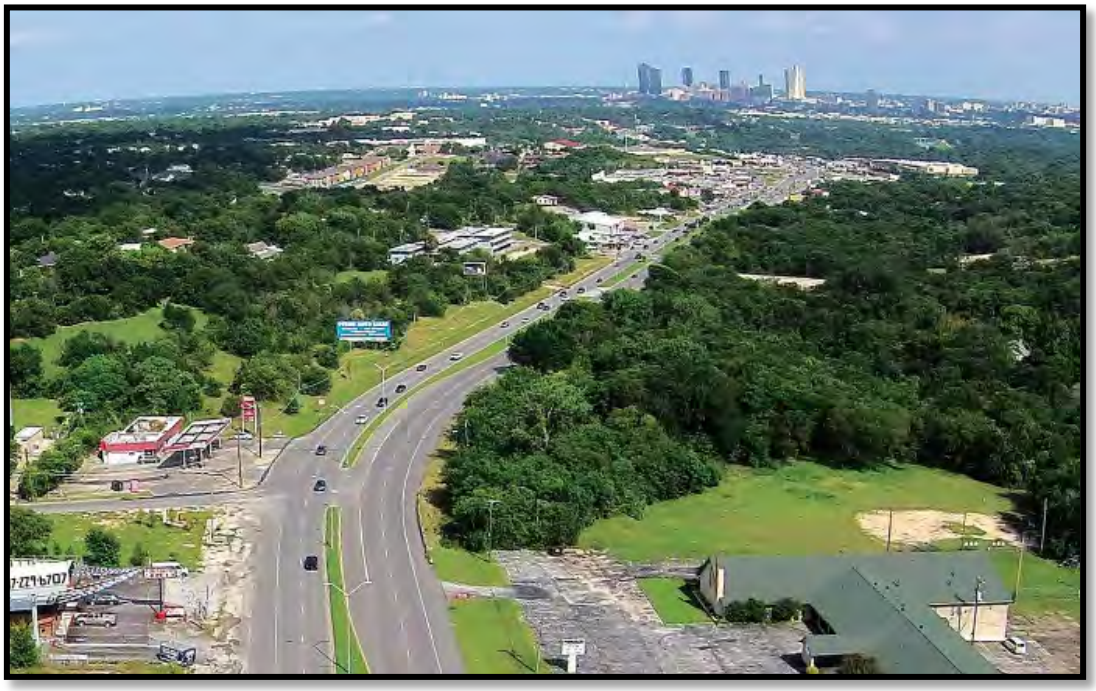
Executive Summary

Introduction

State Highway (SH) 199 has been identified as a vital regional transportation facility in northwest Tarrant County. The SH 199 Corridor Master Plan was initiated to produce a plan that could provide a basis for future design and construction. The SH 199 study area is bound by Interstate Highway (IH) 820 to the west and Belknap Street to the east, a distance of six miles. The roadway travels in a southeast and northwest direction through the cities of Lake Worth, Sansom Park, River Oaks, and Fort Worth.



SH 199 is classified as a major arterial and is part of the Texas Department of Transportation (TxDOT) roadway system.
SH 199 is both a key commuter corridor and provides mobility for local residents and businesses. The roadway is currently six lanes from IH 820 to Roberts Cut Off Road and then reduces to four lanes from Roberts Cut Off Road to Belknap Street. The existing right-of-way width is between approximately 150 feet on the west end of the corridor to and approximately 80 feet at the east, near downtown Fort Worth.



Even though the efforts conducted for the SH 199 Corridor Master Plan were not part of a formal National Environmental Policy Act (NEPA) process, it was anticipated that the study could be used as a basis for future NEPA documents and engineering under the Planning and Environmental Linkages approach. To achieve this, a multi-disciplined team of planners, engineers, landscape architects, and economic specialists was assembled to work on the SH 199 Corridor Master Plan. The team evaluated the existing physical environment, traffic, and economic market conditions to develop a corridor design to address study specific goals:

- Provide transportation options for all modes and users
- Maintain and enhance capacity for the flow of traffic through the corridor
- Improve drainage systems
- Identify and provide economic development opportunities
- Include context sensitive solution principles and transportation engineering concepts to increase the livability in the corridor

Early agency coordination and public involvement were vital to this study. Almost 30 meetings, briefings, and presentations were held to gain knowledge and input from local governments and the public. Meetings were held at key points in the study process to engage stakeholders and the public in the discussion of community ideas for the SH 199 corridor.

Existing Conditions

Previous and related studies in the area and current conditions of the corridor were assessed. The existing site conditions within and around the SH 199 corridor study area were important to identify to assist the project team in identifying preliminary issues relevant to the development of improvements in the corridor and to provide a context for exploring opportunities and challenges. Conditions described include land use, zoning, environmental considerations, right-of-way, utilities, transportation facilities and operations, and drainage. The following graphic summarizes the public input provided regarding the context, challenges, and opportunities for improvements within the SH 199 corridor.

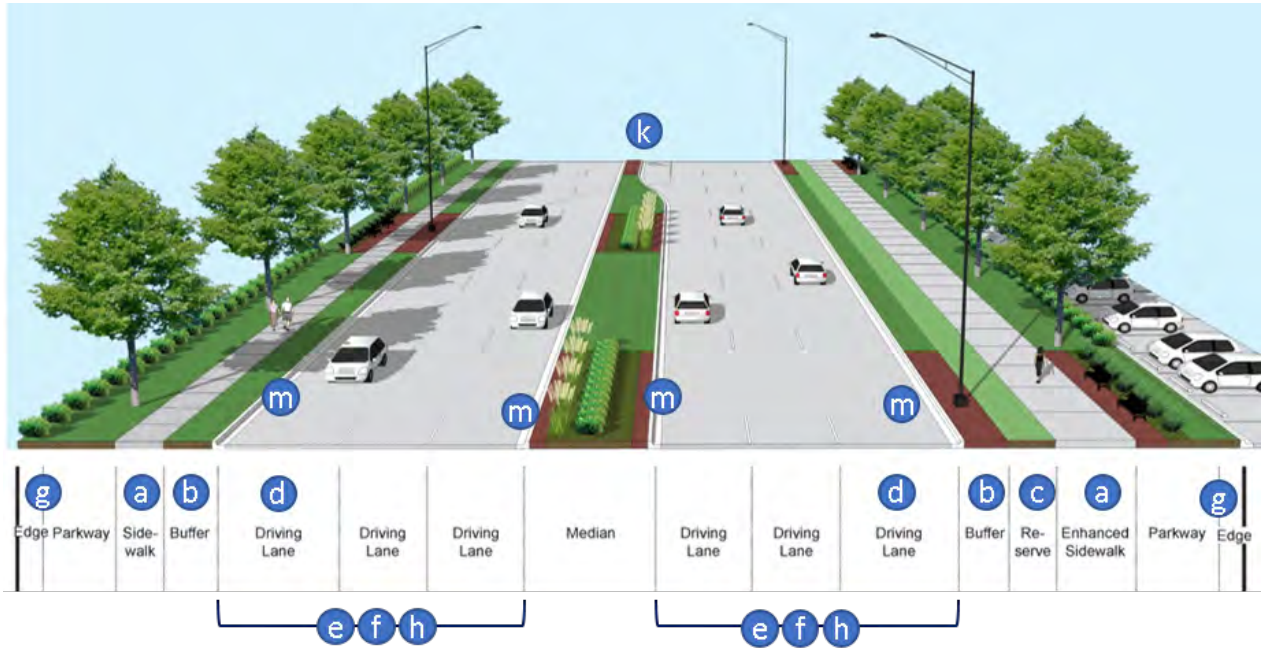
SH 199 Corridor Context, Challenges, and Opportunities

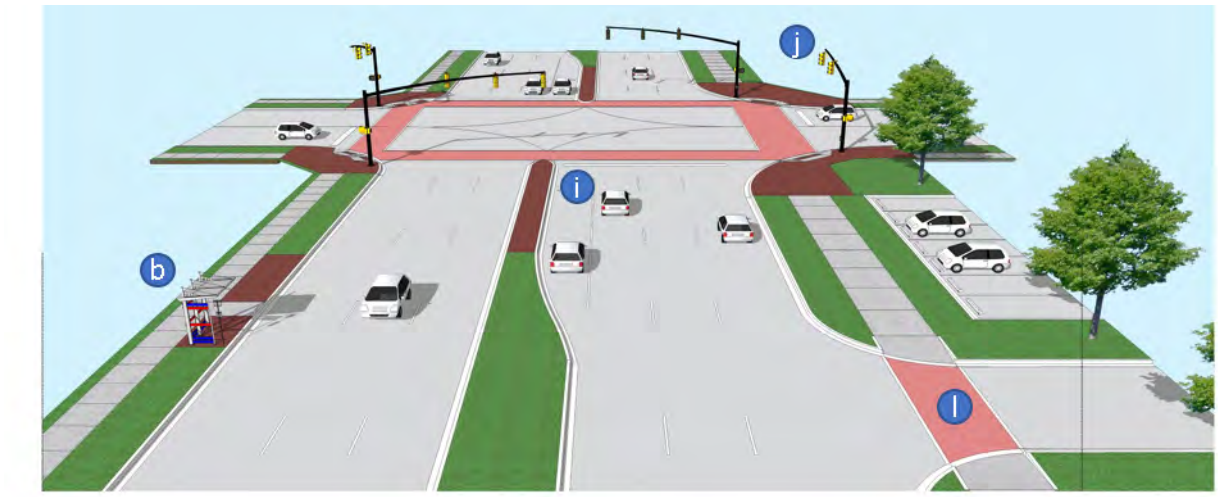
What is Great?	What are the Challenges?	What are the Opportunities?
• Historical Context of the Corridor • Parks in the Area • Adjacent Neighborhoods • Vistas and Views • Redevelopment Opportunities	• Traffic Volumes • Drainage • Topography • Number and Size of Driveways • Speed • Safety • Pedestrian Access • Making the Corridor Attractive to Businesses • Adjacency to Park Land and a Historic Neighborhood	• Right-of-Way Width • Increased Pedestrian/Bike Connectivity to Parks and Trails • Park and Ride near IH 820 • More Mixed-Use Development • Enhanced Urban Design

Recommendations

Based on the age and condition of the pavement and the forecasted travel demand in 2040, it is recommended that SH 199 be reconstructed to current design standards as an urban roadway. Specifically, the roadway should be improved to six lanes from IH 820 to University Drive/ Northside Drive and four lanes from University Drive/Northside Drive to Belknap Street. This would include the addition of curbs and gutters, sidewalks, underground drainage, traffic signals, lighting, and streetscape improvements. These recommendations were built on existing conditions, community and stakeholder input, and technical analyses performed as part of this study and were developed to meet the study goals. The following demonstrates how the study design concepts and recommendations support and achieve the study goals.

Study Goal	Study Recommendations
Provide transportation options for all modes and users	a) Inclusion of sidewalks/enhanced sidewalks that meet Americans with Disabilities standards for pedestrians and bicyclists b) Inclusion of buffer areas for bus stops and shelters c) Provision for future expansion of the sidewalk on the south side of road d) Inclusion of a shared lane for an on-street bicycle accommodation e) Maintain six to four lanes of travel for motor vehicles f) Use of TxDOT design standards to accommodate large trucks g) Provision for utilities within the buffer area of the right-of-way
Maintain and enhance capacity for the flow of traffic through the corridor	h) Widen roadway to six lanes from IH 820 to University Drive/Northside Drive i) Improve intersection operations with the inclusion of left and right turn lanes, where appropriate j) Replace traffic signals k) Provide median access at appropriate locations l) Reduce number of driveways based on TxDOT access management standards
Improve drainage system	m) Convert rural cross section (with open flow drainage) to curbs and gutters with a closed storm drainage system

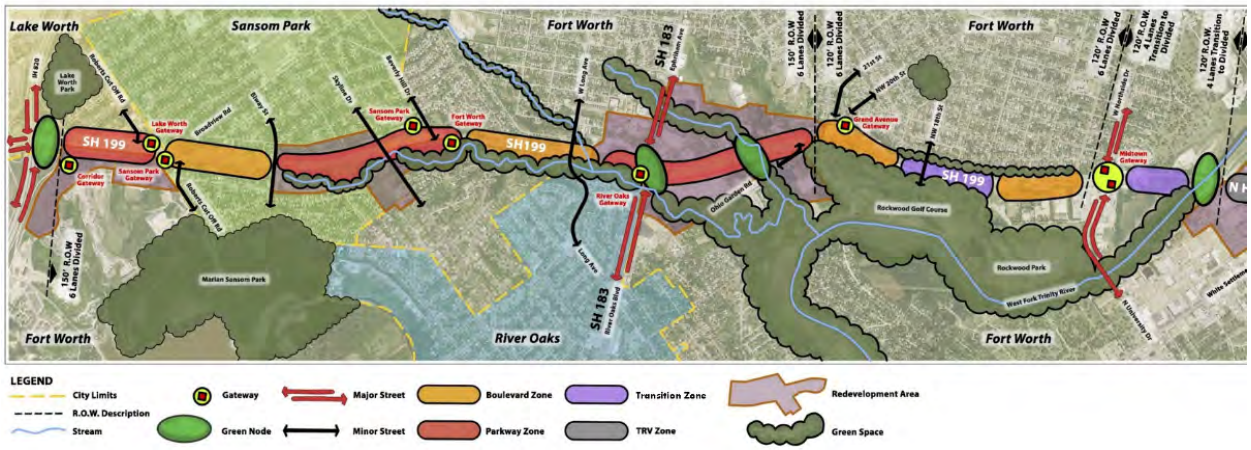




Study Goal	Study Recommendations
Identify and provide economic development opportunities	The following four core areas to target redevelopment efforts were identified along with development types: • IH 820/SH 199 intersection • The primarily undeveloped area within Sansom Park near the Skyline Drive/SH 199 intersection • Commercial intersection of SH 183 (River Oaks Boulevard)/ SH 199 • The Panther Island/Trinity River Vision area




Study Goal	Study Recommendations
Include context sensitive solutions principles and transportation engineering concepts to increase the livability in the corridor	Three urban design concepts were developed to pose different perspectives for the future design phases. All concepts anticipate interagency and/or public-private partnerships to accomplish the level of improvements depicted. This includes initial construction funding and ongoing maintenance agreements with the affected cities, improvement districts, or interested stakeholders. Urban design concepts may affect geometric roadway engineering design; therefore, warranting early coordination and integrated decision making in future design phases.



Based on the recommended improvements, the preliminary construction cost has been estimated at $99.8 million (in 2017 dollars). It is expected that the project would begin construction in 2023; therefore, the costs were escalated to $121.5 million (in 2023 dollars or year of expenditure). On December 13, 2016, the Regional Transportation Council for the North Central Texas Council of Governments approved the 10-year plan cost/revenue for the Dallas-Fort Worth region, which included $100 million (in 2017 dollars) for construction of SH 199, east of IH 820.

Next Steps

Future design and environmental efforts need to be coordinated with local and regional transportation plans for transit, bicycle, and pedestrian facilities. As a follow-on to the stakeholder involvement feedback obtained to date, it is recommended that the subsequent environmental and engineering studies follow a context sensitive solutions approach to include urban design and redevelopment strategies to the degree possible during the development of the preliminary design.

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1.0 INTRODUCTION

State Highway 199 (SH 199) has been identified as a regional transportation facility in northwest Tarrant County. Through previous studies, concepts to balance mobility and accessibility improvements with economic development were developed. To help make these visions a reality, this study (SH 199 Corridor Master Plan) was initiated to produce a planning document that could provide a basis for future design and construction. The SH 199 Corridor Master Plan was conducted from February 2016 to September 2017. This document (Volume I – Final Report) summarizes the study efforts and recommendations of the study in seven sections.

- 1.0 – Introduction: Describes the study area, study purpose and approach, and previous and related studies.
- 2.0 – Existing Conditions: Presents an overview of the existing social, economic, and physical conditions in the corridor. This section includes a description of the transportation facilities in the study area.
- 3.0 – Economic Market Analysis: Provides a summary of the market-based analysis performed to analyze the potential economic development that may be associated with the recommended improvements to the corridor.
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- 6.0 – Public and Stakeholder Involvement: Summarizes the agency coordination and public involvement efforts conducted during the study.
- 7.0 – Recommendations: Documents the recommendations and outlines the next steps in the project development process.

There are also three other volumes that include more detailed information and mapping.

- Volume II – Mapping includes the mapping of the social, economic, natural environment, and other physical conditions within the study area. This volume supports Volume I.
- Volume III – Public and Stakeholder Involvement documents the meetings and coordination efforts associated with the study, along with comments received from the public and stakeholders. This volume supports Section 6.0 in Volume I.
- Volume IV – Technical Memorandums includes a compilation of the 18 technical memorandums developed during the SH 199 Master Corridor Plan. This volume supports Volume I.

1.1 STUDY AREA

The SH 199 study area is bound by Interstate Highway (IH) 820 to the west and Belknap Street to the east (see Figure I-1 and Exhibit II-1 in Volume II), a distance of six miles. The study did not include the interchange of IH 820. In April 2017, the Texas Department of Transportation (TxDOT) initiated a separate study of the interchange at IH 820 and SH 199.

SH 199 is located in northwest Tarrant County. The roadway travels in a southeast and northwest direction through the cities of Lake Worth, Sansom Park, River Oaks, and Fort Worth in Tarrant County, Texas. The roadway intersects with SH 183 (River Oaks Boulevard) and crosses over the West Fork Trinity River and Clear Fork Trinity River. SH 199 is also known as Lake Worth Boulevard (west of IH 820), Jacksboro Highway, Thunder Road, and Henderson Street (east of the West Fork of the Trinity River). Other features in the vicinity of the study area

include the Naval Air Station Fort Worth Joint Reserve Base (NAS Fort Worth JRB), Lake Worth, Fort Worth Stockyards, Marion Sansom Park, and Rockwood Golf Course. For consistency within this report, the SH 199 corridor will be described from west (IH 820) to east (Belknap Street) with adjacent features described as north and south of the corridor.

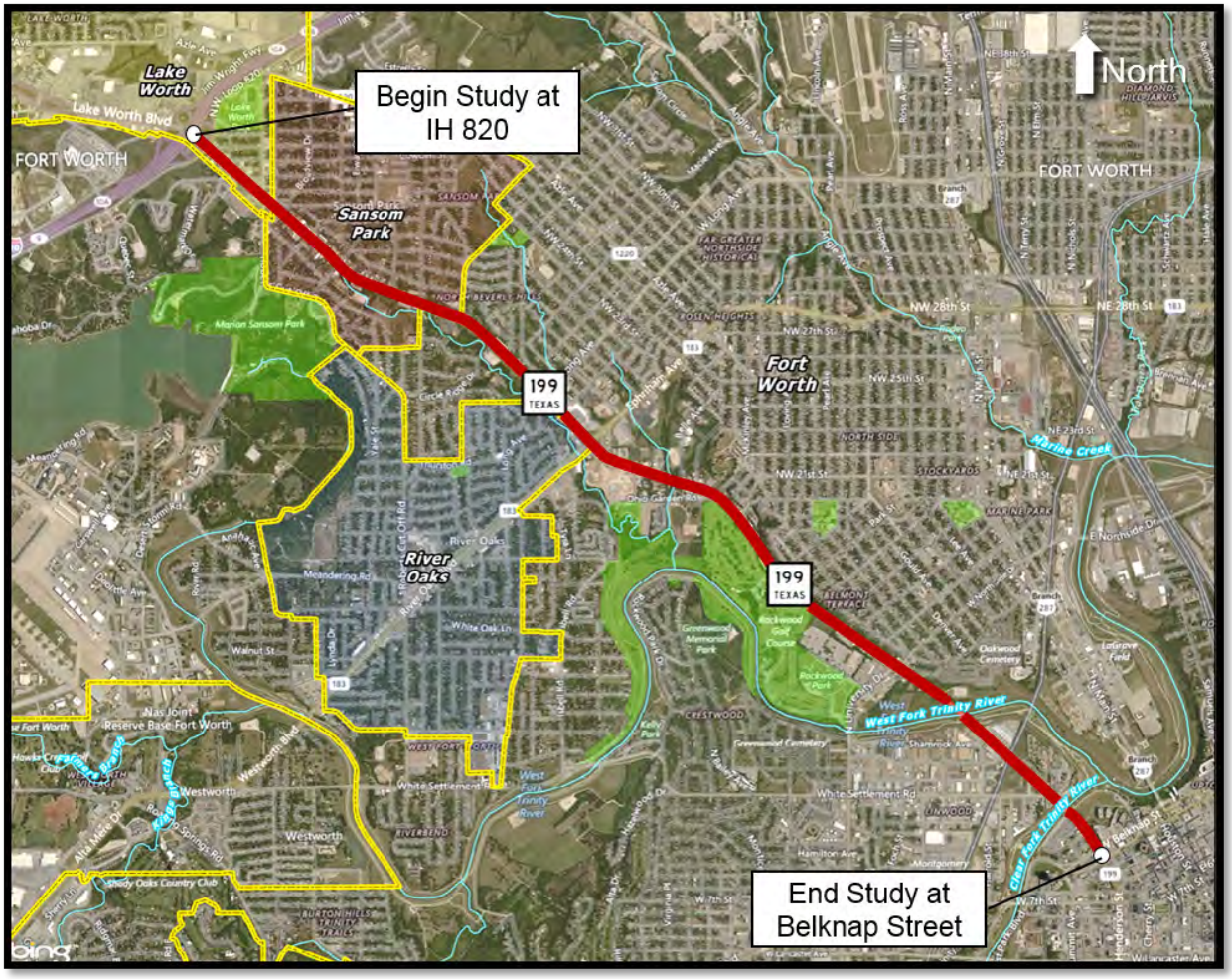


Figure I-1. Project Location

1.2 STUDY PURPOSE AND APPROACH

The purpose of the SH 199 Corridor Master Plan was to provide a basis for preliminary design/ engineering for improvements to the corridor. Specifically, the goals of the study were to:

- Provide transportation options for all modes and users
- Maintain and enhance capacity for the flow of traffic through the corridor
- Improve drainage systems
- Identify and provide economic development opportunities
- Include context sensitive solution principles and transportation engineering concepts to increase the livability in the corridor

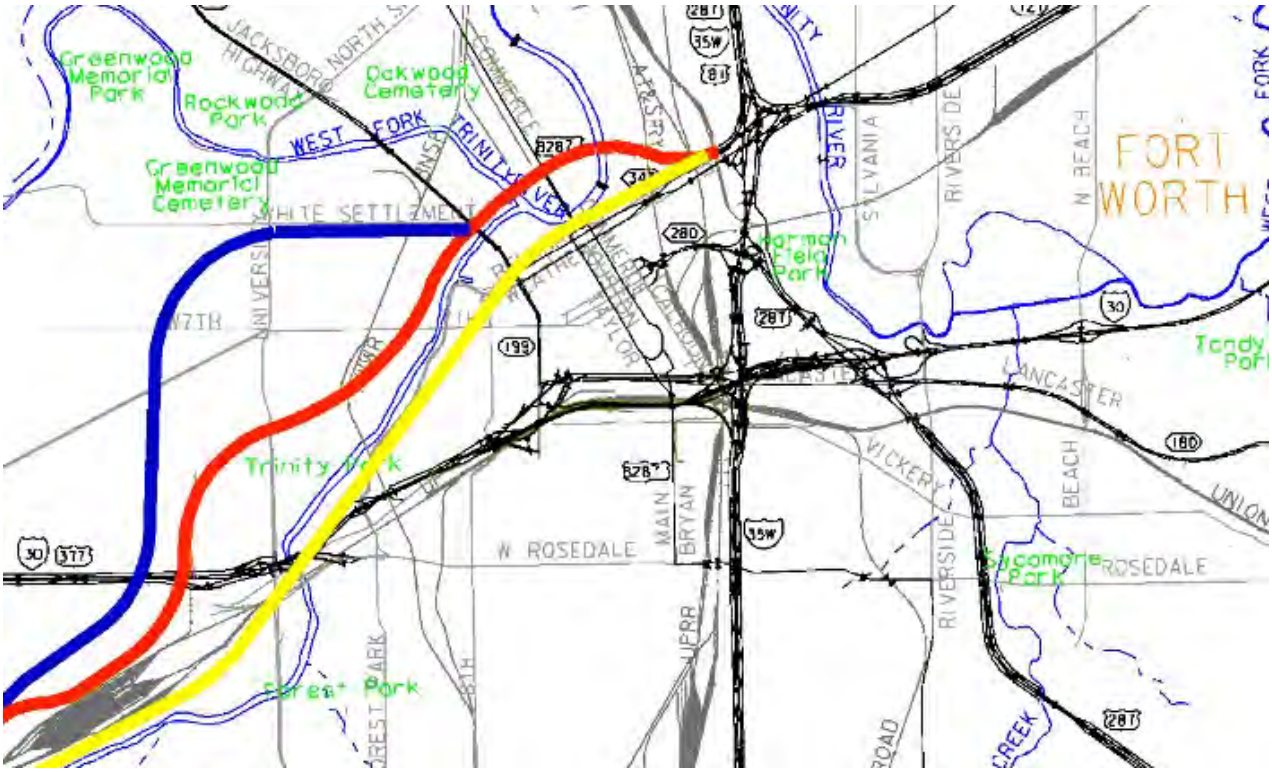
Even though the study was not part of a formal National Environmental Policy Act (NEPA) process, it is anticipated that the SH 199 Corridor Master Plan can be used as a basis for future NEPA documents and engineering under the Planning and Environmental Linkages (PEL)

approach. PEL represents a collaborative and integrated approach to transportation decision making that 1) considers environmental, community, and economic goals early in the transportation planning process, and 2) uses the information, analysis, and products developed during planning to inform the environmental review process. To achieve this, a multi-disciplined team of planners, engineers, landscape architects, and economic specialists was assembled. The study included five major tasks:

- Collection and analysis of existing condition data
- Coordination and input gathering through stakeholder and public involvement
- Conduction of an economic market analysis
- Recommendation of corridor design and operation through the preparation of a traffic assessment, drainage assessment, urban design/streetscape alternatives, and multimodal accommodations
- Development of a corridor master plan report

1.3 HISTORY

SH 199 was originally known as SH 34 and was built in the 1930s. In the 1950s and 1960s, the roadway was widened to four lanes. In the early 1960s, the concept of extending SH 121 as a freeway from IH 35W around the north side of downtown Fort Worth to southwest Tarrant County was placed on the *Fort Worth Metropolitan Area Thoroughfare Plan*. Route studies for SH 121 began in the 1970s and numerous alignments were developed (see Figure I-2). Based on the alignments for SH 121, TxDOT began a study in 1987 to upgrade SH 199 to a six/eight-lane freeway from FM 730 in Azle to proposed SH 121 on the north side of Fort Worth.



Source: Excerpt from Exhibit 1.2 from the SH 121 from IH 30 to FM 1187 Final Environmental Impact Statement

Figure I-2. SH 121 Alignment Alternatives in 1973

Because of reduced funding opportunities, a task force was convened in 1994 to re-examine the SH 121 project alternatives to reduce costs and explore financial options. The task force recommendations included implementing SH 121 as a toll road and shortening the SH 121 project limits from FM 1187 in south Fort Worth to IH 30 south of downtown Fort Worth. This resulted in the portion of SH 121 north of downtown Fort Worth being eliminated from the SH 121 project. Once this segment of SH 121 from IH 35W to IH 30 was removed, there was no longer a need for a freeway along SH 199.

1.4 PREVIOUS AND RELATED STUDIES

To help understand the context of the study area, previous studies and planning documents were reviewed. Three recent planning studies have been conducted in the area and another is underway. Also, there have been 10 related plans concerning the corridor from a regional, land use, or modal aspect. Table I-1 provides a list of these efforts. The following sections summarize the recommendations related to SH 199. For more information, see the Previous and Related Studies Technical Memorandum in Volume IV.

Table I-1. Previous and Related Studies

Documents	Date Completed/ Adopted
Studies	
Joint Land Use Study	2008
Planning for Livable Military Communities	2013
SH 183 River Oaks Boulevard Corridor Master Plan (SH 199 to West Fork of the Trinity River)	2016
SH 183 Corridor Master Plan (West Fork of the Trinity River to IH 30)	Late 2017
Planning Documents	
Mobility 2040: The Metropolitan Transportation Plan for North Central Texas	2016
2013 City of Lake Worth Comprehensive Plan Vision Report	2013
2013 City of Sansom Park Comprehensive Plan Vision Report	2013
City of River Oaks Comprehensive Plan Vision Report	2013
Fort Worth Master Thoroughfare Plan	2016
Bike Fort Worth Plan	2009
Walk Fort Worth Plan	2014
Trinity River Vision Plan	2004
Fort Worth Transportation Authority Master Plan	2015
Fort Worth 2017 Comprehensive Plan	2016

1.4.1 *Joint Land Use Study*

The 2008 *Joint Land Use Study* (JLUS) was conducted by surrounding cities and Tarrant County in partnership with the US Department of Defense and the US Office of Economic Adjustment regarding NAS Fort Worth JRB. The goal of the JLUS was to promote compatible community growth that supports military training and operational missions. The JLUS sought to mitigate issues related to development in aircraft safety zones and near high noise areas by developing solutions to conflicts and improving communication between NAS Fort Worth JRB and the neighboring communities on land use.

1.4.2 *Planning for Livable Military Communities Vision Report*

Building on the JLUS study and the partnership developed with local governments, the *Planning for Livable Military Communities Vision Report* (PLMC) study was conducted. The effort included five focused planning activities, including analyses of area real estate and economic markets, housing and retail sectors, transportation system and local ordinances, as well as

Comprehensive Plan Visions for five cities (Lake Worth, River Oaks, Sansom Park, Westworth Village, and White Settlement).

Because the SH 199 corridor crosses multiple jurisdictions, the PLMC classified the roadway as a 'Main Street A' to promote livability, access/mobility, and safety. The PLMC also found that 75 percent of the vehicle trips using SH 199 are passing through the corridor rather than stopping or turning onto a different road. Traffic growth will likely be driven by development along the SH 199 corridor northwest of the study area and few alternate routes exist that will be able to relieve this increase in traffic. Traffic projections recognized the challenge of providing a mix of uses fronting the roadway while also accommodating growth from redevelopment. Because of these challenges, the PLMC recommended a corridor assessment study be conducted for SH 199 to determine the appropriate mobility solutions, as well as the feasibility, timeframe, and costs.

1.4.3 *SH 183 River Oaks Boulevard Corridor Master Plan* (SH 199 to the West Fork of the Trinity River) and *SH 183 Corridor Master Plan* (West Fork of the Trinity River to IH 30)

The *River Oaks Boulevard Corridor Master Plan* was published in July 2016 to help guide development along River Oaks Boulevard (SH 183) from SH 199 to the West Fork of the Trinity River. The plan balances mobility and accessibility improvements with economic development. Near SH 199, the recommendations include retaining SH 183 as a four-lane divided roadway but maximizing the use of the wide, available right-of-way to incorporate as many modal mobility options as possible. The preliminary recommendations include utilizing a contra-flow frontage road centered on the service road right-of-way configuration.

As a next step, the North Central Texas Council of Governments (NCTCOG) began development of a second corridor master plan for SH 183 from the West Fork of the Trinity River to IH 30. The overall focus of the study is to evaluate bicycle/pedestrian options, determine desired streetscape amenities, and conduct a safety and access management review. This study should be completed by fall 2017.

1.4.4 *Mobility 2040*

Mobility 2040: The Metropolitan Transportation Plan for North Central Texas (Mobility 2040) is the defining vision for the multimodal transportation system in the Dallas-Fort Worth metropolitan planning area. The primary purpose of Mobility 2040 is to prioritize and guide the implementation of multimodal mobility improvements in a growing region within fiscal constraints. Mobility 2040 reflects an increase in projected development for central Tarrant County, which the corridor directly serves. This forecast trend is reflected in both the demographic projections used for the 2040 regional travel demand model, as well as the need for renewed infrastructure to support increasing multimodal demands in redeveloping corridors. Mobility 2040 notes SH 199 as a candidate for complete streets principle application of urban thoroughfare revitalization - with the supporting call to integrate land-use context, and supporting reinvestment through the addition of alternative modes of transportation, needed repairs and maintenance, and coordination with local governments.

1.4.5 *2013 City of Lake Worth Comprehensive Plan Vision Report*

The *City of Lake Worth Comprehensive Plan Vision Report*, developed in 2013, is part of the PLMC, which is intended to guide the future development of the city of Lake Worth. The report identifies the north side of SH 199 from IH 820 to Azle Avenue as a future mixed-use, commercial redevelopment area. Recommendations from the community vision workshops included bicycle and pedestrian connections south of the Roberts Cut Off Road and SH 199

intersection to Marion Sansom Park, Inspiration Point, and along the perimeter of Lake Worth, as well as a commercial redevelopment area along SH 199 between the intersections of Roberts Cut Off Road and Skyline Drive.

1.4.6 *City of Sansom Park Comprehensive Plan Vision Report*

The *City of Sansom Park Comprehensive Plan Vision Report*, developed in 2013, is part of the PLMC, which is intended to guide the future development of the city of Sansom Park. SH 199 was identified as a key commercial redevelopment area with a commercial redevelopment node located at the intersection of SH 199 and Corner Lane. Recommendations from the Community Vision Workshops include a commercial redevelopment area along SH 199 between the intersections of Broadway Drive and Beverly Hills Drive and a commercial redevelopment node at the intersection of Broadway Drive and SH 199. The proposed improvement recommendations also include traffic improvements to and from SH 199 and Marion Sansom Park in proximity to Norfleet Street and Biway Street with a new park connection between the intersection of SH 199 and Cheyenne Street and Roberts Cut Off Road and Yale Street.

1.4.7 *City of River Oaks Comprehensive Plan Vision Report*

The *City of River Oaks Comprehensive Plan Vision Report*, developed in 2013, is part of the PLMC, which is intended to guide the future development of the city of River Oaks. SH 199 is located along the northeastern edge of River Oaks, which was designated as an area for commercial redevelopment. Recommendations from the community vision workshops include bicycle and pedestrian connections south of and parallel to SH 199 from Beverly Hills Drive to SH 183 and south of SH 199 along Long Avenue, and a commercial redevelopment area south of SH 199 between Long Avenue and SH 183.

1.4.8 *Fort Worth Master Thoroughfare Plan*

The *Fort Worth Master Thoroughfare Plan*, adopted in May 2016, is the long-range plan for major roadways in the city of Fort Worth and is intended to accommodate the ultimate development of the city thoroughfare network. The *Fort Worth Master Thoroughfare Plan* is based on a complete streets philosophy, with street design supporting all transportation users and roads appropriately sized to reflect and support the surrounding land uses. SH 199 is classified as an established thoroughfare with a commercial collector street type in the plan.

1.4.9 *Bike Fort Worth Plan*

The *2009 Bike Fort Worth Plan* promotes bicycling as a safe and attractive transportation alternative. The goal of the plan is to recommend improvements to increase the number of bicycle commuters, decrease bicyclist-related crashes, and attain designation as a bicycle friendly community. The plan outlines preferred routes and treatments to promote safe and comfortable cycling, such as shared-use paths and sidepaths. The segment of SH 199 between Ohio Garden Road and 21st Street is designated as an on-street bike route, connecting routes on the two roadways. The segment of SH 199 continuing into downtown after White Settlement Road includes on-street bicycle lanes.

1.4.10 *Walk Fort Worth Plan*

The *2014 Walk Fort Worth Plan* promotes a safe and convenient pedestrian environment for those who travel by foot, wheelchair, or other mobility aid in Fort Worth. The *Walk Fort Worth Plan* recommends minimum and desirable sidewalk widths of six feet and 10 feet, respectively, along high-speed arterial streets, near schools, transit stops, in downtown, and in mixed-use areas. SH 199 includes many of these characteristics and is noted in the plan as a high priority corridor for sidewalk improvements.

1.4.11 *Trinity River Vision Plan*

Bordering the SH 199 project to the south is the Trinity River Vision Plan and Panther Island. Previously known as Trinity Uptown, Panther Island is a vital segment in the adopted Trinity River Vision Plan. A key feature of this effort is a bypass channel that will carry flood waters around a redeveloping area north of downtown Fort Worth creating an island. Currently, the SH 199 bridge over the proposed bypass channel is under construction and should be completed by summer 2018.

1.4.12 *Fort Worth Transportation Authority Master Plan*

The Fort Worth Transportation Authority (FWTA) adopted a master plan in 2015 with the goals to connect people and places, make transit an attractive choice, and create a sustainable system over the long term. The plan contains network recommendations with a stated five-year horizon, which include improvements along the SH 199 corridor anchored by the central business district in downtown Fort Worth and a new transit center to the south of the intersection of SH 199 and IH 820. Bus service along SH 199 (Route 46) is planned to be expanded with an express route, and a rapid bus route featuring 10-minute intervals between busses during peak periods.

1.4.13 *2017 Fort Worth Comprehensive Plan*

Based on the *2017 Fort Worth Comprehensive Plan*, there are five major themes that will help realize the future vision for the city. These themes include promoting economic growth, meeting the needs of an expanding population, revitalizing the central city, developing multiple growth centers, and celebrating the Trinity River. One of the key values of the city is a focus on mobility. Fort Worth desires to have streets and public transportation systems that allow convenient travel throughout the city and region. The city would like for these streets to have safe sidewalks to allow pedestrian movement throughout neighborhoods, commercial districts, and greenways.

2.0 EXISTING CONDITIONS

The following sections describe the current conditions along the SH 199 corridor. The existing site conditions within and around the SH 199 corridor study area were important to identify to assist the project team in identifying preliminary issues relevant to the development of improvements in the corridor and to provide a context for exploring opportunities and challenges. Conditions described include land use, zoning, environmental considerations, right-of-way and utilities, transportation facilities, and drainage.

2.1 LAND USE AND ZONING

Within the SH 199 corridor, five distinct areas, referred to as character zones, have been observed. These character zones are not absolute but are observed character areas that were determined through site visits, geographic information system (GIS) analysis, existing studies, and local input. Exhibit II-2 in Volume II includes a graphical representation of the five character zones and their boundaries. Exhibits II-3 through II-8 in Volume II illustrate existing land uses and Exhibits II-9 through II-14 in Volume II show current zoning.

- <u>IH 820 to Roberts Cut Off Road (Character Zone 1)</u>
  The land use types along SH 199 in Character Zone 1 include commercial, retail, and office (see Exhibit II-3 in Volume II). Behind these parcels is single-family residential to the north with multi-family and parks to the south. Along Roberts Cut Off Road are commercial, public, and multi-family structures. The structures adjacent to SH 199 include a variety of fast-food chains, restaurants, gas stations, pawn shops, and other commercial uses. Overall this zone is auto-oriented, with parking lots in front of single-use structures. A

majority of the architecture is dated and typical of most auto-oriented environments across the country.

Current zoning for Character Zone 1 includes primarily commercial uses adjacent to SH 199. Limited single-family and multi-family designations are identified behind the SH 199 commercial zoning frontage (see Exhibit II-9 in Volume II).

- Roberts Cut Off Road to Long Avenue (Character Zone 2)
  There are a wide variety of land uses between Roberts Cut Off Road and Long Avenue. These uses include commercial, light industrial, single-family, public park, and vacant land (see Exhibits II-3 through II-5 in Volume II). Behind the properties along SH 199, uses primarily include single-family, multi-family, vacant land, and public land. The commercial uses include single-use, auto-oriented structures with parking in the front. Some of the specific uses include bars, liquor stores, motels, feed and supply stores, gas stations, auto repair shops, hardware stores, restaurants, and discount stores.

  East of Skyline Drive, the parcels south of SH 199 become deeper and are predominantly made up of single-family residential and vacant land. Despite the increased parcel depth, the development potential of these parcels is affected by a stream that runs through this area. The general architecture in Character Zone 2 does not possess significant character and is typical for older, commercial-style buildings. Many buildings are one story and have flat roofs. Of the five zones, Character Zone 2 has the most undeveloped land but the stream running parallel to SH 199 may affect development opportunities and/or designs. There are also a handful of infill sites throughout the zone.

  Current zoning for Character Zone 2 includes primarily commercial uses adjacent to SH 199, with some planned developments in place. Single-family designations are identified behind the SH 199 commercial zoning frontage (see Exhibits II-9 through II-11 in Volume II).
- Long Avenue to Ohio Garden Road (Character Zone 3)
  Character Zone 3 is marked with larger parcels than Zones 1 and 2. These parcels range from commercial, to industrial, to multi-family, to vacant land (see Exhibits II-5 and II-6 in Volume II). There are a handful of single-family residential lots behind the parcels lining SH 199; however, most of the lots located off SH 199 include uses for commercial, light industrial, multi-family, vacant, or public. The development typology in Character Zone 3 continues to be auto-oriented with buildings set back on the property and large parking lots lining the front. Uses include gas stations, auto-repair shops, thrift stores, single-story strip retail, fast-food restaurants, drug stores, and big-box retail stores.

  The architectural character of Character Zone 3 is generally single-story buildings with flat roofs and metal siding. Most of the construction was likely built prior to the 21st century; however, there are a few newer developments, particularly around the intersection of SH 199 and SH 183. These newer uses include a big-box retail store, a drug store, and an auto parts store. These newer structures have some enhanced architectural features such as stone façades and façade articulations. More recent developments have maintained landscape elements.

  Current zoning for this character zone includes primarily commercial uses adjacent to SH 199, with some industrial designations near the Ohio Garden Road area. Mostly single-family designations are identified behind the SH 199 commercial zoning frontage with a few public sites associated with existing school or community facilities (see Exhibits II-11 and II-12 in Volume II).

- Ohio Garden Road to the West Fork of the Trinity River (Character Zone 4)
  While there are multiple commercial parcels on SH 199 in Character Zone 4, a majority of this zone is lined with park uses (Rockwood Golf Course and Rockwood Park) on the south and single-family uses on the north (see Exhibits II-6 and II-7 in Volume II). Several of the existing commercial developments have been more recently constructed and offer enhanced façade materials and landscaping features. The remaining commercial properties are dated, single-story structures with large, non-landscaped parking lots, many of which are classified as car dealerships. The single-family uses adjacent to the north side of SH 199 are set back a minimum of 150 feet from the right-of-way and mostly not visible from the road. There is a periodic, cast-in-place retaining wall lining SH 199 along these residential parcels. There are very few vacant parcels within the zone. Existing vacant parcels are tucked between single-family uses.

  Current zoning is primarily single-family uses adjacent to and within neighborhoods near SH 199. Concentrated areas of commercial zoning are located throughout Character Zone 4. Industrial designations are located along the south side of SH 199 near University Drive and continue toward the West Fork of the Trinity River (see Exhibits II-12 and II-13 in Volume II).
- West Fork of the Trinity River to Belknap Street (Character Zone 5)
  Character Zone 5 is primarily made up of existing commercial and industrial land uses with a few parcels of park land associated with the Trinity River and public land (see Exhibit II-8 in Volume II). The commercial and industrial properties house single-story buildings, most of which are metal structures. A majority of these parcels are very large and include warehousing. They have large loading docks and wide parking lots that cater to trucks moving in and out of the site. Small commercial use parcel sizes are located near White Settlement Road. The design of these businesses is auto-oriented with parking lots in the front and undesirable walking conditions for pedestrians. More recent multi-family uses are located near the far southeast end of Character Zone 5. Areas closer to downtown Fort Worth include urban forms with buildings near the street edge; the enhanced sidewalks in this area are wide and offer both street trees and lighting. Character Zone 5 includes the planned Panther Island redevelopment.

  Current zoning is primarily mixed-use associated with the future Panther Island project. In addition, industrial zoning is designated in portions of Character Zone 5 (see Exhibit II-14 in Volume II).

For more information, see the Existing Character Zones Technical Memorandum included in Volume IV.

2.2 DEMOGRAPHICS

Most of the communities along the study corridor have experienced an increase in population from 2010 to 2016 (see Table I-2). Lakeside had the largest percent change at 29.30 percent, and other cities also experienced high percentages of growth such as Fort Worth at 8.79 percent and Azle at 4.23 percent. Sansom Park and River Oaks both experienced slight decreases in population changes at -0.34 percent and -1.84 percent, respectively. The municipalities of Fort Worth, Lake Worth, and Springtown all have higher daytime populations, a trend that supports SH 199 as an important commuter corridor.

Table I-2. Current Study Area Demographics

City/Town	2010 Population	2016 Population	Percent Change	Daytime Population (2014)	Median Household Income (2014)	Percent of People in Poverty (2014)
Fort Worth	741,206	806,380	8.79%	880,002	$52,273	19.4%
Sansom Park	4,686	4,670	-0.34%	3,366	$38,368	30.5%
River Oaks	7,427	7,290	-1.84%	5,569	$42,622	14.5%
Lake Worth	4,584	4,710	2.75%	6,345	$47,004	7.1%
Lakeside	1,307	1,690	29.30%	838	$78,750	3.6%
Azle	10,947	11,410	4.23%	10,370	$54,171	11.8%
Springtown	2,658	2,670	0.45%	3,374	$52,500	15.8%

Source: 2016 Population Estimates, North Central Texas Council of Governments (NCTCOG), April 2016

The Town of Lakeside has the highest median income at $78,750. According to the US Census, the 2015 median household income for Tarrant County was $58,711. Fort Worth, Azle, and Springtown are slightly below the Tarrant County average. Sansom Park, River Oaks, and Lake Worth are further below the average. Sansom Park has the highest percentage of people in poverty at 30.5 percent. The Tarrant County average is 13.1 percent for persons in poverty according to the US Census Bureau data for 2015. For more information, see the Demographics Technical Memorandum included in Volume IV.

2.3 ENVIRONMENTAL CONSIDERATIONS

The corridor master plan team identified environmental conditions through field observation and consideration of compiled environmental geospatial databases. The team used a pair of web-based tools, the Regional Environmental Framework tool (http://www.nctcog.org/traces/Ref.asp) published by NCTCOG and the National Environmental Policy Act Assist (NEPAssist) tool (https://www.epa.gov/nepa/nepassist). The following sections summarize the information collected and displayed on Exhibits II-15 through II-20 in Volume II. For more information, see the Environmental Considerations Technical Memorandum included in Volume IV.

2.3.1 Historical Sites

The SH 199 corridor contains and is adjacent to two sites listed on the National Register of Historical Places and one likely to be eligible for listing.

The Grand Avenue Historic District is parallel and adjacent to the north side of SH 199 between the extension of Park Street and University Drive, which includes approximately seven blocks (see Exhibits II-18 and II-19 in Volume II). Within the district, there are 57 contributing buildings, 31 non-contributing buildings, and one contributing structure. The contributing structure is a concrete retaining wall along the face of the bluff between SH 199 and the core of the historic district. This contributing structure appears to be within the existing TxDOT right-of-way for SH 199 and may need to be reconstructed based on the recommended roadway improvements and existing stability and drainage conditions.

The Henderson Street Bridge at the Clear Fork of the Trinity River is also listed on the National Register of Historic Places (see Exhibit II-20 in Volume II). This four-lane bridge was constructed in 1930 and is 836 feet long. The bridge includes seven-foot sidewalks on either side of the exterior travel lanes. Physically, the Henderson Street Bridge is located three-eighths of a mile west of the confluence of the Clear Fork and the West Fork of the Trinity River. Currently, paved walking and bicycling trails, elements of the Trinity River Trails System, parallel the Trinity River and traverse under the historic bridge.

The Rockwood Golf Course, has not been nominated and is currently not listed on the National Register of Historic Places, but may be considered an eligible site for historic designation. The Rockwood Golf Course is parallel and adjacent to the south side of SH 199 between Ohio Garden Road and the extension of 16th Street (see Exhibits II-18 and II-19 in Volume II). The 18-hole Rockwood Golf Course originally opened for play in 1938 and was originally designed by John Bredemus. In November 2015, a reconstruction and reconfiguration of the golf course began. The reconstruction included new greens, fairways, bunkers, and cart paths and was opened in July 2017. Confirmation has been made that no Land and Water Conservation Funds were used for the original construction or site updates to the Rockwood Golf Course or Rockwood Park.

2.3.2 Places of Worship

There are two places of worship located along the SH 199 corridor – Northwest Bible Church at 5025 Jacksboro Highway, Fort Worth, TX 76114 and St. Demetrios Greek Orthodox Church at 2020 NW 21st Street, Fort Worth, TX 76164. Additionally, there are 20 places of worship within one mile of SH 199. Exhibits II-15 through II-20 in Volume II show these locations.

2.3.3 Schools

There are nine schools within a half-mile proximity of the SH 199 corridor (see Exhibits II-15 through II-20 in Volume II). The area is served by two school districts – Fort Worth Independent School District and Castleberry Independent School District. Within the project study area, no known school bus routes currently include stops along SH 199.

2.3.4 Topography and Soils

The SH 199 study area contains diverse natural conditions in topography and soil type. The topography within the study area typically includes a sloped terrain from the north to the south. This sloped terrain allows for unique vistas and vantage points along the corridor. However, the topography introduces challenges and costs to site development and corridor widening. From the US Department of Agriculture Natural Resources Conservation Service Web Soil Survey, the soil within the study area is classified mainly as Aledo-Urban Land Complex (three to 20 percent slopes) and Aledo-Bolar-Urban Land Complex (one to eight percent slopes). These two types of soils are variations in clay loam which is found in many parts of North Texas.

2.3.5 Natural Habitats, Wetlands, and Floodplains

A review of the US Environmental Protection Agency (USEPA) resource material yielded no critical habitat, limited wetlands, and multiple sections of the corridor within or near flood hazard zones delineated by the Flood Insurance Rate Map published by Federal Emergency Management Agency (see Exhibits II-15 through II-20 in Volume II). The one percent annual change flood hazard zone is on the south side and parallel to SH 199 from Cheyenne Street to the West Fork of the Trinity River. The one percent annual change flood hazard zone crosses SH 199 at Menefee Avenue, Belle Avenue, the West Fork of the Trinity River, and the Clear Fork of the Trinity River. Flood control levees exist on the south side of the West Fork of the Trinity River at the SH 199 crossing and on the west and the east sides of the Clear Fork of the Trinity River at the SH 199 crossing.

2.3.6 Parks and Recreational Areas

There are 15 noted park, recreation, and public resource sites located within the study area (see Exhibits II-15 through II-20 in Volume II). One park, Rockwood Golf Course, is parallel and adjacent to the south side of SH 199 between Ohio Garden Road and the extension of 16th Street. The golf course was recently reconstructed. The reconstruction included new greens, fairways, bunkers, and cart paths and was reopened in July 2017. Confirmation has been made

that no Land and Water Conservation Funds were used for the original construction or site updates to the Rockwood Golf Course or Rockwood Park.

Though not a publicly owned facility, the Henderson Street Bazaar (1000 N. Henderson Street) is a noteworthy, regularly scheduled flea market occurring adjacent to the study area on Saturdays in a large, weather protected and paved area. The Oakwood Cemetery is also located approximately 110 feet from the edge of the SH 199 right-of-way just north of the West Fork of the Trinity River.

2.3.7 Air Quality

Tarrant County is listed as a moderate nonattainment area for the eight-hour ozone level. Much of Dallas-Fort Worth is an air quality control region, meaning that pollutant levels in the air are higher than the threshold for a particular type or air pollutant – ozone. This is a federal air quality standard designed to protect human health, including those vulnerable to respiratory sensitivity, such as children and the elderly.

Because of nonattainment status, Dallas-Fort Worth is required to submit a state implementation plan to designate an approach to reducing the pollutant levels in the air, including abiding by transportation conformity rules within those plans. The state implementation plan for the Dallas-Fort Worth region designates NCTCOG as responsible for on-road and some non-road source control measures. More information regarding state implementation plan strategies can be found through both the Texas Commission on Environmental Quality website (https://www.tceq.texas.gov/airquality/sip/dfw/dfw-latest-ozone) and the NCTCOG website (http://www.nctcog.org/trans/air/sip/future/strategies.asp).

2.3.8 Regulated Material Sites

There are several sites noted by the USEPA for various characteristics along the corridor, including regulated material sites. The USEPA notes commercial sites that use and potentially dispose of flammable substances or hazardous chemicals, such as gas stations, cleaners, manufacturing, paint stores, etc. Eleven such sites along the SH 199 corridor are listed as potential regulated material sites.

One brownfield site (0.31 acres) is listed on the USEPA registry along the SH 199 corridor. The site is a former gas station located on the northwest corner of the SH 199 and Beverly Hill Drive intersection. The site currently includes tree and shrub plantings and an entrance monument for the city of Sansom Park oriented toward westbound travelers on SH 199. The study area does not contain any known/documented toxic release sites.

2.4 UTILITIES

The SH 199 corridor includes multiple aboveground and underground utilities whose purpose is to serve customers along SH 199 and within Tarrant County. The franchise utility companies that have been identified and are expected within the corridor limits include electric providers, cable and telephone providers, and oil and gas providers. For more information, see the Franchise and City-Owned Utilities Technical Memorandum included in Volume IV.

Based on site observations and available data, it appears that the utility poles owned by the franchise utility companies are within the first three feet of the existing roadway right-of-way. The franchise utility lines on these utility poles include companies such as Oncor Electric, AT&T, and Charter Communications. Throughout the corridor, the electric and telecommunication services appear to service the existing properties through overhead lines from SH 199, side

street right-of-way, property easements, or alley service points. These overhead service points vary depending on the property location and the roadway network around the property site. In addition to overhead franchise utility lines, there is evidence that underground telecommunications lines exist within a segment of the SH 199 corridor. Based on site investigation, it has been noted that between Roberts Cut Off Road and Biway Street underground telecommunication lines owned by AT&T are located within the roadway median.

According to the Railroad Commission of Texas files, there are multiple oil and gas midstream and transmission pipeline utilities varying from six inches in diameter to 24 inches in diameter within the corridor (see Exhibit II-21 in Volume II). The available data shows that there are oil and gas pipeline crossings at the intersections of Skyline Drive, Belle Avenue, and the West Fork of the Trinity River and SH 199. In addition to crossings, there are segments of the SH 199 corridor that have oil and gas pipelines traveling parallel to the roadway, on the south side of the roadway. Atmos Energy is known to be within the SH 199 corridor; however, detailed locations have not been determined at this phase of the project.

The cities of Lake Worth, Sansom Park, and Fort Worth have water and waste water utilities within the SH 199 corridor. Exhibit II-22 through Exhibit II-40 in Volume II include maps of both the existing and planned utility infrastructure within or adjacent to the SH 199 corridor. Currently, only the city of Fort Worth is planning to upsize the 24-inch gravity waste water line between Biway Street and SH 183 to a 30-inch and 33-inch gravity waste water line through a sewer line improvements effort in the year 2030. The city of Sansom Park has discussed upsizing of their force main, south of SH 199 between IH 820 and Roberts Cut Off Road.

2.5 TRANSPORTATION ELEMENTS

The following sections describe the roadway configuration, speed limits, pavement conditions, traffic volumes, bicycle and pedestrian accommodations, transit service, and crash data for the existing conditions of SH 199.

2.5.1 Roadway Configuration

The study corridor can be generalized into six different configurations based on the number of travel lanes and right-of-way width. SH 199 is classified as a major arterial and is part of the TxDOT roadway system. SH 199 is within a right-of-way owned by TxDOT. The existing right-of-way width is between approximately 80 feet and approximately 150 feet (see Exhibits II-41 though II-46 in Volume II). Table I-3 summarizes the number of travel lanes and right-of-way widths along SH 199.

Table I-3. Roadway Configuration

Location	Number of Travel Lanes	Right-of-Way Width	Median Width
IH 820 to Roberts Cut Off Road	6 lanes	150 feet	18 to 20 feet
Roberts Cut Off Road to NW 21st Street	4 lanes	150 feet	18 to 20 feet
NW 21st Street to extension of Park Street	4 lanes	140 feet	18 to 20 feet
Extension of Park Street to University Drive	4 lanes	120 feet	18 to 20 feet
University Drive to Peach Street	4 lanes	100 feet	0 to 12 feet
Peach Street to Belknap Street	4 lanes	80 feet	0 feet

Source: Freese and Nichols, Inc., 2017

From IH 820 to University Drive, the center median varies from 18 to 20 feet (see Table I-3) and includes roadway illumination. South of University Drive, the median varies from zero to 12 feet and does not include roadway lighting. The median typically includes a 12-foot wide left turn

lane at signalized intersections. Outside of signalized intersections, the center median openings typically do not include deceleration, taper, or storage lengths. Within the SH 199 corridor, there are 10 median openings at signalized intersections and 26 median openings at non-signalized intersections (see Exhibits II-41 though II-46 in Volume II). Figures I-3 and I-4 show representative median openings along SH 199.

Source: Freese and Nichols, Inc. 2016

Figure I-3. Median Opening and Left Turn Lane West of SH 199 and Beverly Hills Drive Intersection

Source: Freese and Nichols, Inc. 2016

Figure I-4. Center Median Opening East of SH 199 and 21st Street Intersection

Along the outer edges of the roadway right-of-way, many of the access points along SH 199 within the study corridor are unmanaged. Large sections of the highway have paved shoulders that are contiguous with parking lots or other adjacent paved uses (see Figure I-5). These swaths of pavement are also commonly used as parking or queuing areas for vehicles, including large trucks. Parking in the right-of-way can create obstructions to proper sight distances. In locations where driveways are present, many have large corner radii and pavement treatments that show no visual or physical differentiation at non-motorized crossings.

Source: Freese and Nichols, Inc., 2016

Figure I-5. Continuous Driveways Along SH 199 East of Roberts Cut Off Road

There are currently 117 driveways on the north side of SH 199 and 93 driveways on the south side (see Exhibits II-41 though II-46 in Volume II and Table I-4). Driveways on the north are more closely spaced than those on the south (270 feet between driveways on the north versus 340 feet on the south). Driveway throat widths average approximately 80 feet on each side of SH 199, with many driveway widths in excess of 100 feet. There are many locations where no curbs exist and the roadway pavement abuts a paved parking area.

Table I-4. Existing Access Conditions within SH 199 Study Corridor*

	Driveway Width (Feet)	Number of Driveways	Cross Streets (Feet)	Number of Cross Streets
North of SH 199 Centerline	9,470	117	1,125	31
South of SH 199 Centerline	7,465	93	1,190	21
Total	16,935	210	2,315	52

Source: Freese and Nichols, Inc., 2017
* Existing number of driveways and driveway widths were determined using 2015 aerial imagery

For more information, see the Existing Right-of-Way and Corridor Configuration Technical Memorandum and Access Management Technical Memorandum in Volume IV.

2.5.1.1 Posted Speed Limits

Within the SH 199 corridor study, there are three different posted speed limits. Between IH 820 and University Drive, the posted speed limit is 45 miles per hour. As SH 199 approaches downtown Fort Worth, from University Drive to 400 feet west of the West Fork of the Trinity

River, the posted speed limit transitions to 40 mph. The posted speed limit of SH 199 is 35 mph from 400 feet west of the West Fork of the Trinity River to Belknap Street.

2.5.1.2 Pavement Conditions

Generally, the existing driving surface is an asphaltic concrete overlay with concrete curbs along the center median and drainage channels to convey stormwater between the edge of the road and the right-of-way. Based on available TxDOT record drawings, the roadway pavement section within the SH 199 corridor was established during three major projects constructed by TxDOT. The first project was the initial construction of the SH 199 roadway, which was named SH 34 at the time. In 1930, the construction began at Belknap Street and ended at Nine Mile Bridge Road. The construction included one travel lane in each direction, concrete curbs along the center median, and drainage improvements consisting of roadside drainage channels and drainage culverts crossing underneath SH 199.

A portion of SH 199 (from University Drive to the Lake Worth bridge) was widened to four lanes (two lanes in each direction) in 1956. The project also added outside shoulders, median openings, and left turn lanes. In 1969, SH 199 was widened from White Settlement Road to University Drive. This project also included the construction of concrete curbs, concrete driveways, and drainage improvements in proximity to the University Drive intersection.

2.5.2 Traffic Conditions

A traffic study was conducted to analyze the existing overall corridor operations. It focused on the 10 existing signalized intersections between Roberts Cut Off Road and University Drive/Northside Drive. The study determined that the overall traffic operations of SH 199 are hindered by aging signal equipment, poor geometric configurations, and a lack of pedestrian facilities. See the Existing Conditions Traffic Analysis Technical Memorandum in Volume IV for more detailed information.

2.5.2.1 Traffic Volumes

Weekday 24-hour vehicle classification and intersection turning movement counts were recorded on two days in April 2016. The daily traffic volumes observed ranged from 28,400 to 40,500 vehicles per day (see Table I-5). Based on the 2016 traffic counts, SH 199 is highly directional, with approximately 70 percent of the traffic heading eastbound towards downtown Fort Worth during the morning peak hour and 63 percent heading westbound during the evening peak hour. The morning peak hour constitutes 8.4 percent of the daily traffic volume while the evening peak hour constitutes 9.5 percent. Large vehicles comprise approximately three percent of the traffic volumes for the corridor.

Table I-5. 2016 Traffic Counts

SH 199 Segment		
From	**To**	**Daily Volume**
IH 820	Roberts Cut Off Road	40,500
Roberts Cut Off Road	Skyline Drive	28,700
Skyline Drive	Long Avenue	28,400
Long Avenue	SH 183	34,600
SH 183	Ohio Garden Road	36,500

Source: AECOM Technical Services Inc., 2017

During the morning peak hour, much of the inbound traffic originates from north of IH 820 and enters the corridor as background through traffic on SH 199. However, the northern side of Long Avenue, SH 183, NW 21st Street, and University Drive/Northside Drive are all significant

feeders for the corridor during the morning peak hour. The eastbound right turn volume at Roberts Cut Off Road is high (690 vehicles per hour) due to the relatively large number of vehicles that use Roberts Cut Off Road as an alternate route to NAS Fort Worth JRB. The eastbound right turn at University Drive is also high (507 vehicles per hour) because the cross street provides access to several major traffic generators.

During the evening peak hour, approximately 60 percent of the outbound traffic originates from downtown, while the remaining enters the corridor from University Drive/Northside Drive. Most of the traffic continues on SH 199 to the western end of the project limits, though significant turning movements away from the corridor are present at NW 21st Street, SH 183, and Long Avenue. The northbound left turn from Roberts Cut Off Road is also high (396 vehicles per hour). As was the case in the morning peak hour, a significant number of vehicles use Roberts Cut Off Road as an alternate route from NAS Fort Worth JRB.

2.5.2.2 Measures of Effectiveness

Analysts use level of service (LOS), a qualitative measure which ranges from A to F, to help determine how well a particular facility operates. The scale, in which LOS A represents the best operating conditions while LOS F the worst, uses numeric values of speed, flow, and density to describe the perceived quality of flow as viewed by drivers. Acceptable level of service is equal to or less than LOS D and unacceptable level of service is equal to or greater than LOS E. The *2000 Highway Capacity Manual* provides measures of effectiveness used to determine level of service for signalized intersections, which is presented in Table I-6**.** Level of service is determined using the average delay (in seconds per vehicle) for the intersections. Figure I-6 presents a visual representation of level of service.

Table I-6. Signalized Intersection LOS Criteria

LOS	Average Delay (seconds/vehicle)
A	≤ 10
B	> 10 to ≤ 20
C	> 20 to ≤ 35
D	> 35 to ≤ 55
E	> 55 to ≤ 80
F	> 80

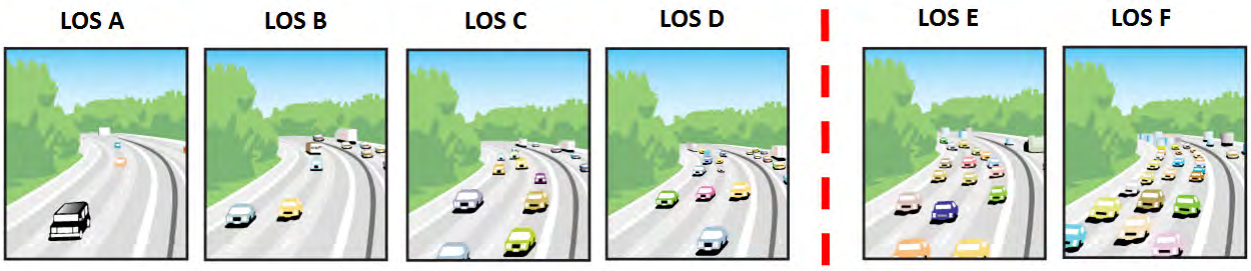


Figure I-6. Corridor Level of Service

The traffic simulation software Synchro 9 was utilized to analyze the existing condition and measure the current operations. The traffic data, existing geometry, and timing plans were input into the Synchro software to create a realistic baseline of the existing condition. Table I-7 presents the level of service results for the existing morning and evening peak hours based on 2000 *Highway Capacity Manual* analysis procedures. The analysis shows that while most of the

intersections are currently operating at an acceptable LOS, three intersections are nearing capacity or are already at capacity: Roberts Cut Off Road, SH 183, and University Drive/Northside Drive.

Table I-7. Existing LOS Analysis

Study Intersections	Morning		Evening	
	Delay (seconds/ vehicle)	LOS	Delay (seconds/ vehicle)	LOS
SH 199 and Roberts Cut Off Road	43.5	D	70.8	E
SH 199 and Biway Street	9.1	A	15.1	B
SH 199 and Skyline Drive	26.1	C	10.4	B
SH 199 and Long Avenue	28.6	C	33.3	C
SH 199 and SH 183	44.9	D	43.9	D
SH 199 and Walmart Driveway	15.7	B	22.3	C
SH 199 and Ohio Garden Road	16.4	B	13.8	B
SH 199 and NW 21st Street	10.8	B	22.6	C
SH 199 and NW 18th Street	12.1	B	14.7	B
SH 199 and University Drive	46.7	D	50.5	D

Source: AECOM Technical Services Inc., 2017

2.5.3 Bicycle and Pedestrian

There are currently no dedicated bicycle facilities along the SH 199 corridor between IH 820 and Belknap Street. Along the same segment of SH 199, there are limited segments of pedestrian accommodations (sidewalks) totaling approximately 6,000 feet, most of which are located in proximity to areas with recent development activity, signalized intersections, and east of University Drive connecting to downtown Fort Worth. Pedestrians use the paved shoulder or social (pedestrian-created) paths near the corridor.

There are numerous bicycle and pedestrian facilities in the area surrounding the SH 199 corridor. Primary bicycle and pedestrian facilities in this area include the Fort Worth Trinity Trails, Marine Creek Trail, and Marion Sansom Park. The existing and planned bicycle and pedestrian accommodations along and near the SH 199 study area are shown in Exhibit II-48 in Volume II.

Planned bicycle and pedestrian facilities near the SH 199 corridor include the Lake Worth Regional Trail and shared-use paths along SH 183. The planned Lake Worth Regional Trail begins at the northern end of the Fort Worth Trinity Trails and continues through YMCA Camp Carter, Marion Sansom Park, and along Cahoba Drive. The shared-use path planned for SH 183 runs from Sam Calloway Road to SH 199. For more information, see the Bicycle and Pedestrian Safety, Accommodations, and Linkages Technical Memorandum included in Volume IV.

2.5.4 Transit

Both River Oaks and Fort Worth are served by Fort Worth Transportation Authority (FWTA) bus service. The primary route serving the SH 199 corridor is Route 46, known as the Jacksboro Highway route. FWTA currently uses standard buses to serve Route 46. Route 46 does not have any stops along sections of SH 199 located in the non-participating jurisdictions. This

service pattern creates large sections of the study corridor without bus service (see Exhibit II-47 in Volume II). Within the FWTA service area, most bus stops are spaced within one-quarter to one-half mile along the corridor, with closer spacing near the Walmart and Town and Country Center transfer centers between SH 183 and Ohio Garden Road. Outside of the locations with bus pullouts, the FWTA buses currently utilize the outside lane or the outside shoulder to service the bus stops along the corridor.

Other FWTA routes that intersect SH 199 include Route 90 (Long Avenue) and Route 91 (Ridgmar Mall/Stockyards) (see Figure I-7). These intersecting routes provide transfer opportunities to SH 199 at four bus stop locations east of SH 183 near Walmart (Route 90) and at the intersection with SH 183 (Route 91). Transfers to Route 90 can be made at the bus stops shared with Route 46. Transfers between Route 46 and Route 91 require walking 0.2 miles in an area with no sidewalks for bus stops on the same quadrant of the SH 199/SH 183 intersection. For transfers between bus stops in different quadrants of the intersection, bus riders must walk 0.3 miles and cross two legs of this large intersection. Crossing distances are long, measuring between 160 and 180 feet, and lack median refuges.

Source: Fort Worth Transportation Authority, 2017

Figure I-7. Bus Routes Serving the SH 199 Study Corridor

With almost 14,000 riders, Route 46 had the 13th highest ridership of the 42 routes where data was collected during the month of April 2017. In the same time period, Route 91 had almost 3,000 riders (27th of 42 routes) and Route 90 had almost 1,300 riders (33rd of 42 routes). As mentioned in Section 1.3.8, FWTA adopted a master plan in 2015 with the goals to connect people and places, make transit an attractive choice, and create a sustainable system over the long term. The plan contains network recommendations with a stated five-year horizon, which include improvements along the SH 199 corridor anchored by the central business district in downtown Fort Worth and a new transit center to the south of the intersection of SH 199 and

IH 820. For more information, see the Bus Transit Technical Memorandum included in Volume IV.

2.6 CRASH ANALYSIS

Based on data from the TxDOT Crash Records Information System between the years 2010 and 2014, the study team categorized and evaluated the crash data to better understand the existing conditions in the corridor. Within the five-year period in the study area, a one-quarter mile radius from the SH 199 centerline, there were 1,191 total reported crashes with 1,164 vehicular crashes, 23 pedestrian crashes, and four bicycle crashes (see Exhibits II-49 through II-54 in Volume II). Of the 1,191 total crashes, there were nine vehicular fatalities, three pedestrian fatalities, and no bicycle fatalities.

Because a one-quarter mile radius from the SH 199 centerline would include crashes on streets with no relation to SH 199, the data was reduced to crashes that occurred within the SH 199 right-of-way and 500 feet along intersecting side streets. Of the 788 reported crashes, there were 766 vehicular crashes, 19 pedestrian crashes, and three bicycle crashes. Of the 788 total crashes, there were eight vehicular fatalities, three pedestrian fatalities, and no bicycle fatalities. Table I-8 provides a summary of this crash data. For more information, see the Crash Data Technical Memorandum included in Volume IV.

Table I-8. Summary of Crash Analysis

Factor	Summary of Data
Number of Crashes	788 total reported crashes 766 vehicular crashes 19 pedestrian crashes 3 bicycle crashes
Severity of Crashes	Unknown Injury Crashes = 15 Incapacitating Injury Crashes = 35 Non-Incapacitating Crashes = 117 Possible Injury Crashes = 194 Fatal Crashes = 11 Non-Injury Crashes = 416
Day of the Week	Highest number of crashes occurred on Tuesdays About 15 percent higher than an average weekday
Month of Year	Highest number of crashes occurred in June About 20 percent higher than other months Lowest number of crashes occurred in September
Hour of Day	Higher number of crashes during the morning (7:00 a.m. to 9:00 a.m.) and evening (4:00 p.m. to 6:00 p.m.) peak hours corresponding with higher traffic volumes
Contributing factor	57 percent of all crashes could be attributed to three crash contributing factors – failure to control speed, driver inattention, and failure to yield
Manner of crash	In 53 percent of all crashes, the vehicles were traveling in the same direction which correlates with failure to control speed and driver inattention
Crashes per roadway segment	The segments from IH 820 and Skyline Drive experienced the highest crash rates within the corridor
Crashes per intersection	Highest intersection crash rates were observed at Roberts Cut Off Road, SH 183, and University Drive

Source: TxDOT Crash Records Information System, 2010-2014 data

The overall crash rate and fatal crash rate along the study corridor were compared to similar statewide data obtained from Texas Motor Vehicle Crash Statistics. The average statewide traffic crash rate on urban state highway systems over the analysis period was 191.61 crashes per 100 million vehicle miles traveled (VMT), compared to 234.7 crashes per 100 million VMT for the SH 199 study corridor over the same period. The statewide average fatal crash rate was 1.24 per 100 million VMT over the five-year analysis period, compared to a fatal crash rate of 3.28 per 100 million VMT for the corridor. The higher observed crash rates on the study corridor compared to the statewide averages could be attributed to the urban nature of the corridor with multiple intersections, cross streets, and access driveways that increase the possibility of vehicle conflicts.

During project site visits and discussions with stakeholders, the consultant team observed and was made aware of multiple conditions that could contribute to the corridor crash statistics. These conditions are as follows:

- Lack of defined pedestrian and bicycle space along the corridor and at intersections
- Private development within the TxDOT right-of-way leading to obstruction to the intersection sight distance
- Bus transit stops with difficult and challenging access points
- Lack of access management and definition between roadway edge and commercial driveways
- Lack of drainage infrastructure causing ponding within roadway right-of-way
- Inadequate lighting for pedestrians and cyclists

2.7 DRAINAGE

SH 199 has limited drainage infrastructure within the project limits. The roadway was originally built in the 1930s as a rural roadway and has never been fully reconstructed or significantly improved. The highway drainage system consists of several culverts that drain runoff from north to south under the roadway. There are few longitudinal improvements such as roadside ditches or storm drains to collect and convey the runoff to the culverts. The minimal road drainage system varies along the length of the study area and appears to have been constructed sporadically when new development or redevelopment occurred. Longitudinal drainage is generally carried by wide shallow depressions along the road shoulder. For a significant length of the project there is no depression and the runoff runs along the face of a retaining wall at the edge of the pavement. There are limited areas with curb and gutter, typically within the Fort Worth city limits, and there are a couple locations with drainage ditches.

Two creeks, Menefee Creek and an unnamed tributary to Stream WF-5, cross under the highway through large culverts. The creeks discharge to Stream WF-5, which runs parallel to the highway along its south side. Stream WF-5 drains to the West Fork Trinity River downstream of Ohio Garden Road. At the southeast end of the project area, there are bridge crossings at the West Fork Trinity River and the Clear Fork Trinity River. An additional bridge is currently under construction to cross the proposed Panther Island Bypass Channel.

Areas that drain to the highway culverts are shown in Exhibits II-55 and II-56 in Volume II. Within Fort Worth, these contributing areas typically contain storm drains. These storm drains are generally not connected to the highway drainage system and discharge either to an open channel or to the road surface. Within Sansom Park and River Oaks, surface flow is carried to the highway mainly through ditches along the streets. The existing condition of the watershed is considered to be fully developed.

A site visit was conducted on July 12, 2016, to observe and record existing drainage infrastructure. During the visit, it was observed that many pipes were heavily silted. Both Sansom Park and Fort Worth have experienced flooding issues along the highway due to the lack of storm drain infrastructure. A high-level analysis was performed to evaluate the adequacy of the existing cross drainage structures.

For more information, see the Existing Conditions – Drainage Assessment Technical Memorandum included in Volume IV.

3.0 ECONOMIC MARKET ANALYSIS

From a national perspective, both Texas and the Dallas-Fort Worth area are in a time of rapid growth and opportunity.

- Texas has been the largest job-creating state for over 25 years. Since 1990, Texas has had more than twice the employment growth than the rest of the country.
- Dallas-Fort Worth ranked first in 2015 among all Texas Metropolitan Statistical Areas for receiving the highest number of jobs.
- Dallas-Fort Worth continues to be affordable when viewed nationally during this time period; only Atlanta offered more affordability.
- As the fourth largest Metropolitan Statistical Area in population, Dallas-Fort Worth had the fifth largest total investment and fifth largest gross domestic product in 2015.

These factors provide real potential for redevelopment in the SH 199 corridor with proper planning strategy. As part of the SH 199 Corridor Master Plan, a market-based analysis of the study area was performed to analyze the potential economic development that may be associated with the recommended improvements to the corridor. The scope of this effort included:

- The evaluation of the macro-economic trends and demographic patterns.
- Definition of the market “trade area” to better understand the socio-economic condition of the area and related land use potential.
- The calculation of a conceptual land use program (for the primary land use drivers of office, retail, and housing) over a 10-year period for use in physical planning scenarios.

The following summarizes the analysis and recommendations. For more information, see the Economic Market Analysis Technical Memorandum included in Volume IV.

3.1 TRADE AREA

For the economic market analysis, the SH 199 corridor trade area boundary was defined by a 10-minute driving distance to the corridor that has been adjusted to accommodate impacting natural and transportation features, as well as competing centers of development. The impacting natural boundary on the northwest side of the trade area is Lake Worth. The impacting transportation boundaries include Meacham Airport, NAS Fort Worth JRB, railroads, West 7th Street, and IH 35W. The impacting competitive areas are the area south of West 7th Street and the west side of IH 35W, as people would not likely pass through them to go to the SH 199 corridor offering similar land uses.

The SH 199 trade area contains a large percentage of 25 to 34 year olds and exists within a larger economy being driven (in part) by those in the knowledge-based economy. Two groups (Millennials and Creative Class) represent a large opportunity to help drive the shift towards redevelopment in an older inner-ring suburban environment as exists in the study area.

The trade area was analyzed in terms of demographics, income, psychographic composition, consumer spending, existing retail nodes, retail potential, office and employment potential, and housing. Table I-9 summarizes the findings of these analyses.

Table I-9. Economic Market Analysis Summary

Analysis	Conclusions
Demographic Analysis	The largest age groups in the trade area are the Millennials (15 to 34 years old) and Gen Xers (35 to 54 years old).
Income Analysis	50 to 55 percent have incomes of $35,000 to $149,000. 39 to 42 percent have incomes less than $35,000.
Retail and Restaurant Market	At 34.1 percent, the largest market segment is the Ethnic Enclaves. These are multi-generational Hispanic homeowners. They are younger, diverse families with children or single-parent households with multiple generations living under the same roof. These families enjoy shopping the latest trends and purchase with an eye to brands.
Consumer Spending	The trade area does not have the same successful districts when compared nationally.
Existing Retail	• There are more traditional/suburban in format retail centers along and near IH 820 that rely on larger store formats. • An urban streetscape format exists along West 7th/Museum Place that provides an "eater-tainment" and mixed-use experience centered on outdoor dining and walkable streetscapes.
Retail Potential	The primary programming opportunities include grocery stores, clothing and accessory stores, and used merchandise stores.
Employment Analysis	White-collar jobs (46 percent) are among the largest types of jobs held by those in the trade area.

Source: Catalyst Urban Development, LLC, 2017

3.2 PLANNING PROGRAM FOR 10-YEAR PERIOD

Based on the economic market analysis conducted for the SH 199 Corridor Master Plan, Table I-10 summarizes the forecasted programming potential within the next 10 years. This forecasted program envisions six to eight coordinated development efforts across a 10-year period. A planning strategy could be successful if it distributed these development programs into strategic nodes along the corridor aimed at creating a critical mass in use and activity. Implementation of these programs will require local jurisdiction actions to put policies and complementary initiatives in place for implementation.

Table I-10. Forecasted Programming Potential within 10-Year Period

Retail, Restaurant and Office	
Retail/Restaurant	68,600 square feet (multiple projects)
Office	23,300 square feet (part of mixed-use projects)
Residential	
Market Rate Apartments	278 units (single phase)
Affordable Housing	303 units (two phases)
Senior Housing	148 units (single phase)
Townhome/Single Family	114 homes
Renovated Single Family	12 homes
Total	855 Residential Units

Source: Catalyst Urban Development, LLC, 2017

3.3 FORECASTED LAND USE POTENTIAL

Despite regional strength, the SH 199 corridor is challenged by the market identity created by the appearance of much of its current development frontage, a meek 10-year economic development program potential based on forecasted growth, and existing real estate conditions that include higher land values and complexity of land ownership that will cause more difficult land assembly for redevelopment to occur. It will be necessary for the cities to take a proactive approach to guide new interest and investment to the corridor. This strategy should be targeted around the creation of distinct development districts with emphasis on key locations where critical mass of land assembly and new development may occur. These mixed-use urban districts should be based upon strong place-making concepts to attract a younger demographic to the corridor. The likely development types that may occur in these districts are mixed-use residential/office retail, attached townhomes, senior and independent living, and streetscape-based development. These uses are best accomplished with compatible land use and zoning policies backed by corridor specific urban design guidelines, investment/capital improvements funding, and public-private partnership mechanisms.

3.4 TARGETED REDEVELOPMENT

Due to the length of the SH 199 corridor and amount of forecasted economic development potential, it is recommended that the communities along the corridor focus on four core areas.

- IH 820/SH 199 intersection
- The primarily undeveloped area within Sansom Park near the Skyline Drive/SH 199 intersection
- Commercial intersection of SH 183 (River Oaks Boulevard)/SH 199
- The Panther Island/Trinity River Vision area

The planning program has been used as a basis for plans in these four areas, as well as a detailed analysis of real estate factors such as assessed property values, degree of land assembly challenge, natural features, etc. The master plans for these areas emphasize urban villages that provide walkable streetscapes and a mix of uses in a manner that is highly visible from SH 199 to complement and leverage its new construction. Figures I-8 through I-11 are a series of concept plans that depict various potential redevelopment scenarios. These scenarios are indicative of other developments, potentially of smaller scale, that may be possible along and near the corridor.

Source: Catalyst Urban Development, LLC, 2017

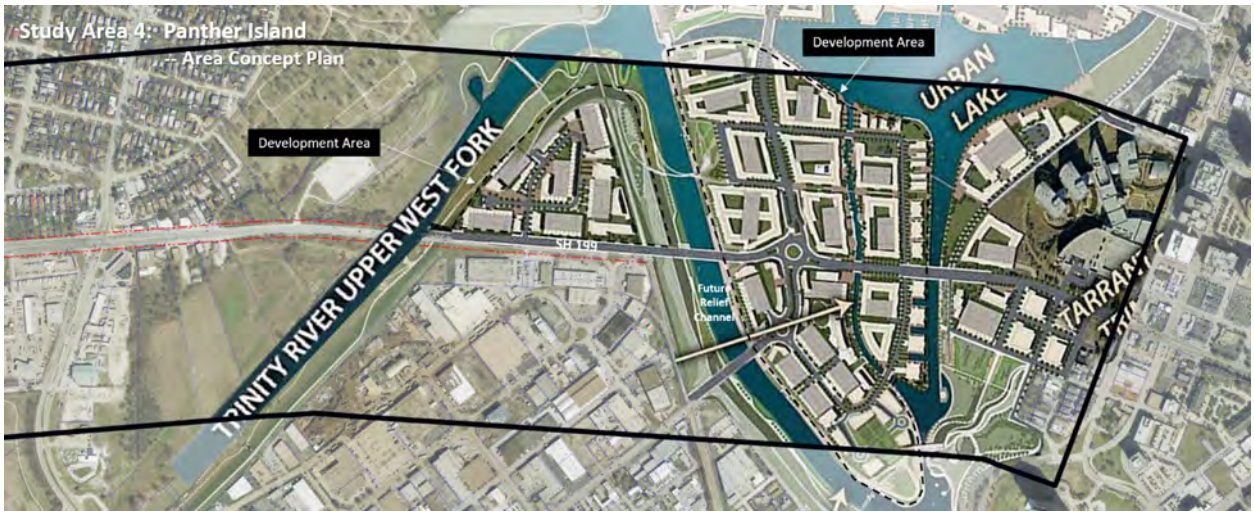
Figure I-8. IH 820 Gateway: Area Concept Plan

Source: Catalyst Urban Development, LLC, 2017

Figure I-9. Sansom Park Village: Area Concept Plan

Source: Catalyst Urban Development, LLC, 2017

Figure I-10. SH 199/SH 183 Intersection: Area Concept Plan



Source: Catalyst Urban Development, LLC, 2017

Figure I-11. Panther Island: Area Concept Plan

4.0 TRAFFIC/ALTERNATIVES ANALYSIS

As mentioned in Section 2.5.2, an analysis of existing traffic conditions shows that while most of the intersections are currently operating at an acceptable LOS, three intersections are nearing capacity or are already at capacity. A similar traffic study was performed using future traffic volumes (year 2040) to assess the overall corridor operations and the signalized intersections. The following summarizes the future traffic analysis and recommendations. For more information, see the Proposed Configuration Traffic Analysis Technical Memorandum included in Volume IV.

4.1 FUTURE TRAFFIC VOLUMES

Future traffic volumes (year 2040) were based on the NCTCOG regional travel demand TransCAD model. This computer model includes elements such as the roadway and transit networks, population, and employment data for 2040 to generate trips throughout the network, estimate the shortest and quickest path to complete a trip, and uses predicted roadway characteristics to estimate an hourly capacity per lane. The 2040 population and employment data included is based on regional demographic forecasts. Currently, Tarrant County is projected to gain the most population – just over one million residents – between 2017 and 2040. Mobility 2040 shows a large increase in population density to the north and west of IH 820 and recommends upgrading the SH 199 corridor to a freeway west of IH 820. These projections show that SH 199 is forecasted to serve as a major arterial from downtown Fort Worth to the northwest.

As noted in Section 2.5.2.1, SH 199 is highly directional, with approximately 70 percent of the traffic heading eastbound towards downtown Fort Worth during the morning peak hour and 63 percent heading westbound during the evening peak hour. This directionality is forecasted to increase in 2040 to approximately 75 percent eastbound during the morning peak hour and 68 percent westbound during the evening peak hour.

In the morning, much of the inbound traffic originates from north of IH 820. However, the northern side of Long Avenue, SH 183, NW 21st Street, and University Drive/Northside Drive all continue to be significant feeders for the corridor during the morning peak hour. A large number of vehicles will continue to use Roberts Cut Off Road as an alternate route to NAS Fort Worth JRB. Furthermore, a large number of vehicles will leave the SH 199 corridor at University Drive/Northside Drive.

During the evening peak hour, downtown Fort Worth and University Drive/Northside Drive are the largest feeders of the outbound traffic volume. Most of the traffic continues on SH 199 to IH 820, though high numbers of vehicles leave the corridor at NW 21st Street, SH 183, and Long Avenue. The northbound left turn from Roberts Cut Off Road will also remain high.

The NCTCOG model is a regional model, primarily focused on overall flow across the region. While it may be used as a basis for the traffic forecasts, further refinements are required to better estimate turning movements for a series of intersections. Future detailed turning movement counts were projected using the forecasted volumes from the NCTCOG travel demand model and the existing turning movement counts.

4.2 ALTERNATIVE ANALYSIS

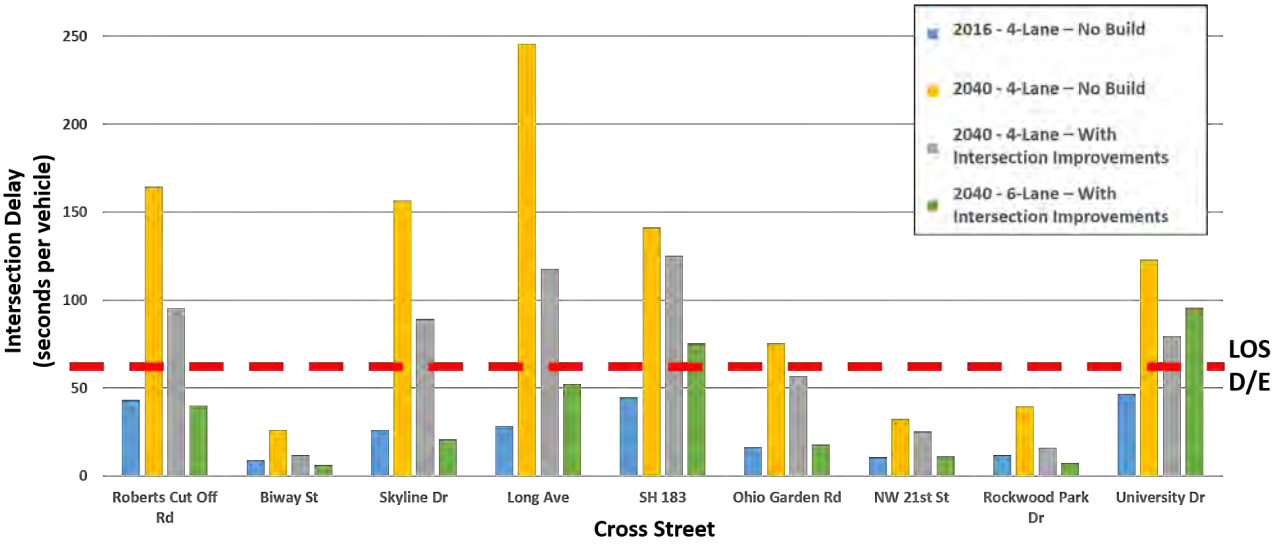
To help evaluate the future travel demand for the corridor, three roadway configurations were modeled to determine the number of lanes needed on SH 199. Table I-11 presents 2040 traffic projections based on these three configurations.

- Four-lane roadway from IH 820 to Belknap Street – this would maintain the current number of lanes
- Six-lane roadway from IH 820 to Belknap Street
- Combination six- and four-lane roadway with six lanes from IH 820 to University Drive/ Northside Drive and four lanes from University Drive/Northside Drive to Belknap Street.

Table I-11. 2040 Traffic Projections

SH 199 Segment		4 Lane	6 Lane	6 Lane and 4 Lane
From	To			
IH 820	SH 183	39,500	50,800	49,700
SH 183	University Drive/ Northside Drive	44,500	57,400	55,600
University Drive /Northside Drive	Belknap Street	37,100	50,000	38,500

Figure I-12 shows the corresponding level of service and intersection delay for the four-lane and six-lane configurations. Under the no build condition (no improvements to the current condition of SH 199), in 2040 intersections at Roberts Cut Off Road, Skyline Drive, Long Avenue, SH 183, Ohio Gardens Road, and University Drive/Northside Drive would have failing levels of service. If intersection improvements are made (e.g., additional left and right turn lanes, signal improvements), the level of service would improve. However, the same intersections, with the exception of Ohio Gardens, would still have a failing level of service. Under the six-lane configuration, only the intersections at SH 183 and University Drive/Northside Drive would have a failing level of service.



Source: Freese and Nichols, Inc. 2017

Figure I-12. Future Intersection Level of Service Comparison

The combination roadway, six lanes from IH 820 to University Drive/Northside Drive and four lanes from University Drive/Northside Drive to Belknap Street was recommended for the following reasons:

- Although the travel demand model forecasts higher traffic volumes for the six-lane alternative, the resultant lane density is comparatively lower than the four-lane alternative. Subsequent analyses noted that the resulting level of service was better for the six-lane alternatives.
- A four-lane section east of University Drive/Northside Drive is more feasible than a six-lane section because of a narrower existing right-of-way width and both the SH 199 bridge over the proposed bypass channel (see Section 1.4.10) and the historic designation of the Henderson Street Bridge (see Section 2.3.1) are four lanes. Furthermore, University Drive/Northside Drive is a major arterial that provides north and south access to major destinations and is a natural breakpoint for the cross-section width.

4.3 LEVEL OF SERVICE

Based on projected 2040 traffic volumes and travel patterns, traffic optimization models (Synchro 9) were developed for the corridor for both the no build and proposed scenarios to analyze the morning and evening peak hours. The no build scenario assumes no major improvements to the corridor and is used for comparative purposes. The optimized signal cycles and the existing signal timing coordination on the corridor were used. Additionally, based on 2040 turning volumes, the need for left and right turn bays were evaluated to optimize the level of service along the corridor. Table I-12 presents the resulting level of service for the morning and evening peak hour using *2000 Highway Capacity Manual* analysis procedures.

Table I-12. 2040 Level of Service Analysis Results

	Morning Peak Hour				Evening Peak Hour			
	No Build		Proposed		No Build		Proposed	
Cross Street	Delay*	LOS	Delay*	LOS	Delay*	LOS	Delay*	LOS
Roberts Cut Off Road	122.0	F	30.4	C	151.5	F	41.3	D
Biway Street	26.1	C	7.4	A	36.9	D	15.5	B
Skyline Drive	155.7	F	29.2	C	81.4	F	15.6	B
Long Avenue	226.4	F	66.4	E	153.1	F	68.9	E
SH 183	104.0	F	54.3	D	86.1	F	65.7	E
Walmart Drive	48.5	D	7.2	A	57.2	E	18.1	B
Ohio Garden Road	56.7	E	16.1	B	17.2	B	9.1	A
NW 21st Street	29.3	C	12.4	B	30.7	C	8.8	A
NW 18th Street	37.8	D	10.0	A	64.9	E	14.5	B
University Drive	126.4	F	86.7	F	164.1	F	146.7	F

Source: AECOM Technical Services Inc., 2017
* Delay measured in seconds per vehicle

By 2040, nearly all of the intersections in the corridor would operate at an unacceptable level of service in the no build scenario. Increasing traffic volumes on SH 199 would exacerbate many of the previously described problems on the corridor and the existing geometry does not provide enough capacity to meet demand.

In the proposed scenario for SH 199, only the Long Avenue, SH 183, and University Drive/ Northside Drive intersections are forecasted to operate at LOS E or F in 2040. All three cross streets have high turning volumes to and from SH 199 and, in the case of SH 183 and University Drive/Northside Drive, are major arterials with heavy traffic volumes. Both intersections are essentially built out and greater intersection improvements would be needed to provide any noticeable improvement. Some possible solutions include the following; however, the first two could have significant impacts to the existing land uses and property:

- Add another through lane to the cross street.
- Grade separate the SH 199 through movement.
- Innovative intersection improvements to improve efficiency. Section 5.2 includes some discussion on alternative intersection designs at Roberts Cut Off Road and SH 183.

5.0 DESIGN RECOMMENDATIONS

Based on the age and condition of the pavement and the need to widen the roadway, it is recommended that SH 199 be reconstructed to current design standards as an urban roadway. This would include the addition of curbs and gutters, sidewalks, underground drainage, new traffic signals, and lighting. The following sections describe the recommended roadway elements, intersection designs, bicycle and pedestrian elements, transit operations, utilities, drainage, urban design, and construction cost estimates.

These recommendations were built on existing conditions, community and stakeholder input, and technical analyses performed as part of this study and were developed to meet the goals outlined in Section 1.2. The following summarizes the conceptual design recommendations. For more information, see the Corridor Roadway Improvements Technical Memorandum included in Volume IV.

5.1 ROADWAY ELEMENTS

Although the limits of this study extended from IH 820 to Belknap Street, the recommended roadway improvement limits are from IH 820 to Shamrock Avenue (east side of the West Fork of the Trinity River) (see Figure I-13). At the west end of the study corridor, TxDOT has initiated a study of the IH 820 and SH 199 interchange and this project will likely include improvement along SH 199 from IH 820 to Roberts Cut Off Road. At the eastern end, the limits are shorter because of the current construction along SH 199 associated with the Trinity River Vision/Panther Island project, as well as the SH 199 bridge over the Clear Fork of the Trinity River (i.e., Henderson Street Bridge) being listed on the National Register of Historic Places.

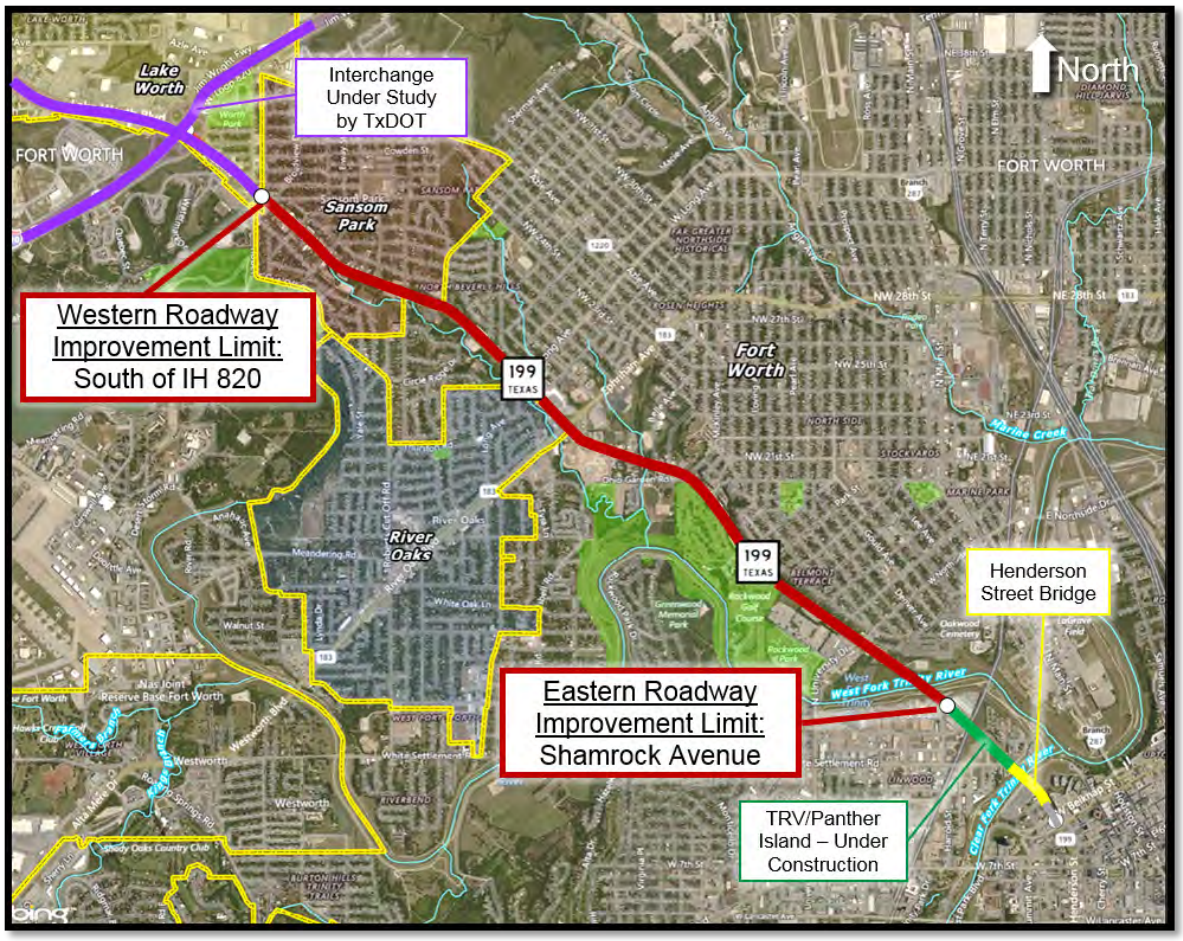


Figure I-13. Recommended SH 199 Improvement Limits

Based on the number of lanes and right-of-way widths, the project corridor has been divided into four sections. Each section has features and context that make it unique and require attention to appropriately provide the necessary transportation infrastructure.

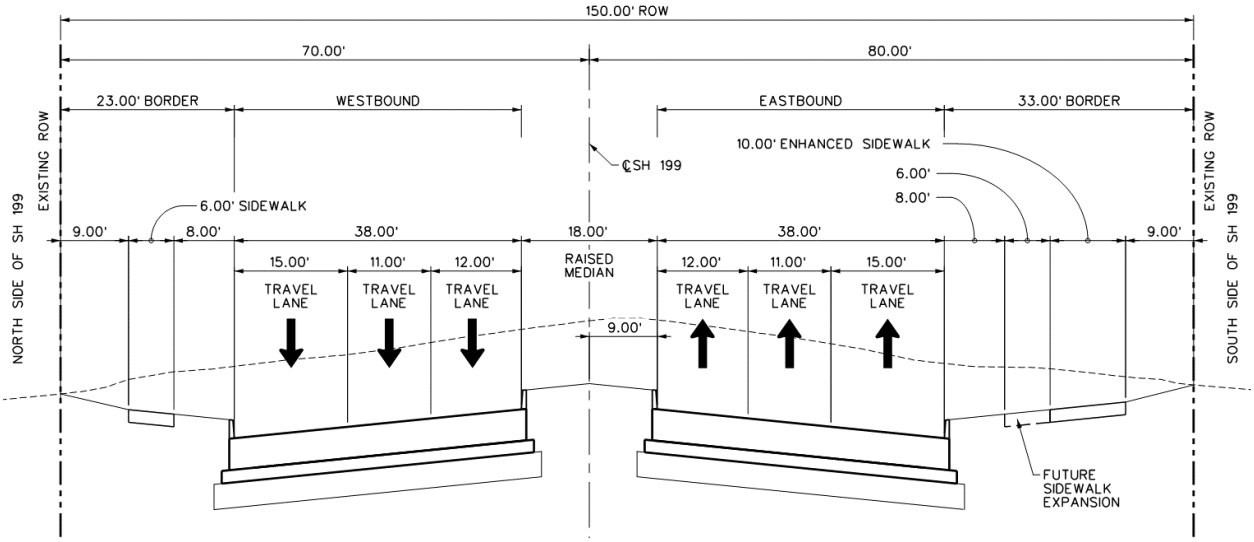
- Section 1 – IH 820 to Ohio Garden Road
- Section 2 – Ohio Garden Road to Extension of 16th Street
- Section 3 – Extension of 16th Street to University Drive/Northside Drive
- Section 4 – University Drive/Northside Drive to Shamrock Avenue

The SH 199 corridor is a TxDOT owned and maintained facility; therefore, the design recommendations for the corridor configuration should be in accordance with the approved and accepted practices by this agency. The published TxDOT *Roadway Design Manual* (http://onlinemanuals.txdot.gov/txdotmanuals/rdw/rdw.pdf) was used as a basis for design criteria. The recommended typical cross sections provide for franchise and city-owned utilities, underground drainage systems, urban design elements, bus transit, pedestrian, and bicycle accommodations. Certain improvements, such as urban design and bicycle and pedestrian accommodations, would require additional refinements in future design phases and may include alternative design strategies to accommodate these features. Appendix A includes a summary table of the recommended proposed design criteria and Appendix B includes recommended typical sections.

Several dimensions being recommended for SH 199 meet the minimum criteria outlined in the *TxDOT Roadway Design Manual* rather than the desirable criteria. These recommendations are due to the urban context of the roadway, the necessary retaining walls, the adjacent historic and park properties, the need to provide access to adjacent properties, and the need to provide multimodal accommodations along the corridor length. In many situations, if desirable criteria were followed, right-of-way acquisition would be required, there would be an increase in need for retaining walls, and the roadway width would increase by upwards of 10 feet, which could impact the multimodal accessibility and urban design character of the corridor.

5.1.1 Section 1 – IH 820 to Ohio Garden Road

This section is the longest of the four sections, spanning 3.24 miles. The recommended typical section includes a six-lane roadway with an 18-foot median and a six-foot sidewalk on the north side and a 10-foot enhanced sidewalk on the south side, both set eight feet behind the curb (see Figure I-14).



*Variation in the raised median and border widths may vary based on the context of the corridor and the urban design recommendations
Source: Freese and Nichols, Inc., 2017

Figure I-14. Recommended Typical Section from IH 820 to Ohio Garden Road*

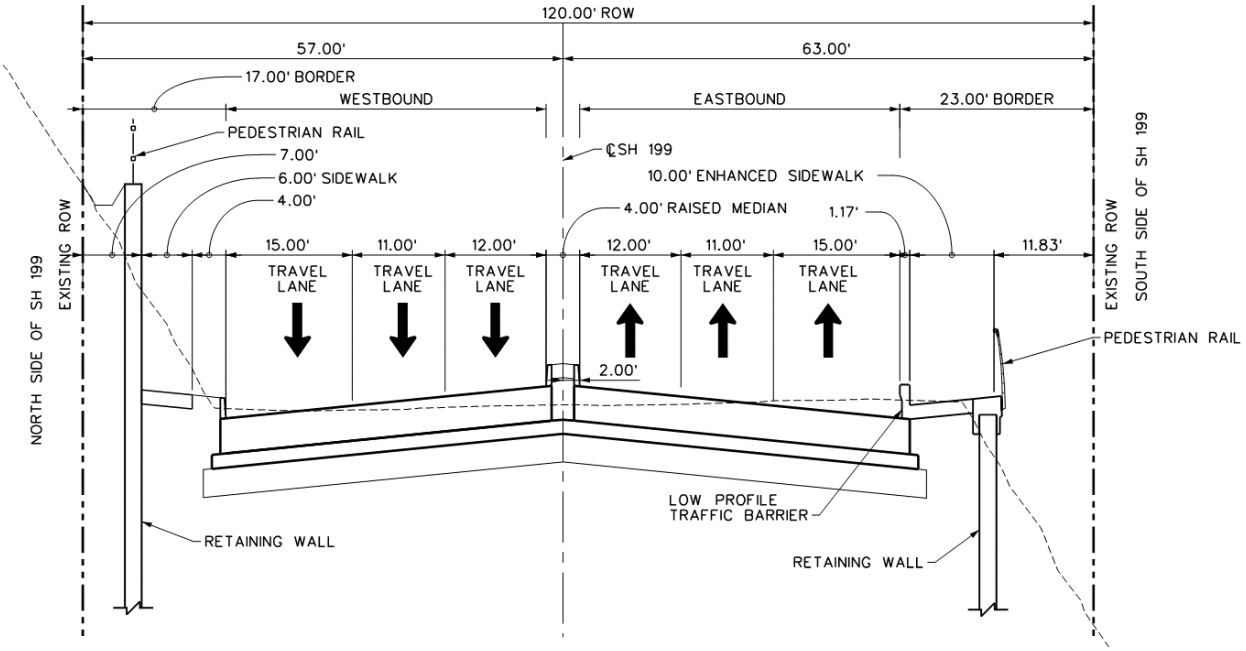
A majority of Section 1 includes commercial properties adjacent to the SH 199 right-of-way and multiple intersections with side streets. Access to properties and roadway networks adjacent to SH 199 is important through the varying terrain within this section. To reduce impacts to unique features outside of the existing right-of-way, a retaining wall (fill wall) on the south side of SH 199 between Beverly Hills Drive and Long Avenue, approximately 2,200 feet in length and approximately six feet in height, would be necessary.

5.1.2 Section 2 – Ohio Garden Road to Extension of 16th Street

This section spans a distance of 0.78 miles. A majority of Section 2 includes varying terrain with the higher elevations being on the north side of SH 199 and the lower elevations being on the south side of SH 199. The elevations along the north right-of-way and the south right-of-way can vary as much as 15 feet in areas. In addition, properties between the extension of Park Street and the extension of 16th Street and along the north side of this section are residential properties within the Grand Avenue Historic District, which is listed on the National Register of Historic Places. The property along the south side of this entire section is Rockwood Golf

Course and it is a public recreational facility. These features and environmental impacts were considered during the development of a recommended corridor configuration for Section 2.

The recommended typical section (see Figure I-15) reflects the challenges within Section 2 and includes a six-lane roadway with a four-foot median and a six-foot sidewalk on the north side and a 10-foot enhanced sidewalk on the south side. Compared to Section 1, Section 2 includes a reduced median width, reduced border width, retaining walls, and sidewalks located closer to the vehicular travel lanes. The recommended typical section also provides space for drainage structures behind the retaining walls on the north side of the roadway (cut wall) and space for the construction and maintenance of retaining walls (cut and fill wall). Table I-13 lists the locations and approximate dimensions of the retaining walls.



Source: Freese and Nichols, Inc., 2017

Figure I-15. Recommended Typical Section from IH 820 to Ohio Garden Road

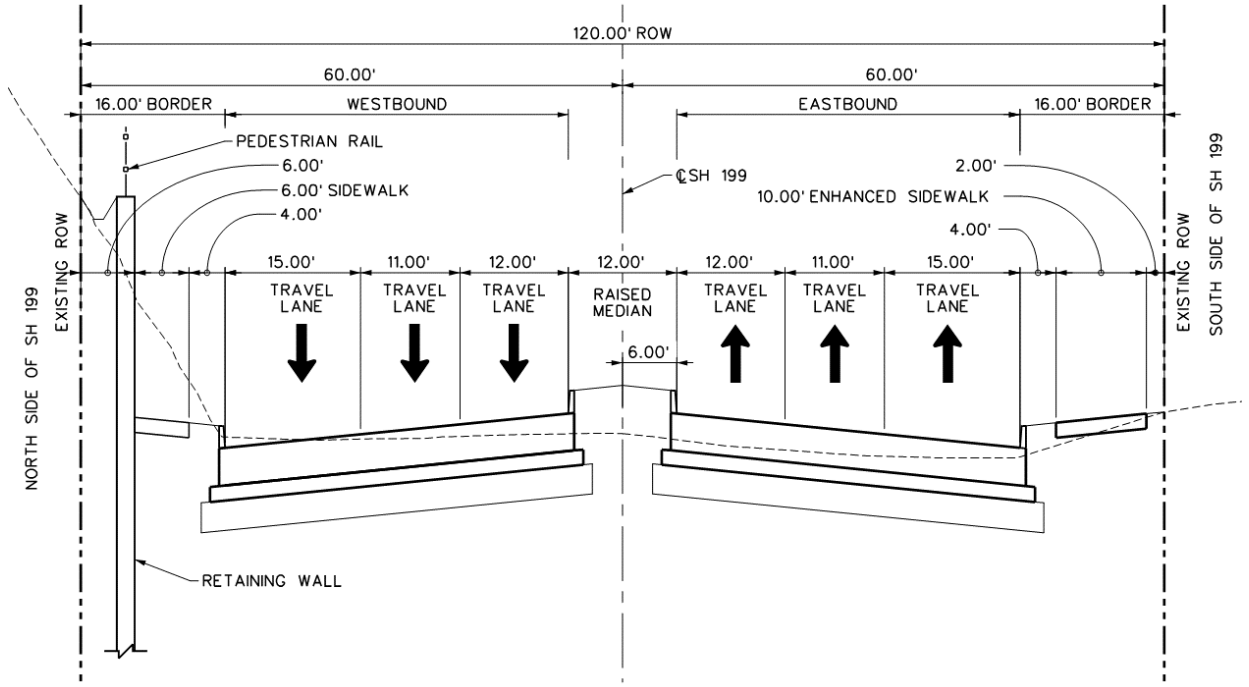
Table I-13. Retaining Wall Locations in Section 2

Location	Approximate Length	Approximate Height	Type
North Side of SH 199			
Extension of Odd Street and 18th Street	750 feet	8 feet	Cut wall
Extension of Park Street and extension of 16th Street	900 feet	7 feet	Cut wall
South Side of SH 199			
Ohio Garden Road and extension of 16th Street	4,100 feet	5 feet	Fill wall

A retaining wall (cut wall) currently exists along the north side of SH 199 between the extension of Park Street and the extension of 16th Street. The existing retaining wall appears to reside within the existing SH 199 right-of-way and would likely need to be removed and replaced with the recommended improvements to SH 199. It is recommended that the retaining wall along SH 199, and within the Grand Avenue Historic District, include colors and patterns that are sensitive to the context of the historic district. The design would likely need to be approved by the Texas Historical Commission and local historians.

5.1.3 Section 3 – Extension of 16th Street to University Drive/Northside Drive

This section spans a distance of 0.51 miles. Section 3 includes residential properties and commercial properties along the north side of SH 199, and commercial properties along the south side. The properties along the north side of SH 199, between the extension of 16th Street and University Street, are within the Grand Avenue Historic District, which is listed on the National Register of Historic Places. The recommended typical section (see Figure I-16) includes a six-lane roadway with a 12-foot median and a six-foot sidewalk on the north side and a 10-foot enhanced sidewalk on the south side.



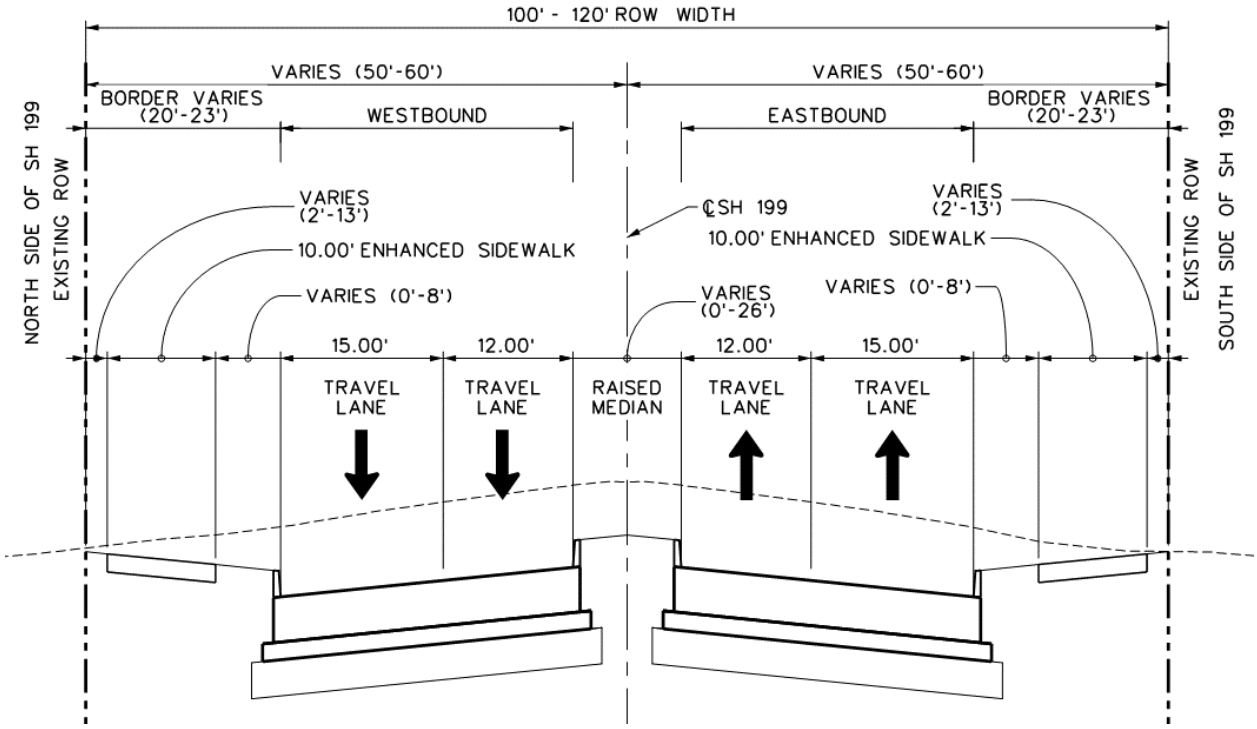
Source: Freese and Nichols, Inc., 2017

Figure I-16. Recommended Typical Section from Extension of 16th Street to University Drive/Northside Drive

Section 3 includes a raised median wider than Section 2 but narrower than Section 1. Due to the right-of-way width, the adjacent historic district, and necessary retaining wall along the north side of the roadway, the horizontal clearance between the outside travel lane and the sidewalks are four feet. Along the north side of SH 199, between the extension of 16th Street to University Drive (approximately 2,700 feet), a retaining wall (cut wall) height of approximately eight feet would be necessary.

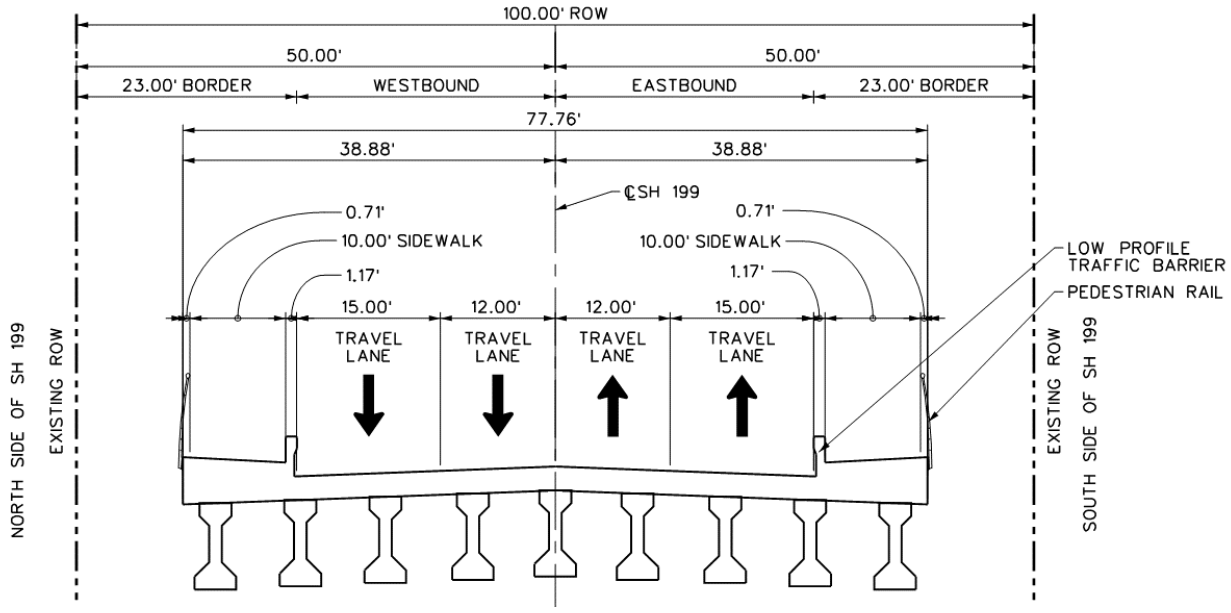
5.1.4 Section 4 – University Drive/Northside Drive to Shamrock Avenue

This section spans a distance of 0.59 miles. Section 4 includes commercial properties along the north side and the south side of SH 199 between University Drive and 900 feet east of University Drive. Section 4 also crosses the West Fork of the Trinity River and includes a bridge structure over the body of water. The recommended typical section transitions from the six-lane section to the west to a four-lane roadway with a median ranging from zero to 26 feet in width and 10-foot wide sidewalks on both sides (see Figure I-17). The recommended roadway transitions from a raised median to no median across the West Fork of the Trinity River and to the construction limits of the Trinity River Bridge/Panther Island project. To match and extend the improvements being constructed with the Trinity River Bridge/Panther Island project, 10-foot sidewalks are recommended on the north side and the south side of SH 199 (see Figure I-18).



Source: Freese and Nichols, Inc., 2017

Figure I-17. Recommended Typical Section from University Drive/Northside Drive to Shamrock Avenue



Source: Freese and Nichols, Inc., 2017

Figure I-18. Recommended Typical Bridge Section at the West Fork of the Trinity River

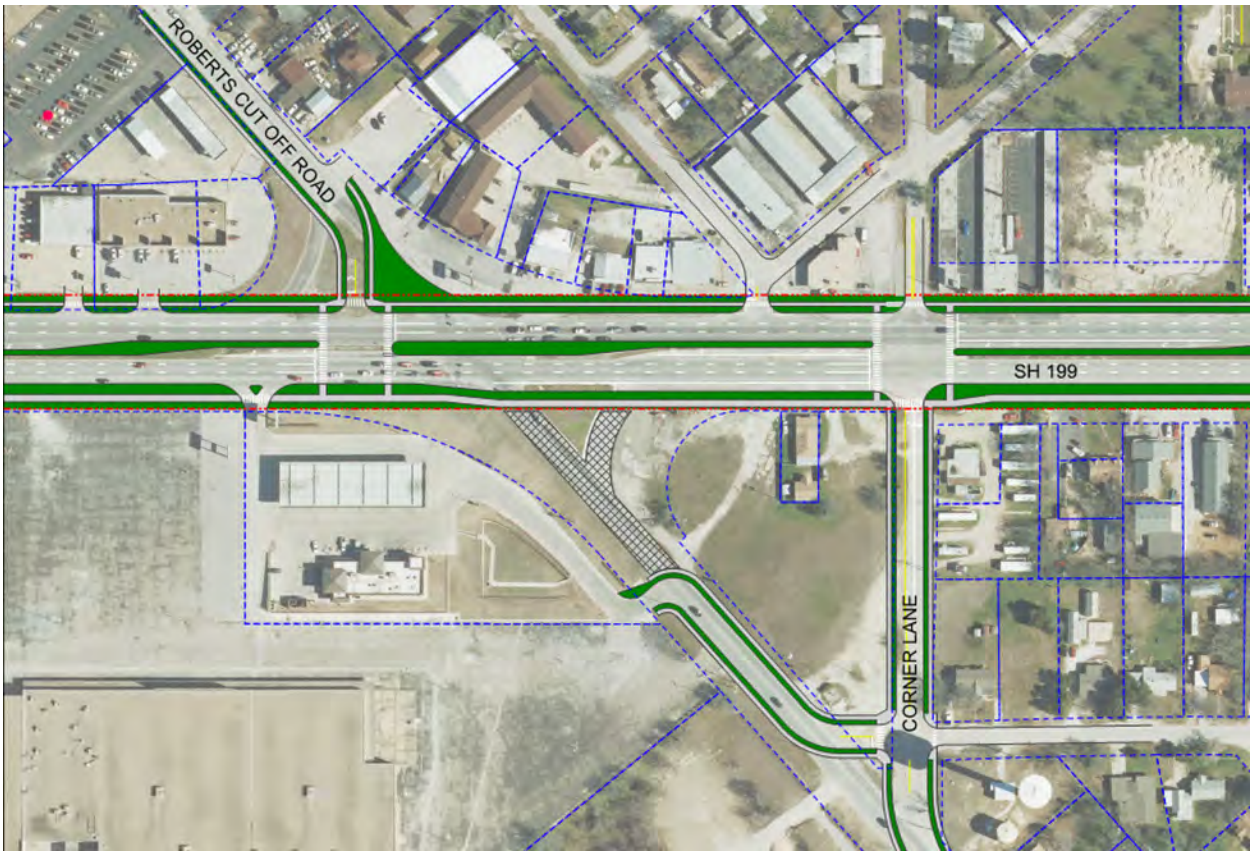
It is recommended that the existing 490-foot long bridge at the West Fork of the Trinity River be removed and replaced. The West Fork of the Trinity River also includes a flood-control levee along the east side. Considering the impacts that a grade separated crossing would have on adjacent properties, motor vehicle driver comfort, and visualization of surrounding aesthetics, it is recommended that a 525-foot long bridge with an at-grade crossing of the eastern levee of the Trinity River be considered. With an at-grade crossing of the levee, a concrete floodwall would be required to reinforce the earthen levee in proximity to the eastern bridge abutment. In addition to structural improvements, stormwater pollutant control and regional water quality should be considered when discharging stormwater into the Trinity River or related tributaries. Future design phases of SH 199 should consider coordination meetings with the Tarrant Regional Water District (TRWD) and the US Army Corps of Engineers (USACE) to ensure compliance of planned improvements with federal and local regulations.

5.2 INTERSECTION DESIGN

To support recommended design, conceptual intersection layouts have also been developed. The need for left turn lanes and right turn lanes at intersections were analyzed using Synchro 9 (see Section 4.3). The *TxDOT Roadway Design Manual* recommends using an acceptable traffic model such as Synchro to estimate the required storage lengths. The minimum lengths for turn bays were provided where possible, but factors such as available right-of-way and the distance to the next upstream intersection or driveway limited the allowable turn bay length at several locations. In these cases, the maximum practical turn bay length was provided. In addition to the functional features of the intersections, stakeholder feedback encouraged consideration of pedestrian crosswalks delineated with contrasting pavements. Additional input suggested consideration of special pavement pattern inlays at major intersections. It is recommended that these concepts be further evaluated in subsequent engineering and urban design tasks.

The conceptual intersection layouts have been included as Exhibits II-57 through II-68 in Volume II. Two alternative intersection concept designs were considered during the development of the recommended geometric configuration for SH 199 at Roberts Cut Off Road and SH 199 at SH 183.

- Roberts Cut Off Road – This design would separate the northbound and southbound Roberts Cut Off Road approaches into two separate intersections, as shown in Figure I-19 and Exhibit II-58 in Volume II. The southbound approach would intersect SH 199 at a three-legged intersection, while the northbound approach would follow the current alignment of Corner Lane and intersect SH 199 opposite Broadview Drive at a four-legged intersection. This concept was considered due to the high crash rate at and in the proximity of the intersection, the skew angle and poor geometry for all users, and the low percentage of through traffic on Roberts Cut Off Road. Aside from potential benefits to traffic operations, the concept could also allow for adjacent properties to be better formed for development.



Source: Toole Design Group, LLC, 2017

Figure I-19. Alternative Intersection Design for SH 199 at Roberts Cut Off Road

Synchro 9 traffic models were developed for the Roberts Cut Off Road alternative intersection design. This analysis showed that separating the Roberts Cut Off Road approaches into separate intersections would improve operations during the morning peak hour and produce similar results to the conventional single intersection approach for the evening peak hour. While this alternative provides several promising benefits, additional factors such as the loss of direct connectivity on Roberts Cut Off Road and the cost of a new signalized intersection should factor into any final decision.

- SH 183 – An alternate design concept for the SH 183 intersection was developed to include displaced left turn lanes for all four approaches (see Exhibit II-63 in Volume II). A bypass right turn lane was also included for the heavy right turn on the eastbound approach. This concept was considered due to the high traffic volumes on both arterials, the existing right-of-way footprint, and the preference of stakeholders to evaluate non-grade separated options at this intersection.

  A displaced left turn intersection, also known as a continuous flow intersection, relocates the left turn movement on an approach to the other side of the opposing roadway. This eliminates the left turn phase for this approach at the main intersection. This provides a greater capacity for the entire intersection and reduces the number of conflict points, making a displaced left turn intersection safer than conventional intersections. However, the intersection design requires a larger footprint, creates challenges for pedestrians, and usually requires additional traffic signals at the crossover points.

The Synchro traffic models showed no improvement in level of service for the displaced left turn intersection alternative at SH 183. Based on the operational results and other factors such as the additional costs from right-of-way acquisition and four additional traffic signals, loss of access to the properties on all four corners, impacts to transit service, and impacts to bicycle and pedestrian movements, a displaced left turn intersection at SH 183 was not recommended.

5.3 ACCESS

Based on an evaluation of the established roadway network, observed turning movements, and the crash locations identified in the Crash Data Technical Memorandum, 11 non-signalized locations are recommended for median openings. These include Azle Way, Old Mill Creek Road, Corner Lane, Norfleet Street, Cheyenne Street, Beverly Hills Drive, Circle Ridge Drive, Capri Drive, Town and Country Center, Belle Avenue, and Fort Worth Independent School District Service Center III. The designs of these openings should include left turn deceleration lanes and storage lengths consistent with the design criteria outlined in the *TxDOT Roadway Design Manual*.

All of the existing median opening locations should be reviewed during the future design phases. Closing unnecessary median openings could help reduce turning movement conflicts and improve the safety and operation of the corridor. For the openings deemed necessary, the design may be reconfigured to manage movements through the opening. For more information, see the Corridor Roadway Improvements Technical Memorandum included in Volume IV.

To improve corridor safety and efficiency, it is recommended that the widths and locations of driveways along SH 199 be designed in accordance with the guidelines outlined in the *TxDOT Roadway Design Manual* and the *TxDOT Access Management Manual*. Based on these manuals, driveway widths should not exceed 30 feet (for undivided driveways), except in rare instances where large trucks may need additional width for ingress or egress. Where divided driveways are provided, paved medians or landscaped medians should be considered. TxDOT representatives should meet with property owners and review each parcel on a case-by-case basis to determine individual access and driveway needs based on current and future land uses, necessary vehicular access, and site circulation. The number and width of driveways should be kept to a minimum. Parcels should have only a single point of access to the extent possible while observing Texas property access regulations. Shared driveways between adjacent parcels and private property cross-access accommodation can further enhance the access management strategies.

If desired, local governments can develop corridor access management plans. As outlined in the *TxDOT Access Management Manual*, any municipality, in cooperation with TxDOT, may develop an access management plan for a specified state highway segment for purposes of preserving or enhancing safe and efficient operation. For more information, see the Access Management Technical Memorandum included in Volume IV.

5.4 BICYCLE AND PEDESTRIAN ELEMENTS

Providing pedestrian and bicycle accommodations allows for alternate modes of transportation and is integral to the overall connectivity of a community. Because of the 45 miles per hour design speed, it is recommended that off-street accommodations for both pedestrians and cyclists be included in the design.

From IH 820 to University Drive/Northside Drive, it is recommended that the corridor include an enhanced sidewalk with a minimum width of 10 feet on the south side of the street and a

sidewalk with a minimum width of six feet on the north side (see Figures I-14 through I-17). With a properly planned buffer width, the 10-foot sidewalk could be widened in the future to 16 feet in the section from IH 820 to Ohio Gardens Road. This 16-foot width could accommodate a 10-foot two-way separated bike lane, with an additional six feet of width for exclusive pedestrian use (see Figure I-14). East of University Drive, 10-foot enhanced sidewalks are recommended for both sides of SH 199 to match the sidewalk being constructed as part of the Trinity River Vision project. For increased safety and user comfort, it is recommended that all sidewalks should be separated from the roadway with a minimum buffer width of six feet, with the exception of sidewalks separated from vehicular traffic by a physical barrier or railing or the right-of-way is severely constrained. The roadway typical sections (see Appendix B) include a 14-foot wide curb lane as an on-street bicycle accommodation per current TxDOT guidelines. However, if a future release of the *TxDOT Roadway Design Manual* includes flexibility in the geometric design criteria for urban streets with regards to on-street bicycle accommodations, it is recommended that the outside lane width be reduced from 14 feet to 11 feet. It is recommended that the additional two to three feet from each outside travel lane be redistributed to create a separated bicycle facility within the border area of the SH 199 right-of-way.

With the addition of continuous sidewalks along the SH 199, it is recommended that proper connections be made between the SH 199 corridor and the existing Fort Worth Trinity Trails and Marine Creek Trail, as well as the planned Lake Worth Regional Trail, shared-use paths along SH 183, and other pedestrian and bike facilities planned for intersecting streets.

Both intersections and driveways are potential conflict points between pedestrians, bicyclists, and motorists. Sight distances and sight triangles based on motorist, bicyclist, and pedestrian speeds should be preserved at all locations where entering or leaving the roadway is permissible. Proper treatments and design at intersections and driveways can minimize risks to pedestrians and bicyclists. The Bicycle and Pedestrian Safety, Accommodations, and Linkages Technical Memorandum in Volume IV includes best practices for visibility, pavement markings, signage, accessibility, and lighting at intersections and driveways for vulnerable users.

5.5 TRANSIT OPERATIONS

The reconstruction of roadway provides an opportunity to make improvements along the SH 199 corridor that could enhance the bus transit operations and passenger experience and make transit more appealing as a mode choice.

Bus Stop Locations

- Bus stops along SH 199 should be located in a way that allows buses to stop nearer to intersections than the current bus stop sites while not impeding traffic. This design could be achieved with near-side bus stop locations, placing bus stops in locations that allow right-turning motorists to pass around stopped buses or bus pullouts. At a minimum, it is recommended that bus pullouts be provided at the transfer centers at SH 199 and SH 183 (Town and Country Center on the northwest corner and Walmart on the southeast corner).
- Connective sidewalks between bus stops and adjacent land uses, Americans with Disabilities Act (ADA)-compliant facilities, and convenient, comfortable access can greatly improve the experience of transit users.

Bus Stop Amenities

- Paved bus stop platforms should be provided at all bus stops for ADA compliance. Paving the bus stop area at curb level creates a loading platform, which allows bus drivers to deploy bus ramps or kneel the bus to sidewalk height, if these actions are needed to ease passenger boarding or alighting.

- The paved platform should be connected across the street buffer space with a paved access surface to the adjacent sidewalk. The platform and access surface should be designed to the same reinforced concrete standard as the sidewalk, or greater. Designs for the bus stop, access way, sidewalk, and platform must be compliant with the ADA Guidelines.
- Structured shelters at bus stops can provide shade from the sun and protection from precipitation and generally improve the experience of transit patrons while they wait for the bus. Benches can easily be incorporated into the shelter design, as can lighting, powered by a local source or by solar panels. Bus shelters in the FWTA system are typically included where ridership is high, including transfer centers and large commercial generators.
- Common amenities found at bus stops that increase passenger comfort include seating, trash receptacles, bicycle racks, landscaping, and lighting. For security, safety, and usability, it is recommended to provide open sightlines to and from bus stops. Printed schedules and route maps can also help passengers plan their trip, and in areas with numerous non-English speakers, providing these guides in other languages can be helpful.

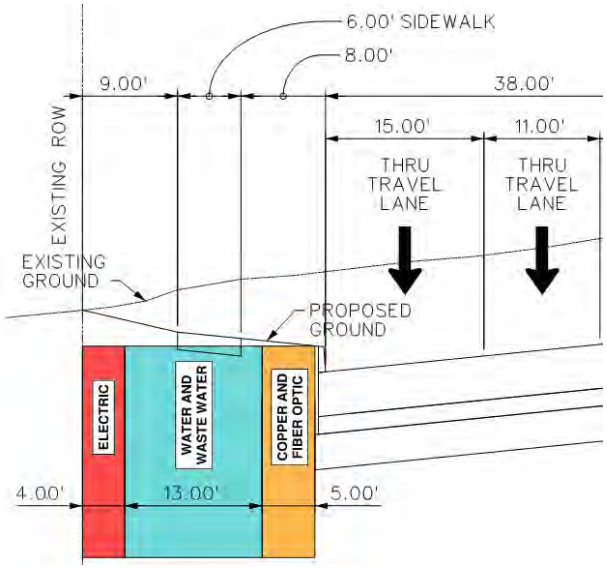
For more information, see the Bus Transit Technical Memorandum included in Volume IV.

5.6 UTILITIES

The reconstruction of SH 199 should make allowances for the existing and planned utility infrastructure within the corridor to continue the current and future services to the community. When reconstructing the SH 199 corridor, it should be expected that all utilities that are in direct conflict with planned construction, are non-compliant with the Utility Accommodation Rules, do not meet local ordinance or industry standards, or include other safety issues will be adjusted, realigned, or replaced. These utilities will need to be planned and constructed per the *TxDOT Utility Manual* and in accordance with the Texas Administrative Code. A summary of the known horizontal location, depth, and encasement expectations of the franchise and city-owned utilities within the corridor is included in the Franchise and City-Owned Utilities Technical Memorandum in Volume IV. During the next design phase, it is recommended that a licensed land surveyor provide field investigation and subsurface utility engineering services to aid in the identification of the horizontal and vertical location of overhead and underground franchise and city-owned utilities within the corridor and locate all existing utility easement limits.

Converting the SH 199 corridor from a rural roadway section to an urban roadway section may lower the centerline roadway profile between two and three feet. The lowering of the roadway and the construction of drainage structures and retaining walls have the potential to cause conflicts with the existing underground utilities and the existing overhead utility poles. It is recommended that the next design phase evaluate the anticipated cut, fill, and construction activities in proximity to existing utilities within the project reconstruction limits. The SH 199 reconstruction project may potentially require the relocations or adjustments of multiple franchise-owned utilities. The condition and location of the existing oil and gas utilities within the project corridor should be considered when designing the location of retaining walls and storm drain outfalls.

Once the utilities within the corridor have been properly identified and located, it is recommended that the utilities consider being placed in the border width (between the back of the curb and the right-of-way line) of the roadway typical section. A depiction of the recommended location for utilities on the north or the south side of SH 199 can be seen in Figure I-20. In this typical section, it is recommended that the electric utility be placed adjacent to the right-of-way, the water and waste water utilities be placed in the next available space from the right-of-way, and the copper and fiber optic lines be placed along the back of the curb, when applicable.



Source: Freese and Nichols, Inc., 2017

Figure I-20. Recommended Typical Franchise and City Utility Location within Right-of-Way

During future design phases, coordination between the location of underground utilities improvements (such as franchise-owned utilities and city-owned utilities) and urban design improvements should occur to allow for the implementation of the desired landscape and hardscape improvements.

5.7 DRAINAGE

As part of the reconstruction of SH 199, drainage improvements would be necessary to meet TxDOT criteria and to resolve the numerous drainage issues identified within the project study area. The recommended drainage improvements consist of both the replacement of undersized outfalls and the implementation of an underground storm drain system. A total of 19 storm drain lines were identified as necessary along SH 199. Proposed culvert crossings were also calculated at two creek crossings – Menefee Creek and an unnamed tributary near Belle Avenue. The conceptual improvements proposed for this master plan are depicted in Exhibits II-69 through II-76 in Volume II. During coordination meetings with TRWD it was mentioned that the design and construction of the SH 199 project would need to follow the regional water quality criteria. Depending on final design configurations, low impact stormwater strategies may complement landscape sustainability and utility system cost, if implemented.

These improvements were evaluated to meet current highway standards as outlined in the *TxDOT Hydraulic Design Manual*. The identified improvements are based on conceptual calculations although the methodology and criteria of the analyses are consistent with those used for final design (for more information, see the Proposed Improvements – Drainage Assessment Technical Memorandum in Volume IV). Although the methodology is similar, the conceptual improvements will need to be evaluated in further detail during the future design phase of the project. During future design phases, coordination between the location of underground utilities improvements (such as drainage) and urban design improvements should occur to allow for the implementation of the desired landscape and hardscape improvements.

5.8 URBAN DESIGN CHARACTER

The reconstruction of the SH 199 corridor offers the opportunity to enhance the character of the corridor through urban design strategies. The urban design effort conducted as part of the SH 199 Master Corridor Plan was preliminary in nature and the concepts would need additional development and may have impact on the roadway geometric and engineering conditions. The concepts consider the existing Character Zones (see Section 2.1) of the corridor and capitalize on principles inherent in the catalyst development concepts to varying degrees.

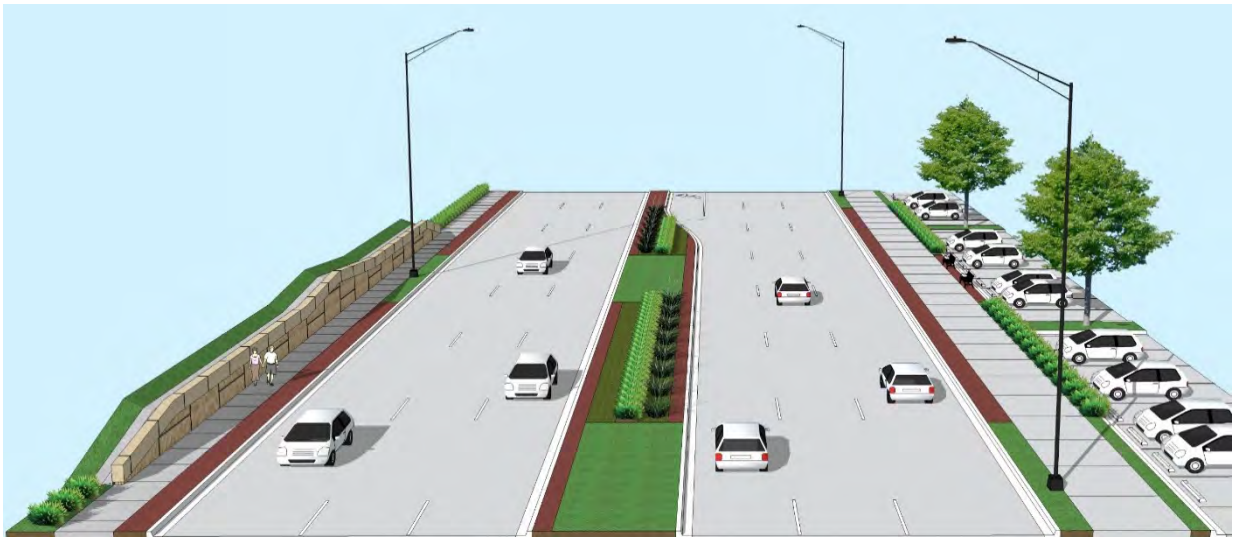
SH 199 is a gateway to the northwest section of Tarrant County and it is a primary corridor for Fort Worth, Samson Park, Lake Worth, and River Oaks. Gateway enhancements demarking the various cities as the roadway travels through provides opportunity for strengthening the identity and sense of place within the corridor. Additionally, high quality design standards exist at the east end of the corridor related to the Trinity River Vision/Panther Island design guidelines.

Three concepts (base, boulevard, and parkway) were developed to pose different perspectives. Whether with lessor or greater levels of enhancements shown, it is wise to organize the urban design around a common set of themes and strategies which can vary by concept alternative.

- Base Concept – The base concept envisions consistency and continuity through a unified design that is repeated throughout the corridor. This approach consistent with the way many transportation projects are designed with repeating patterns and standardized elements. In this regard, this design would be the most closely associated with standard transportation design practices with minimal enhancements (see Figures I-21 and I-22). This concept can be characterized as a “City in Motion, Celebrating the Roadway Experience.”

Source: Freese and Nichols, Inc., 2017

Figure I-21. Urban Design Base Concept within 150-Foot Right-of-Way



Source: Freese and Nichols, Inc., 2017

Figure I-22. Urban Design Base Concept within 120-Foot Right-of-Way

- Boulevard Concept – The boulevard concept emphasizes an inward focus with an expanded median width enabling informally arranged plantings of variable size and type (see Figures I-23 and I-24). Outer margins on each side of the roadway would be reduced in width but still retain sufficient space for variable landscaping. The high degree of variability adapts well to the varied development edges that it interfaces with. Given the emphasis on naturalized landscaping, this concept can be described as "Classic Quality, Enhancing Nature and Green Immersion."

Source: Freese and Nichols, Inc ., 2017

Figure I-23. Urban Design Boulevard Concept within 150-Foot Right-of-Way

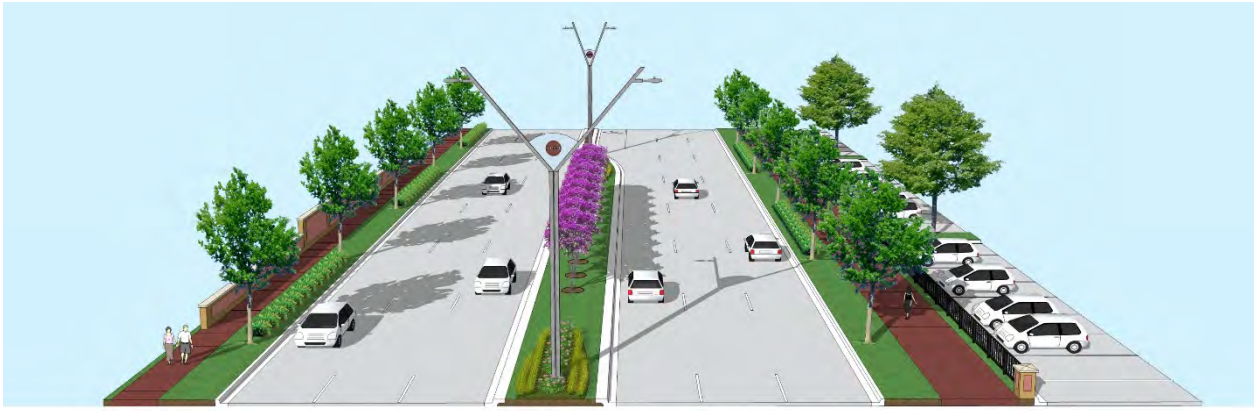
Source: Freese and Nichols, Inc., 2017

Figure I-24. Urban Design Boulevard Concept within 120-Foot Right-of-Way

- Parkway Concept – The parkway concept creates broad outer margins along the outside edges of the roadway (see Figures I-25 and I-26) and minimizes the median width. This concept emphasizes improvements in proximity to what could become catalyst redevelopment sites organized based on traditional neighborhood development principles such as mixed-use, buildings in proximity to roadways, block style arrangements, and other principles, if adopted. Along other properties, it could optimize landscaping as a traditional foreground to varied commercial buildings and parking lots. The outward emphasis of this concept is characterized as "Urban Transition, Creating Walkable Development Edges."

Source: Freese and Nichols Inc., 2017

Figure I-25. Urban Design Parkway Concept with 150-Foot Right-of-Way



Source: Freese and Nichols Inc., 2017

Figure I-26. Urban Design Parkway Concept with 120-Foot Right-of-Way

The potential for variation in horizontal geometry (median and buffer widths) of the roadway corridor is available within the existing right-of-way width to provide placemaking opportunities and the complementing of existing qualities. Further development of these concepts and collaboration is necessary in future design phases. These urban design opportunities should be explored when available space is identified in the future design phase and once topographic conditions, property boundaries, and subsurface utilities are better defined. Additionally, a study of corridor safety considerations such as available sightlines and lateral clearances may be needed.

The urban design concepts are complementary to the potential zoning, development guidelines, and adjacent property redevelopment. It is recommended that all of these tasks be engaged by TxDOT and the affected cities in a manner that dovetails with the final design. All concepts anticipate interagency and/or public-private partnerships to accomplish the level of improvements depicted. This includes initial construction funding and ongoing maintenance agreements with the affected cities, improvement districts, or interested stakeholders. For more information on these concepts, see the Urban Design Considerations Technical Memorandum in Volume IV.

5.9 COST ESTIMATE AND FUNDING

Based on the recommended improvements, the preliminary construction cost has been estimated at $99.8 million (in 2017 dollars). It is expected that the project would begin construction in 2023; therefore the costs were escalated to $121.5 million (in 2023 dollars or year of expenditure). This estimate (see Table I-14) was based on data collected and conceptual design developed during the SH 199 Corridor Master Plan. This estimated construction cost total does not include right-of-way costs or design costs. During future design phases, additional topographic, right-of-way, utility, and geotechnical information will be collected to better define impacts and construction costs. Although a landscape and urban design allowance is included, additional funding will likely be required to achieve some of the improvements depicted in the urban design concepts. For more information, see the Estimated Construction Cost Technical Memorandum included in Volume IV.

Table I-14. Construction Cost Estimate

Item Description	Estimated Cost
Prepare Right-of-Way (removal, excavation, erosion control)	$11,800,000
Roadway (subgrade, pavement)	$27,300,000
Retaining Wall	$7,600,000
Bridge	$4,000,000
Drainage	$4,000,000
Sidewalks	$3,600,000
Traffic Signals	$2,000,000
Illumination	$5,400,000
Signage and Pavement Markings	$700,000
Landscaping and Urban Design Allowances[1]	$2,000,000
Mobilization and Traffic Control during Construction	$4,500,000
Utility Relocation	$6,900,000
Subtotal	*$79,800,000*
Contingency[2]	$20,000,000
Subtotal	*$99,800,000*
Inflation (based on construction beginning in 2023)	$21,700,000
Total (based on year of expenditure)	**$121,500,000**

Source: Freese and Nichols, Inc., 2017
1. Allowances are based on additive cost differentials from TxDOT standard practice improvements.
2. The contingency allowance is to cover items which are not known exactly at this time and need additional engineering to determine.

6.0 PUBLIC AND STAKEHOLDER INVOLVEMENT

The development of the SH 199 Corridor Master Plan included various meetings with stakeholders, local governments, transportation providers, and the community. Almost 30 meetings, briefings, and presentations were held to gain knowledge and input from local governments and the public throughout the study (see Table I-15). Meetings were held at key points in the study process to engage stakeholders and the public in the discussion of community ideas for the SH 199 corridor. Volume III provides a record of the meetings and comments received during the development of the SH 199 Corridor Master Plan.

Table I-15. Meetings and Presentations

Date	Meeting or Presentation
June 4, 2015	Stakeholder Update Meeting
March 23, 2016	TxDOT Coordination Meeting
July 28, 2016	Stakeholder Steering Committee No. 1
August 15, 2016	City of Sansom Park
August 18, 2016	City of Lake Worth
August 22, 2016	City of River Oaks
September 1, 2016	Stakeholder Steering Committee No. 2
September 29, 2016	Stakeholder Steering Committee No. 3
October 24, 2016	Community Meeting No. 1
October 25, 2016	City of Sansom Park
October 25, 2016	FWTA
October 25, 2016	Tarrant County
October 26, 2016	City of Fort Worth
October 26, 2016	City of Lake Worth
October 26, 2016	City of River Oaks
October 27, 2016	Stakeholder Steering Committee No. 4
January 23, 2017	NAS Fort Worth JRB Regional Coordination Meeting

Table I-15. Meetings and Presentations (continued)

Date	Meeting or Presentation
January 24, 2017	TxDOT Coordination Meeting
January 26, 2017	Stakeholder Steering Committee No. 5
February 23, 2017	Coffee and Conversation with Mayor Jim Barnett
February 23, 2017	Fort Worth Pedestrian and Bicycle Advisory Commission
March 29, 2017	Fort Worth Pedestrian and Bicycle Advisory Commission
April 20, 2017	Stakeholder Steering Committee No. 6
April 27, 2017	Sansom Park Business Appreciation Luncheon
May 9, 2017	Fort Worth City Council
May 23, 2017	Tarrant County Commissioners Court
May 31, 2017	Community Meeting No. 2
June 29, 2017	TRWD and USACE Coordination Meeting
August 24, 2017	Stakeholder Steering Committee No. 7

Over 200 comments were recorded from the meetings held over the course of the study. The comments received guided the development of the recommendations. In general, there was strong support for improvements to SH 199. Table I-16 summarizes the number of comments received by category or topic (e.g., design, traffic, drainage, safety, access). The majority of the comments were received during meetings with stakeholders. Volume III, Appendix III-E includes all of the comments sorted by date and sorted by topic.

Table I-16. Summary of Comments by Topic

Topic	Percentage of Comments
Design/Traffic	21.4%
Economic/Development	18.2%
Bicycle/Pedestrian	15.1%
Urban Design	10.9%
Access	7.3%
Drainage	6.8%
Transit	6.8%

Topic	Percentage of Comments
General	3.6%
Safety	2.6%
Coordination	2.1%
Construction	2.1%
Lighting	1.6%
Noise	1.6%

7.0 NEXT STEPS

The purpose of the SH 199 Corridor Master Plan was to provide a basis for preliminary design/engineering. The study included a collaborative and integrated approach to the project by considering environmental, community, and economic goals early in the transportation planning process and using the information, analysis, and products developed during planning to inform the environmental review process.

As discussed in Section 1.2, the SH 199 Corridor Master Plan included five goals for the project. Table I-17 shows how the study design concepts and recommendations support and achieve the study goals.

Table I-17. Study Goals and Recommendations

Study Goals	Supporting Study Recommendations
Provide transportation options for all modes and users	• Inclusion of sidewalks/enhanced sidewalks that meet ADA standards for pedestrians and bicyclists • Inclusion of buffer areas for bus stops and shelters • Provision for future expansion of the sidewalk on the south side of road • Inclusion of shared lane for on-street bicycle accommodations • Maintain six to four lanes of travel for motor vehicles • Use of TxDOT design standards to accommodate large trucks • Provision for utilities within the buffer area of the right-of-way
Maintain and enhance capacity for the flow of traffic through the corridor	• Widen roadway to six lanes from IH 820 to University Drive/Northside Drive • Improve intersection operations with the inclusion of left and right turn lanes, where appropriate • Replace traffic signals • Provide median access at appropriate locations • Reduce number of driveways based on TxDOT access management standards
Improve drainage system	• Convert rural cross section (with open flow drainage) to curb and gutter with a closed storm drainage system
Identify and provide economic development opportunities	• Four core areas to target redevelopment efforts were identified along with development types • IH 820/SH 199 intersection • The primarily undeveloped area within Sansom Park near the Skyline Drive/SH 199 intersection • Commercial intersection of SH 183 (River Oaks Boulevard)/SH 199 • The Panther Island/Trinity River Vision area
Include context sensitive solution principles and transportation engineering concepts to increase the livability in the corridor	• Three urban design concepts were developed to pose different perspectives for the future design phases. All concepts anticipate interagency and/or public-private partnerships to accomplish the level of improvements depicted. This includes initial construction funding and ongoing maintenance agreements with the affected cities, improvement districts, or interested stakeholders. Urban design concepts may affect geometric roadway engineering design; therefore, warranting early coordination and integrated decision making in future design phases.

Future design and environmental efforts need to be coordinated with local and regional transportation plans for transit, bicycle, and pedestrian facilities. As a follow-on to the stakeholder involvement feedback obtained to date, it is recommended that the subsequent environmental and engineering studies follow a context sensitive solutions approach to include urban design and redevelopment strategies to the degree possible during the development of the preliminary design.

7.1 FUNDING

On December 13, 2016, the NCTCOG Regional Transportation Council approved the 10-year plan cost/revenue for the Dallas-Fort Worth region for fiscal years 2017 through 2026. This proposed list of projects included $100 million (in 2017 dollars) for SH 199, east of IH 820. It

should be noted that this does not including funding for ongoing maintenance costs. The Texas Transportation Commission subsequently endorsed the list in March 2017.

7.2 DESIGN CONSIDERATIONS

As the design process continues into the next phases, it is recommended that the following opportunities be considered.

- In-field data such as topographic conditions, property boundaries, and subsurface utilities should be collected to better inform the design process and determine the limits of construction.
- When it is appropriate, design waivers for improvements within the right-of-way should be considered to allow for a reduction in the impacts to historic structures/districts, environmentally sensitive areas, and recreation facilities, and to enable a contribution to the preservation of the community character.
- Due to the varying terrain within and adjacent to the right-of-way and the extent of the corridor improvements, it is recommended that the future design phase include a detailed geotechnical investigation to provide guidance for the appropriate cut and fill retaining wall types, heights, and soil stabilization requirements.
- It is recommended that the design team consider all users of the corridor when making design decisions. There is potential for design decisions that positively affect one user group (motor vehicle users) to negatively affect another user group (pedestrians, bicyclists, and transit users).
- If a future release of the *TxDOT Roadway Design Manual* includes flexibility in the geometric design criteria for urban streets with regards to on-street bicycle accommodations, it is recommended that the outside lane width be reduced from 14 feet to 11 feet. It is recommended that the additional two to three feet from each outside travel lane be redistributed to create a separated bicycle facility within the border area of the SH 199 right-of-way.
- Due to varying terrain and necessary property access, a separate roadway profile may be necessary for the eastbound and the westbound travel lanes. A separate roadway profile may also reduce the amount of cut volume, fill volume, and retaining wall heights along multiple sections of SH 199.
- Urban design is a unique, stakeholder driven program that will require additional coordination and refinement in concert with the engineering design process. These tandem design processes are necessary to achieve desired project outcomes.

7.3 ENVIRONMENTAL CONSIDERATIONS

Even though the study was not part of a formal NEPA process, it is anticipated that the SH 199 Corridor Master Plan could be used as a basis for future NEPA documents and engineering under the PEL approach. The existing site conditions within and around the SH 199 corridor were documented and used to assist the project team in identifying preliminary issues relevant to the development of improvements in the corridor and to provide a context for exploring opportunities and challenges.

7.3.1 Environmental Concerns and Constraints

For most of the corridor, TxDOT owns 150 to 120 feet of right-of-way along SH 199. The recommended typical sections were developed to minimize the need for additional right-of-way, which would reduce impacts. Prior to beginning environmental and engineering studies, it is recommended that the information, data, and stakeholder input included in this report be reviewed and updated based on the latest available information and input from the public and

resource agencies. The information in this report could help establish baseline social, economic, and environmental conditions and help avoid important resources. The following summarizes the main environmental concerns or constraints identified during this study.

Economic Development

All of the cities along the corridor stated a desire to encourage economic development opportunities. Based on the economic market analysis conducted as part of this study, four core areas to target redevelopment efforts were identified. A planning strategy could be successful if it distributed these development programs into strategic nodes along the corridor aimed at creating a critical mass in use and activity. Implementation of these programs will require local jurisdiction actions to put policies and complementary initiatives in place for implementation.

Property Access/Parking

To improve corridor safety and efficiency, it is recommended that the widths and locations of driveways along SH 199 be designed in accordance with the guidelines outlined in the TxDOT *Roadway Design Manual* and the TxDOT *Access Management Manual*. During the design phase, TxDOT representatives should meet with property owners and review each parcel on a case-by-case basis to determine individual access and driveway needs based on current and future land uses, necessary vehicular access, and site circulation. The number and width of driveways should be kept to a minimum. Parcels should have only a single point of access to the extent possible while observing Texas property access regulations. Shared driveways between adjacent parcels should be encouraged.

Along some portions of SH 199, the existing paved shoulders are contiguous with parking lots or other adjacent paved uses. These swaths of pavement (within TxDOT right-of-way) are also commonly used as parking or queuing areas for vehicles, including large trucks. In many cases, it appears that some buildings are located less than 15 feet from the right-of-way line. Property boundary surveys are needed to confirm the right-of-way lines. City officials have requested that TxDOT work with property owners on parking and property access issues during the design process.

Rockwood Park

The Rockwood Golf Course is parallel and adjacent to the south side of SH 199 between Ohio Garden Road and the extension of 16th Street. The Rockwood Golf Course has not been nominated and is currently not listed on the National Register of Historic Places, but may be considered an eligible site for historic designation. Confirmation has been made that no Land and Water Conservation Funds were used for the original construction or site updates to the Rockwood Golf Course or Rockwood Park. The proposed roadway typical section includes retaining walls and a narrower median in this area to avoid impacting the park. The section also includes a 10-foot buffer on the south side to allow for construction and maintenance of the retaining wall.

Grand Avenue Historic District

SH 199 is adjacent to the Grand Avenue Historic District. The concrete retaining wall along the face of the bluff between SH 199 and the core of the historic district is a contributing structure to the district. The retaining wall appears to be within the existing TxDOT right-of-way. The proposed design recommends replacement of the wall based on the recommended roadway improvements and existing stability and drainage conditions. In initial discussions with the community and elected officials, no objections were expressed about replacing the retaining wall. It is recommended that the new retaining wall include colors and patterns that are

sensitive to the context of the historic district. The design would likely need to be approved by the Texas Historical Commission and local historians.

Henderson Street Bridge
Shamrock Avenue is the recommended eastern limit of the SH 199 improvements. No improvements or changes to the Henderson Street Bridge are recommended.

Floodplains/Water Quality
Flood control levees exist on the east side of the West Fork of the Trinity River at the SH 199 crossing. It is recommended that the existing bridge at the West Fork of the Trinity River be removed and be replaced with an at-grade crossing of the eastern levee. With an at-grade crossing of the levee, a concrete floodwall would be required to reinforce the earthen levee in proximity to the eastern bridge abutment. In addition to structural improvements, stormwater pollutant control and regional water quality should be considered when discharging stormwater into the Trinity River or related tributaries. Future design phases of SH 199 should consider coordination meetings with TRWD and USACE to ensure compliance of planned improvements with federal and local regulations.

Noise
Residents in the Grand Avenue Historic District voiced concerns about noise levels. Because of the topography, their homes are significantly higher than SH 199. During the environmental analysis, a noise level analysis would be conducted and mitigation considered.

Construction Impacts
At several meetings, business owners expressed concerns of impacts to their businesses during construction. It is suggested that TxDOT require the contractor to conduct regular meetings with business owners to keep them informed on construction activities.

Permitting and Coordination
It is anticipated that because of the potential impacts to park land and historic properties, a Section 4(f) statement may be required as part of the NEPA documentation in addition to Section 106 (historical) coordination. A nationwide Section 404 permit (jurisdiction waters of the US) from the USACE will likely be required, along with a Section 408 permit because of the levees.

7.3.2 Draft Need and Purpose
To support the future NEPA effort, a draft purpose and need statement has been developed based on information gathered and analysis conducted during the SH 199 Corridor Master Plan.

Purpose
SH 199 is both an important commuter corridor and provides mobility for local residents and businesses. Improving SH 199 will reduce congestion, improve mobility, and meet current roadway design and safety standards for all users.

Specific Corridor Needs
- Roadway Deficiencies
  - The roadway was originally built in the 1930s and has never been fully reconstructed or significantly improved; hence, the roadway does not meet current design, lighting, and safety standards.
  - Both Sansom Park and Fort Worth have experienced flooding and ponding issues in the corridor due to the lack of storm drain infrastructure.

- Safety – From 2010 to 2014, there were nine fatalities. SH 199 has higher observed crash rates compared to the statewide averages. This can be likely attributed to:
  - The urban development of the corridor with multiple intersections, cross streets, and access driveways that increase the possibility of vehicle conflicts.
  - Lack of defined pedestrian and bicycle space along corridor and at intersections.
  - Private development within the TxDOT right-of-way leading to obstruction to the intersection sight distance.
  - Because of a lack of sidewalks, bus transit stops have difficult and challenging access points.
- Modal Interrelationships – Bus service along SH 199 (Route 46) is planned to be expanded with an express route, and rapid bus route featuring 10-minute intervals between busses during peak periods. Additionally, pedestrian and bicycle connections to other trails in the area would expand and increase continuity of the system.
- Capacity – By 2040, eight of the 10 signalized intersections in the corridor would operate at an unacceptable level of service in the no build scenario. Increasing traffic volumes on SH 199 would exacerbate many of the previously described problems on the corridor and the existing geometry does not provide enough capacity to meet demand.

Additionally, improvements to the SH 199 corridor would support these stated goals, as well as the regional performance goals listed in Mobility 2040:

- Mobility – through the potential for congestion reduction and increased system reliability.
- Public Transportation – through better accommodation of transit service and “last-mile” pedestrian and bicycle access. The corridor is also designated for a park-and-ride transit facility, with a direct connection to the downtown employment core.
- Active Transportation – through provision of improved, safe, and multimodal mobility.
- Quality of Life – through supporting economic redevelopment, context sensitive design solutions, and improvements for aging drainage systems.
- System Sustainability – by managing infrastructure conditions and utilizing the existing transportation corridor more effectively.

7.3.3 Future Public and Agency Involvement

As the project moves into the next phase of development, a comprehensive, open, and proactive public and agency participation plan should be developed. The plan should build upon the efforts of this study. Coordination efforts should begin at the start of each study. The plan should provide frequent and meaningful opportunities for stakeholders and the community to participate in the transportation planning process by reviewing and commenting on the design and environmental analysis.

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Appendix A
Recommended Design Criteria

Recommended Design Criteria for SH 199

Design Criteria	Section 1 IH 820 to Ohio Garden Road	Section 2 Ohio Garden Road to Extension of 16th Street	Section 3 Extension of 16th Street to University Drive	Section 4 University Drive to Shamrock Avenue
Existing right-of-way width	150 feet	120 feet	120 feet	Varies (100 feet to 120 feet)
Design speed	45 mph	45 mph	45 mph	40 mph
Terrain	Rolling	Rolling	Rolling	Rolling
Horizontal curvature	1039 feet	1039 feet	1039 feet	762 feet
K value (sag curve)	79	79	79	64
K value (crest curve)	61	61	61	44
Maximum grade	7%	7%	7%	8%
Minimum grade	0.35%	0.35%	0.35%	0.35%
Cross slopes	2%	2%	2%	2%
Number of travel lanes[1]	6	6	6	4
Width of travel lane	11 feet	11 feet	11 feet	11 feet (with raised median) 12 feet (without raised median)
Width of outside travel lane	14 feet	14 feet	14 feet	14 feet
Width of speed change lane	10 feet	10 feet	10 feet	10 feet
Offset to face of curb	1-foot	1-foot	1-foot	1-foot
Raised median width[2]	18 feet	4 feet	12 feet	Varies (0 feet to 26 feet)
Border width (north)[2]	23 feet	17 feet	16 feet	Varies (20 feet to 23 feet)
Border width (south)[2]	33 feet	23 feet	16 feet	Varies (20 feet to 23 feet)
Clear sidewalk width (north)	6 feet	6 feet	6 feet	10 feet
Clear sidewalk width (south)	10 feet	10 feet	10 feet	10 feet
Horizontal clearance width (minimum)	4 feet	4 feet	4 feet	4 feet
Curb parking lanes	None	None	None	None
Shoulder width	None (Curbed)	None (Curbed)	None (Curbed)	None (Curbed)
Superelevation[3]	None	None	None	None
Bridge Sections	None	None	None	Vehicular bridge at the intersection of the West Fork of the Trinity River

1. See Section 4.2
2. To complement urban design recommendations, dimensional variation is recommended based on context within the corridor.
3. No superelevation recommended to reduce vehicles traveling at high rates of speed and to align drainage structures along outside edge of roadway

Appendix B
Recommended Typical Sections

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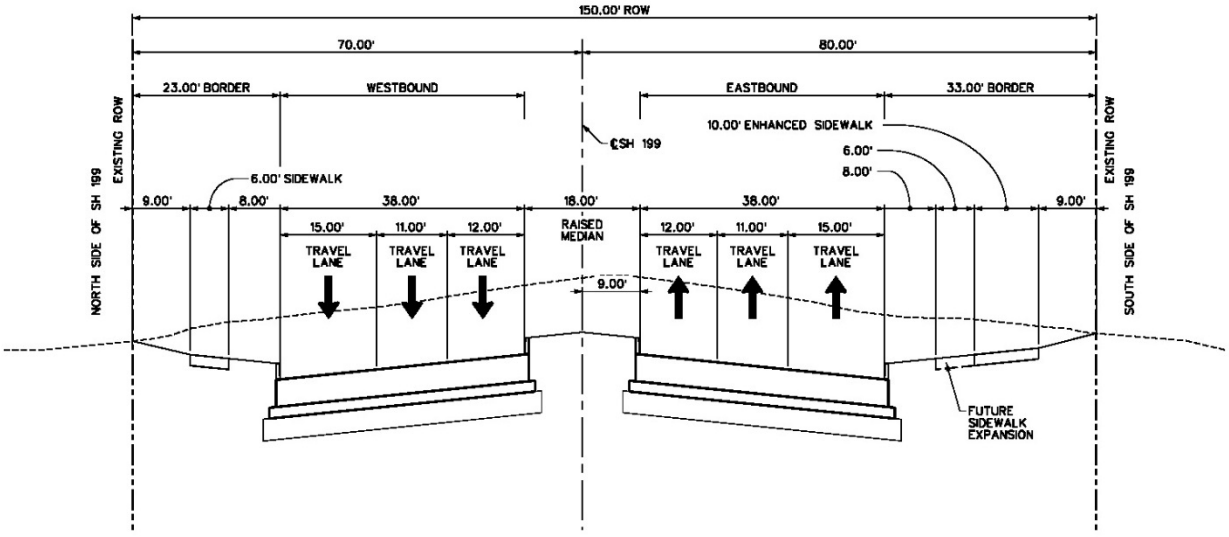
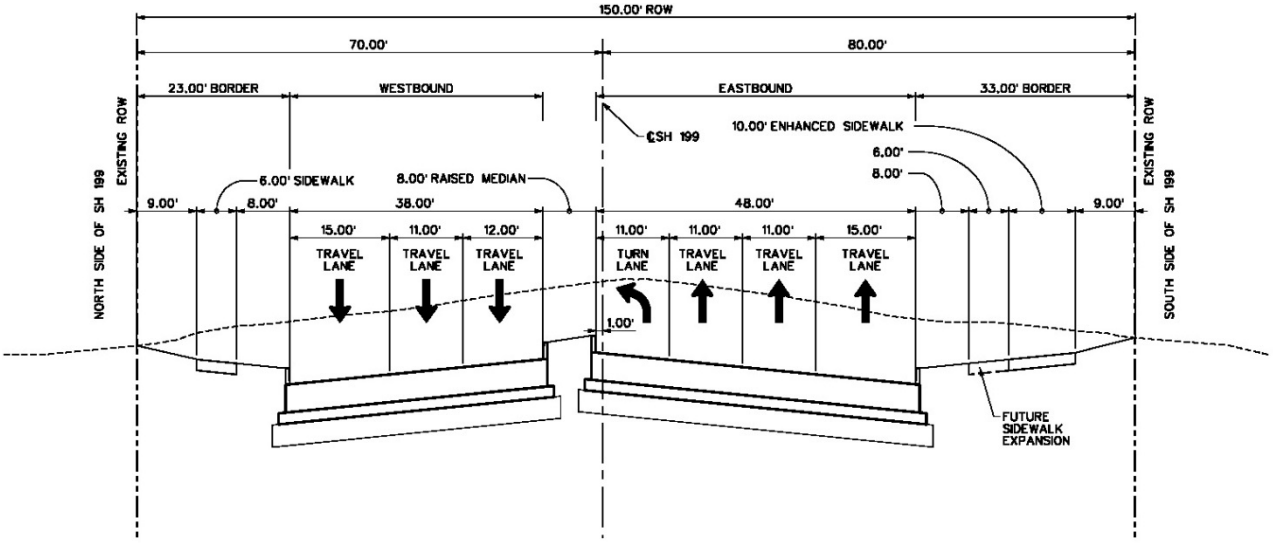


RECOMMENDED
SH 199 TYPICAL SECTION
6 LANES
150' ROW WIDTH

NOT TO SCALE

SECTION 1
FROM IH-820 TO OHIO GARDEN ROAD

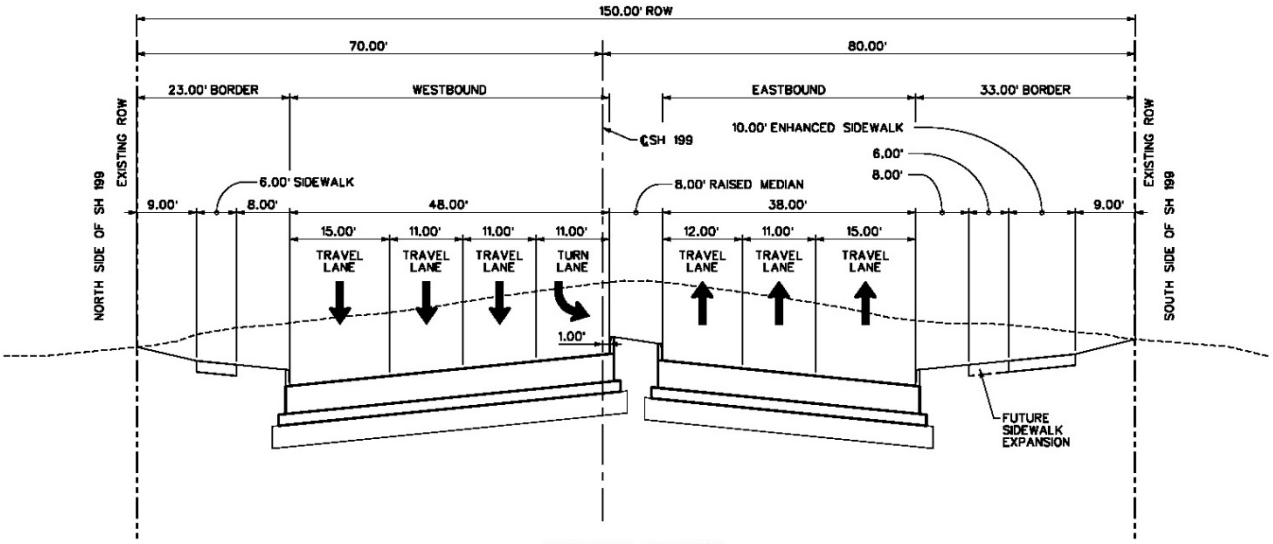


RECOMMENDED
SH 199 TYPICAL SECTION
6 LANES
150' ROW WIDTH

NOT TO SCALE

SECTION 1
FROM IH-820 TO OHIO GARDEN ROAD
EASTBOUND LEFT TURN LANE

AT AZLE WAY, CORNER LANE, NORFLEET STREET, BIWAY STREET, CHEYENNE STREET, SKYLINE DRIVE, BEVERLY HILLS DRIVE, CAPRI DRIVE, TOWN AND COUNTRY CENTER, WALMART DRIVE, AND BELLE AVENUE

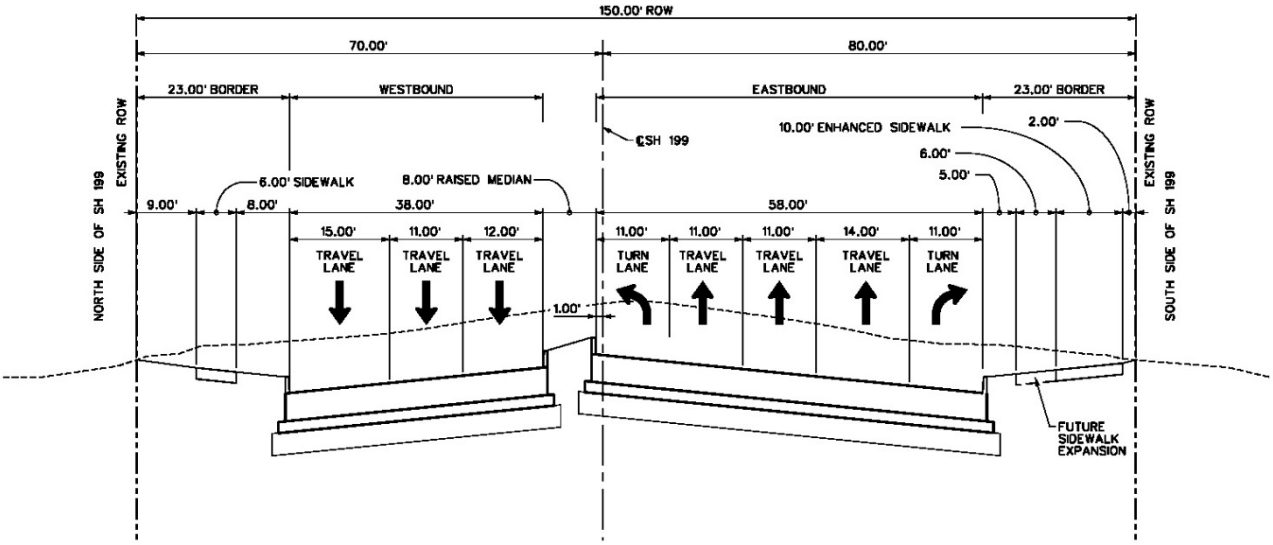


RECOMMENDED
SH 199 TYPICAL SECTION
6 LANES
150' ROW WIDTH

NOT TO SCALE

SECTION 1
FROM IH-820 TO OHIO GARDEN ROAD
WESTBOUND LEFT TURN LANE

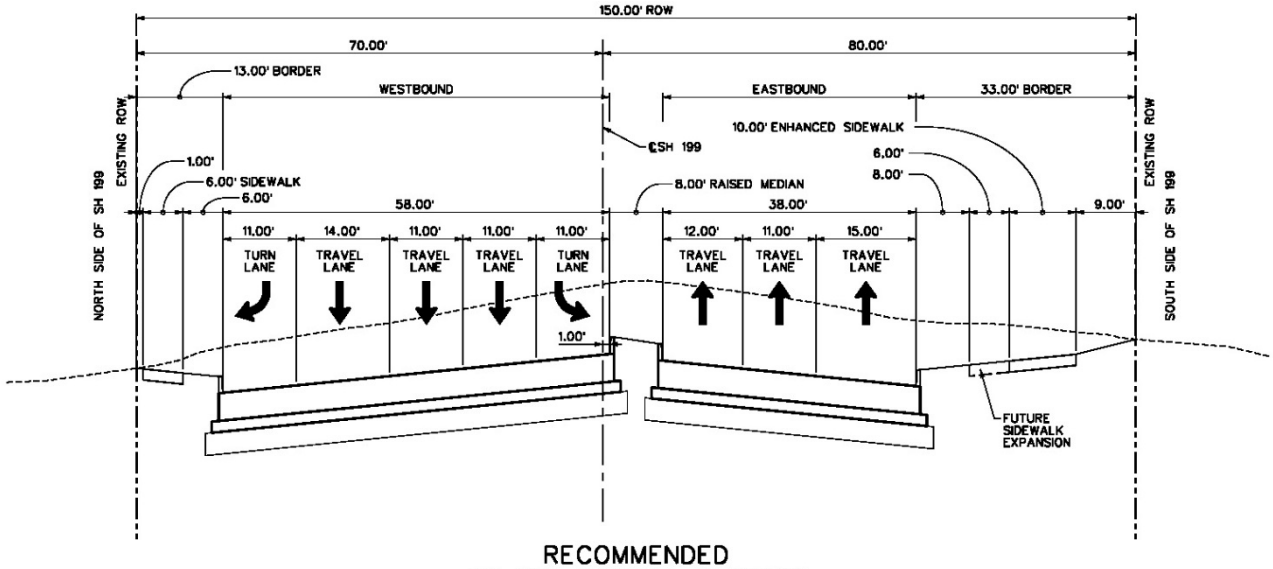
AT OLD MILL CREEK ROAD, ROBERTS CUT OFF ROAD, CORNER LANE, NORFLEET STREET, BIWAY STREET, BEVERLY HILLS DRIVE, CAPRI DRIVE, AND WALMART DRIVE



RECOMMENDED
SH 199 TYPICAL SECTION
6 LANES
150' ROW WIDTH

NOT TO SCALE

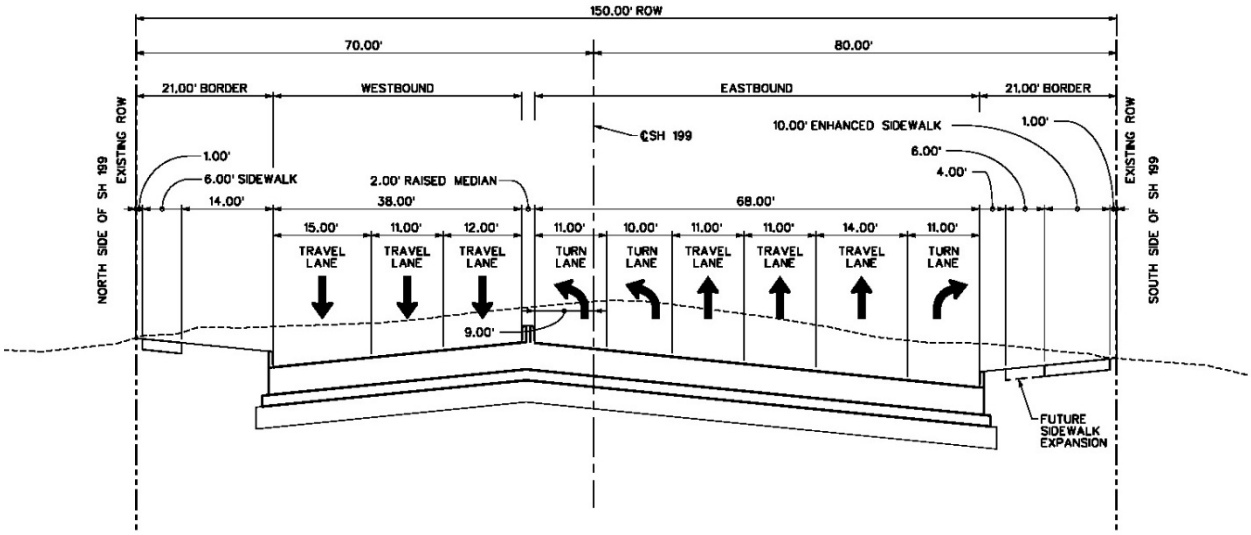
SECTION 1
FROM IH-820 TO OHIO GARDEN ROAD
EASTBOUND LEFT AND RIGHT TURN LANES
AT ROBERTS CUT OFF ROAD AND LONG AVENUE



RECOMMENDED
SH 199 TYPICAL SECTION
6 LANES
150' ROW WIDTH

NOT TO SCALE

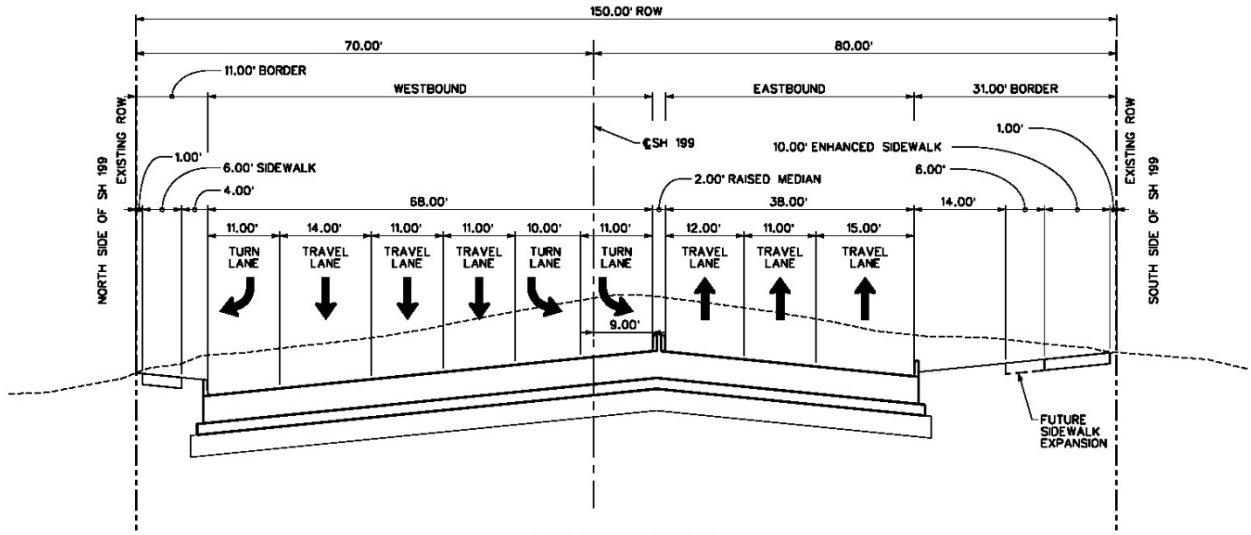
SECTION 1
FROM IH-820 TO OHIO GARDEN ROAD
WESTBOUND LEFT AND RIGHT TURN LANES
AT SKYLINE DRIVE AND LONG AVENUE



RECOMMENDED
SH 199 TYPICAL SECTION
6 LANES
150' ROW WIDTH

NOT TO SCALE

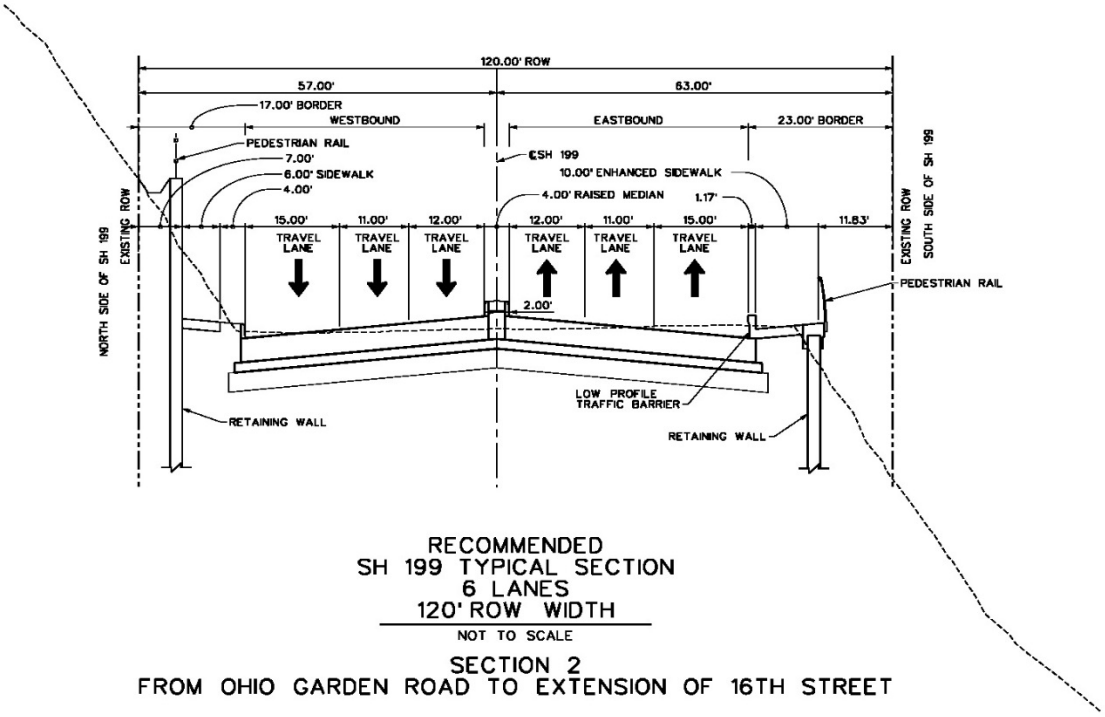
SECTION 1
FROM IH-820 TO OHIO GARDEN ROAD
EASTBOUND DUAL LEFT AND RIGHT TURN LANES
AT SH 183



RECOMMENDED
SH 199 TYPICAL SECTION
6 LANES
150' ROW WIDTH

NOT TO SCALE

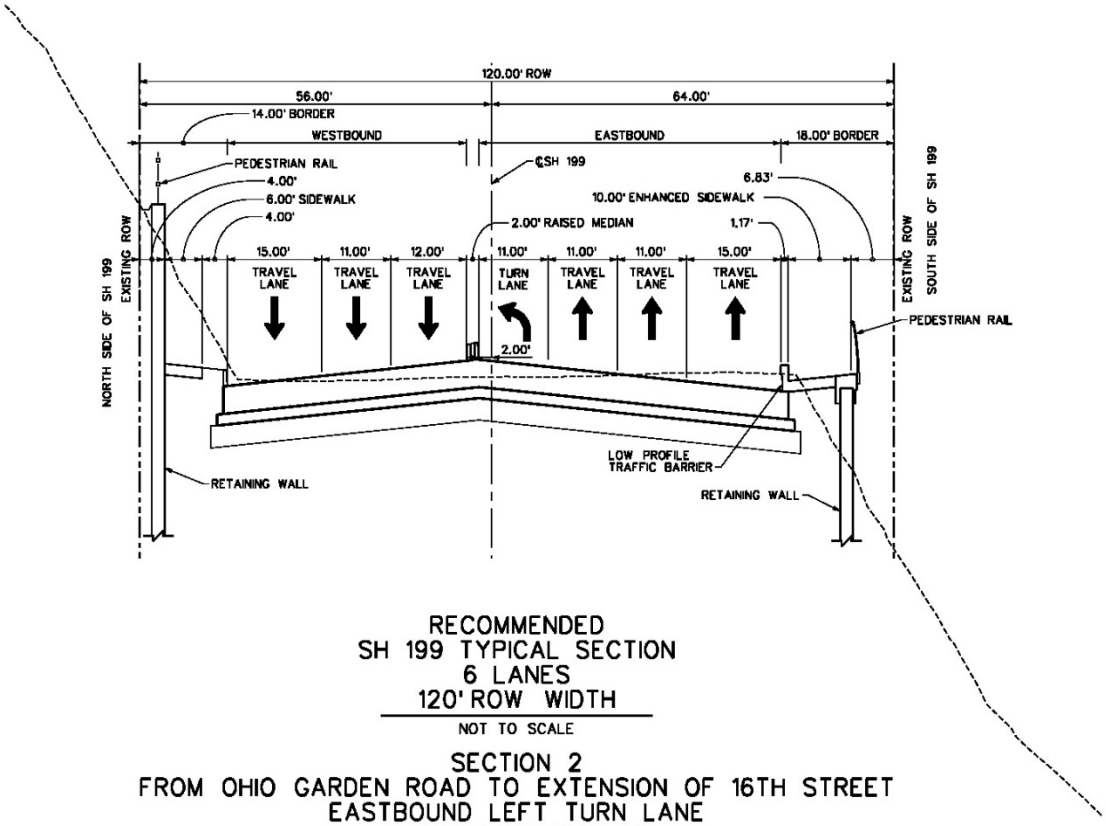
SECTION 1
FROM IH-820 TO OHIO GARDEN ROAD
WESTBOUND DUAL LEFT AND RIGHT TURN LANES
AT SH 183



RECOMMENDED
SH 199 TYPICAL SECTION
6 LANES
120' ROW WIDTH

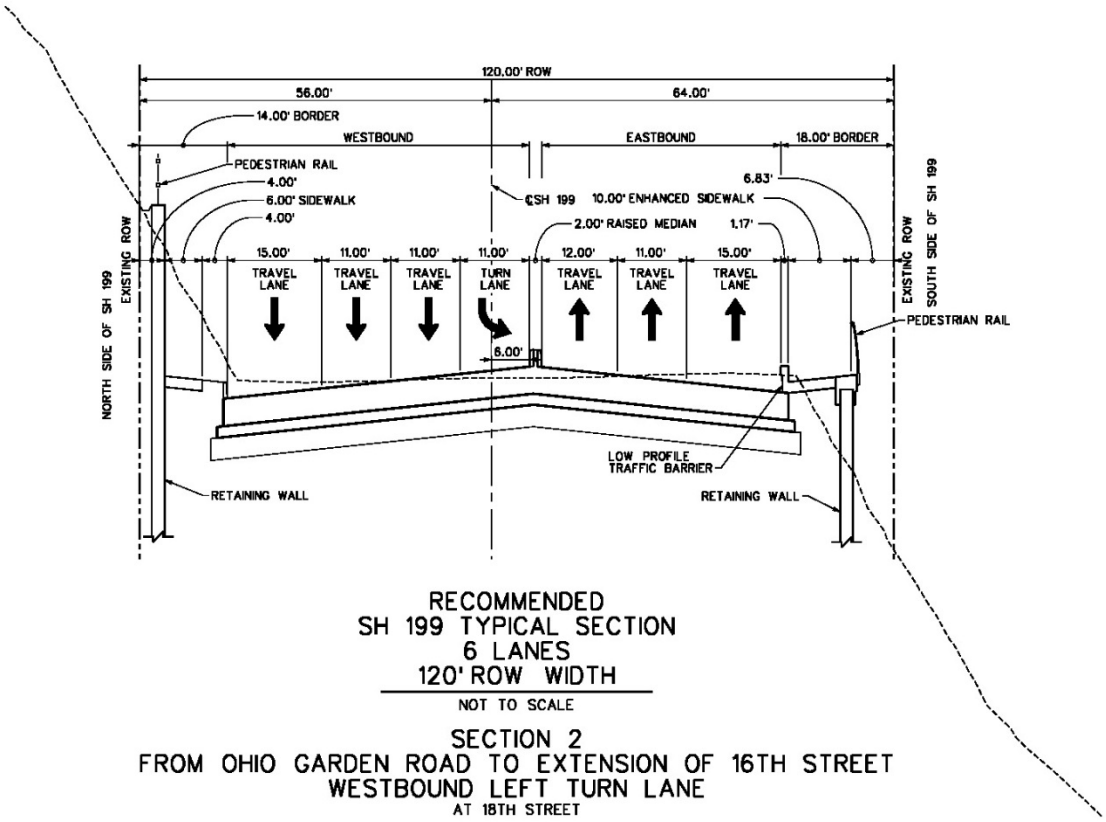
NOT TO SCALE

SECTION 2
FROM OHIO GARDEN ROAD TO EXTENSION OF 16TH STREET



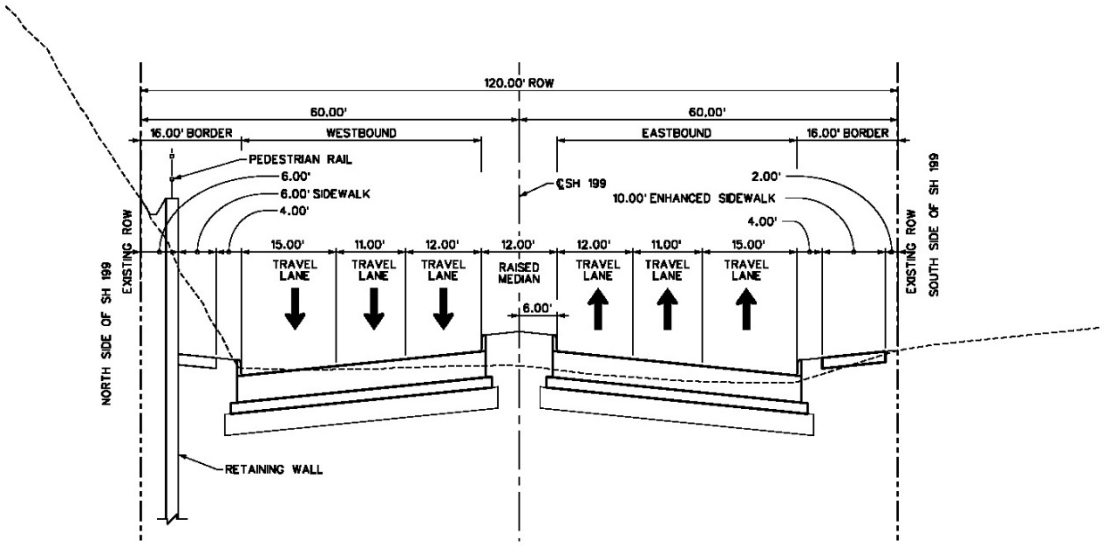
RECOMMENDED
SH 199 TYPICAL SECTION
6 LANES
120' ROW WIDTH
NOT TO SCALE

SECTION 2
FROM OHIO GARDEN ROAD TO EXTENSION OF 16TH STREET
EASTBOUND LEFT TURN LANE
AT 21ST STREET AND 18TH STREET



RECOMMENDED
SH 199 TYPICAL SECTION
6 LANES
120' ROW WIDTH
NOT TO SCALE

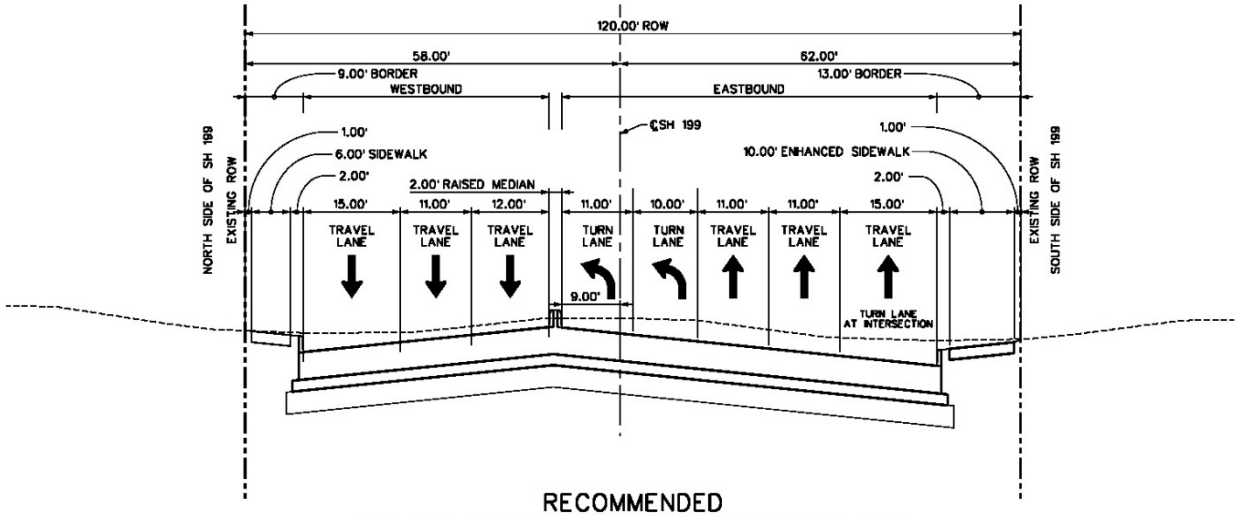
SECTION 2
FROM OHIO GARDEN ROAD TO EXTENSION OF 16TH STREET
WESTBOUND LEFT TURN LANE
AT 18TH STREET



RECOMMENDED
SH 199 TYPICAL SECTION
6 LANES
120' ROW WIDTH

NOT TO SCALE

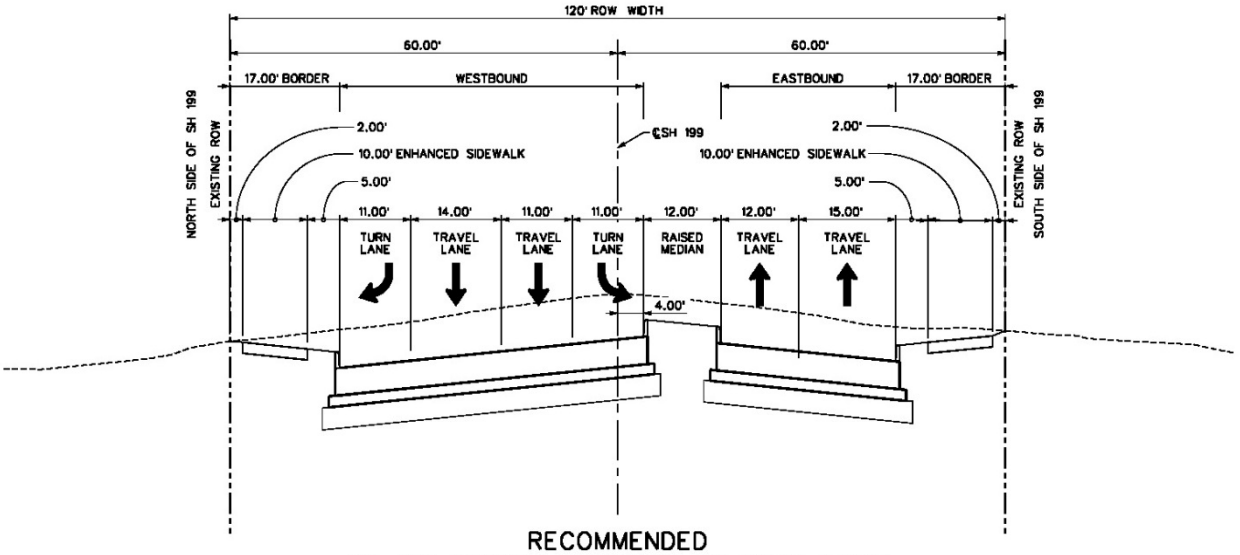
SECTION 3
FROM EXTENSION OF 16TH STREET TO UNIVERSITY DRIVE



RECOMMENDED
SH 199 TYPICAL SECTION AT TURN LANE
6 LANES
120' ROW WIDTH

NOT TO SCALE

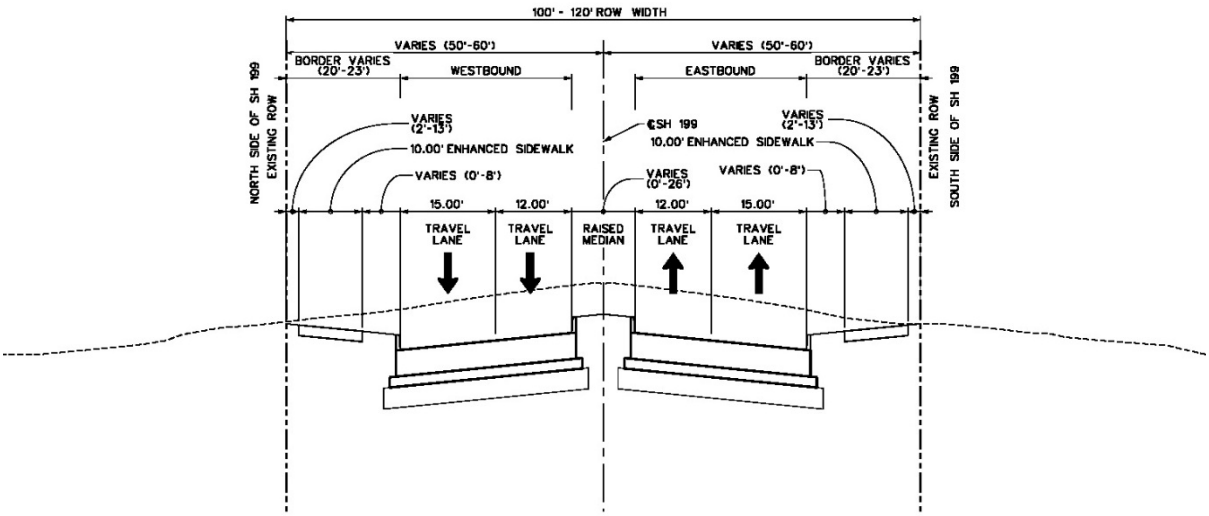
SECTION 3
FROM EXTENSION OF 16TH STREET TO UNIVERSITY DRIVE
EASTBOUND DUAL LEFT TURN LANES
AT UNIVERSITY DRIVE



RECOMMENDED
SH 199 TYPICAL SECTION AT TURN LANE
4 LANES
100'-120' ROW WIDTH

NOT TO SCALE

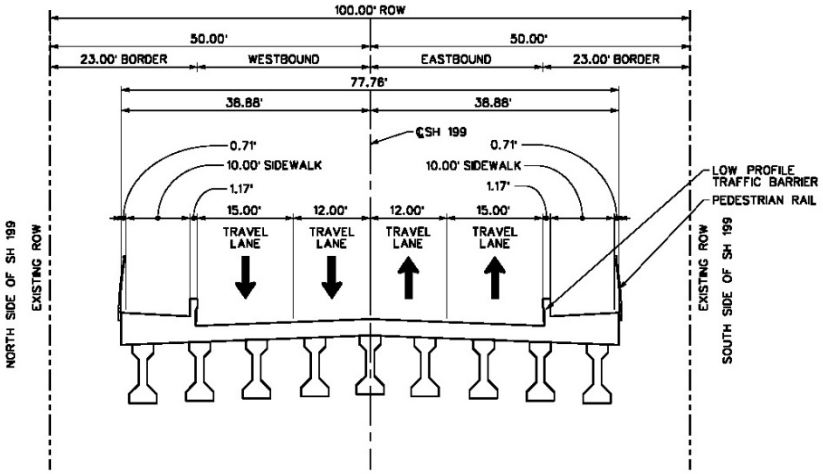
SECTION 3
FROM EXTENSION OF 16TH STREET TO UNIVERSITY DRIVE
WESTBOUND LEFT AND RIGHT TURN LANES
AT UNIVERSITY DRIVE



RECOMMENDED
SH 199 TYPICAL SECTION
4 LANES
100'-120' ROW WIDTH

NOT TO SCALE

SECTION 4
FROM UNIVERSITY DRIVE TO SHAMROCK AVENUE



RECOMMENDED
SH 199 TYPICAL SECTION
4 LANES
100' ROW WIDTH

NOT TO SCALE

SECTION 4
FROM UNIVERSITY DRIVE TO SHAMROCK AVENUE
BRIDGE AT WEST FORK TRINITY RIVER