July 2021

SOUTHERN DALLAS COUNTY TRANSIT STUDY

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Transit Planning Study Report

AECOM

ATG ALLIANCE TRANSPORTATION GROUP

K STRATEGIES

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SOUTHERN DALLAS COUNTY
Transit Planning Study Report

Prepared in cooperation with the Regional Transportation Council, NCTCOG, and the Texas Department of Transportation.

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Executive Summary

ES-1. Introduction

AECOM was tasked by North Central Texas Council of Governments (NCTCOG) to develop a transit planning study for the Southern Dallas County communities of Cedar Hill, DeSoto, Duncanville, Lancaster and the Southern Dallas Inland Port (Inland Port) area. Therefore, our study area for this project includes those four communities and the Inland Port area. The study focuses on the strategic implementation of transit and mobility services in a part of the North Texas region that has limited access to existing transit services. As a part of the study, this report includes recommendations for transit and mobility services over the next 20 years. The services are proposed to be implemented over three phases including Phase 1 (Years 1-5), Phase 2 (Years 6-10) and Phase 3 (Years 11-20).

Transit Existing Conditions and Needs Assessment

As shown in Figure ES-1, the study area includes the four city boundaries of Cedar Hill, DeSoto, Duncanville, and Lancaster, and the Inland Port boundary containing the cities of Hutchins and Wilmer. The cities are not currently member cities of Dallas Area Rapid Transit (DART), however STAR Transit provides limited fixed route and demand response coverage to the cities of DeSoto and Lancaster with connections to the DART Blue Line light rail service at the UNT Dallas Station. Additionally, the Inland Port boundary extends into the DART service area in the city of Dallas and has fixed route and demand response service.

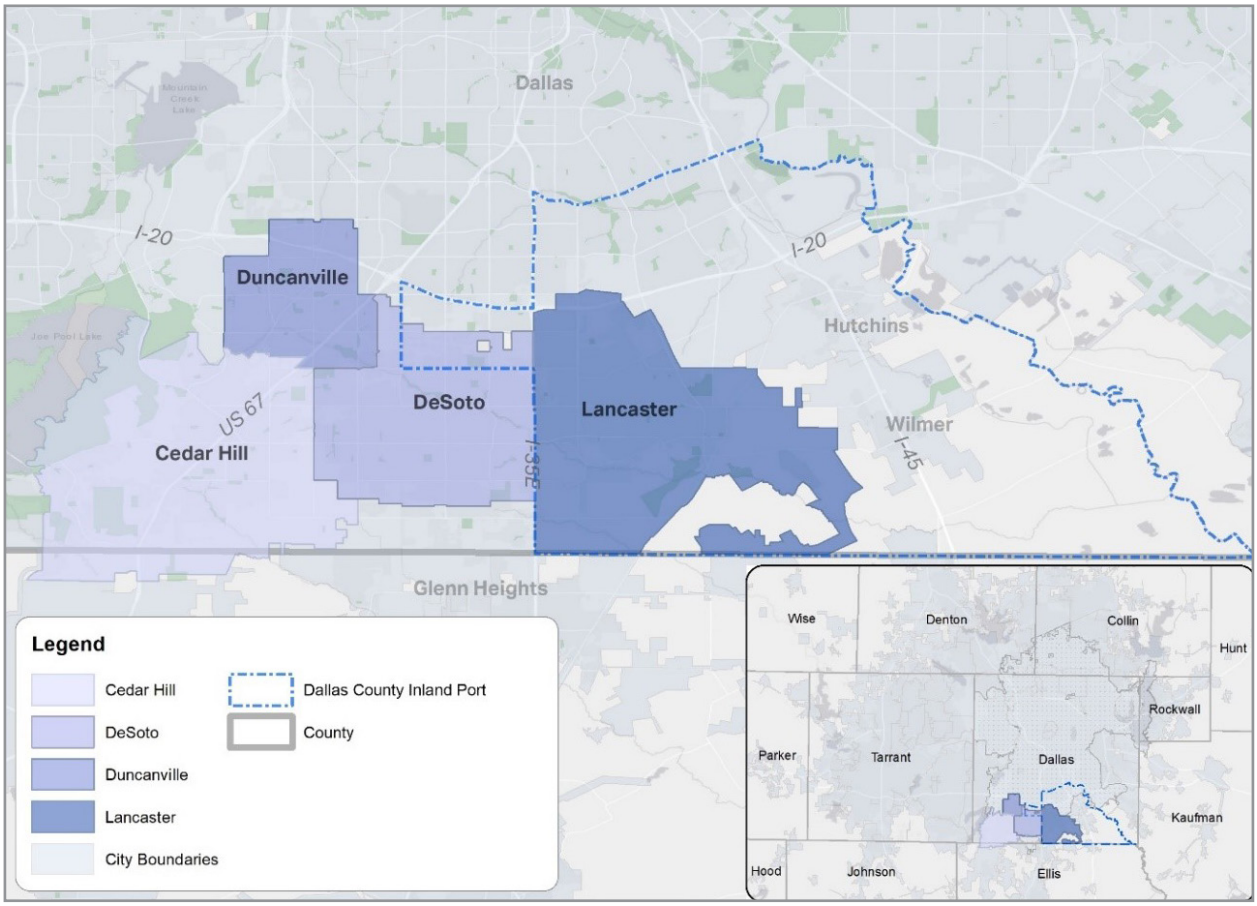


Figure ES-1: **Southern Dallas County Study Area** *Source: AECOM, 2020*

Data Analysis

A market analysis and a review of previous planning studies were completed for the study to provide detailed insight into the study area cities' demographic makeup, land use patterns, commuting patterns, and into potential transit needs for the study area.

Key Findings:

- The Document Review provided a qualitative lens touching on a variety of mobility topics in which to view planning efforts within the study area.
  - Overall findings identify that each city faces challenges related to land use regarding the potential for catalyst areas
  - Public transit consideration is found in nearly all of the reviewed comprehensive plans
  - East-west travel throughout the study area remains challenging
- Population, employment and transit dependent populations generally are found adjacent to or nearby the major arterials (I-20, US-67, I-35E) in the study area
- Overall a high number of trips are interlocal
- High numbers of trips with destinations in the study area originate within Dallas County, generally north of the study area
- Fixed routes for STAR Transit provide east-west travel to commercial and retail destinations
- Low population density within the study area may best be suited for on-demand transit services

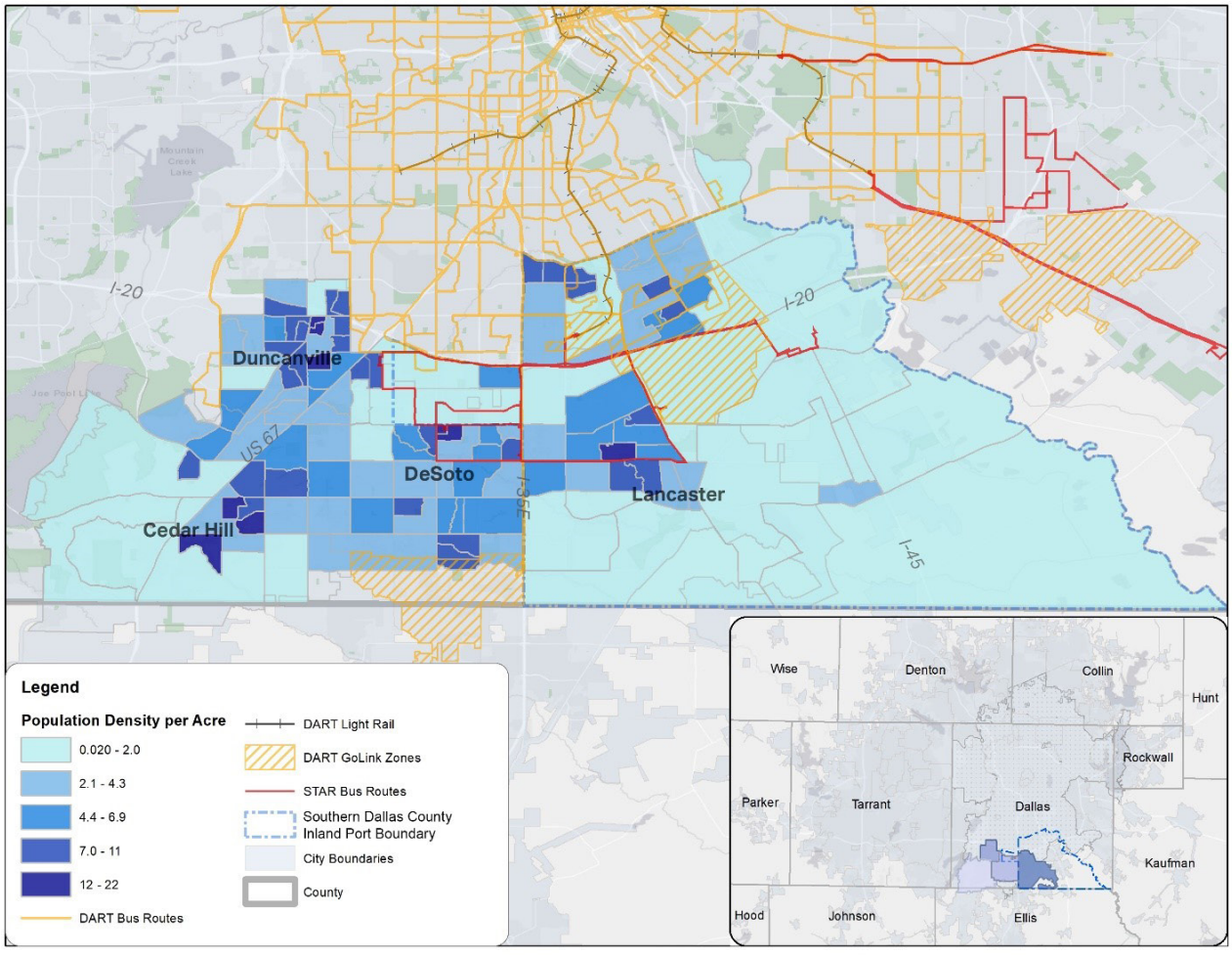


Figure ES-2: **Study Area Population Density** *Source: USCB ACS 2018 5-year estimates, NCTCOG, DART, STAR Transit*

Comprehensive Goods Movement Needs Assessment

Inland Port Market Analysis

Job Growth

Along with its nearly 93,000 residents, as of 2019, the Inland Port study area includes 33,900 total jobs, more than 15,000 of which are in the industrial and manufacturing sectors. In the past two decades, the area has seen a net increase of 15,300 new jobs – including more than 14,000 added since 2010.

The Inland Port is characterized by significant industrial, manufacturing, warehouse, distribution, and fulfilment center employment. Key major employers include Amazon, Taylor Communications, Walmart, FedEx, Proctor & Gamble, Kohl's, Home Depot, United Natural Foods, Shippers Warehouse, and Brass-craft.

Industry Trends

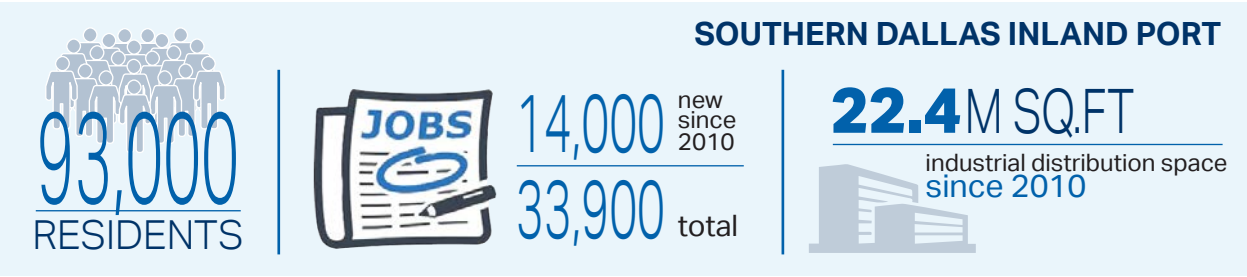
Of all industrial sector employment in the Inland Port, manufacturing, wholesale, transportation and warehousing, and e-commerce (i.e. Amazon fulfillment centers) make up close to half – or 46% - of total jobs. Manufacturing accounts for almost a quarter (23%) of all port employment, with Transportation and Warehousing accounting for 12% of all jobs.

Land Use

While the Dallas Central Appraisal District (DCAD) land use data indicates only 800 acres of land in the Inland Port area currently designated as "vacant industrial," there is significant land currently designated as agricultural – 26,500 acres, or about one-third of the total Inland Port land area. AECOM's GIS analysis indicates 26,625 of total vacant industrial and agricultural parcels greater than five acres.

Market and Real Estate

In addition to job growth, the Inland Port has seen rapid growth in industrial development and occupied square footage. Across the port, 70% of all Rentable Building Area (RBA) square footage (25 million square feet) was constructed between 2010 and 2019, and 90% of all square footage within the Inland Port area has been developed in the past two decades. Nearly all of the new industrial construction since 2010 has been distribution space – 22.4 of the total 25 million square feet of new construction between 2010 and 2019 was industrial distribution space.



Southern Dallas County Freight Analysis

In the past decade, the Inland Port has seen significant growth in industrial and manufacturing development, with corresponding impacts on job and real estate markets.

- 17% of all Dallas-Fort Worth CSA job growth between 2010 and 2019 occurred in the Inland Port. As of 2019, the Inland Port supported an estimated 33,900 total jobs, with roughly 15,200 in manufacturing, transportation and warehousing, wholesale, and e-commerce sectors.
- The Inland Port supports a total of 53 million square feet of industrial space and has added 35 million square feet of new industrial space since 2010, and 21.6 million square feet since 2015 alone – alongside a 3% reduction in vacancy. 90% of all industrial space in the Inland Port has been built after 2000, with 70% of all industrial buildings constructed in the last decade.
- Over the past ten years, the Inland Port study area has been adding industrial square footage at a higher rate than job growth.
- As of 2019, there are an additional 530 acres of proposed industrial development opportunities in the pipeline across the Inland Port, particularly alongside of I-45.
- COVID-19 has dramatically accelerated the shift to e-commerce, with US on-line sales growing from about 10% to 16% of total retail sales within a few months; this has also made clear the dependence of US consumers on foreign manufacturing locations. As a result, more manufacturing activity is expected to return to the US and Mexico in coming years, and locations such as the Inland Port would expect to compete for this activity.

Public Involvement

In coordination with the NCTCOG, public and stakeholder engagement was integral in developing a comprehensive and strategic public transportation plan for Southern Dallas County and the Best Southwest Partnership (BSWP) cities. This engagement and feedback, along with data research, helped formulate the specific goals and objectives that guided the study implementation plan. Due to COVID-19 constraints, public involvement flexibly adapted to these conditions and conducted outreach through virtual meetings and online participation. An overview of the public engagement activities is summarized in **Table ES-1**.

Project Advisory Committee (PAC)

The engagement with stakeholders was inclusive and collaborative, engaging a diverse audience including the four BSWP cities, the Inland Port TMA, DART, STAR Transit, railroad companies, and local freight associations. To guide the study and gather feedback from stakeholders, a Project Advisory Committee (PAC) was established, made up of technical staff, city and county staff, chambers, Inland Port representatives, railroads, transit operators, and other stakeholders.

The 45-member PAC met through live, virtual meetings at three milestones throughout the planning process: July 8, 2020, December 15, 2020, and April 28, 2021.

Public Meetings

Three public meetings were held during the study: September 24, 2020, February 4, 2021, and May 6, 2021. The live, online public meetings also had phone access to ensure equitable access for participation. Meetings were interactive with polling questions and opportunity to chat and verbally ask questions.

Online Public Survey

The online public survey was administered in December 2020 and January 2021 and received 240 total completions from residents and commuters across Southern Dallas County, which provided input that guided the development of the implementation plan.

Comments received from the PAC and public focused on the following:

- Regional transit connections to the Blue Line, Red Line and Red Bird Mall
- Transit impacts on traffic
- Analysis and modeling of data/funding options
- How to pay for transit service
- Service for seniors and vulnerable communities
- Focus service on workforce and education trips
- Supported routes that linked the cities and region
- Discussed need for last mile connections
- Transit

Meeting	Date	Attendees/ Responses
Project Advisory Committee Meeting	July 2020	26
Public Meeting	September 2020	65
Project Advisory Committee Meeting	December 2020	35
Online Survey	December 2020	240
Public Meeting	February 2021	74
Meeting with DeSoto	March 2021	n/a
Meeting with Cedar Hill	April 2021	n/a
Meeting with Duncanville	April 2021	n/a
Meeting with Lancaster	April 2021	n/a
Project Advisory Committee Meeting	April 2021	39
Public Meeting	May 2021	50

Table ES-1: **Public Outreach Overview**

ES-2. Scenario Development

Effective transit for the study area is not a one size fits all solution as transit markets throughout the area are inherently variable. The project team created a 'menu of options' to provide feasible service types for the various markets identified in the existing conditions analysis. Viable transit service delivery options were established by reviewing 'service type indicators', which include:

- population and employment density,
- transit need populations,
- adjacent land uses,
- existing roadway geometry, and
- connectivity to existing DART and STAR Transit services

A robust transit scenario analysis was performed on route and microtransit zone options. Both quantitative and qualitative methods were used to rank and prioritize each proposed service. As shown in **Figure ES-3**, a final preferred alternative was developed based on overall scores, near-term feasibility and the benefits to the communities.

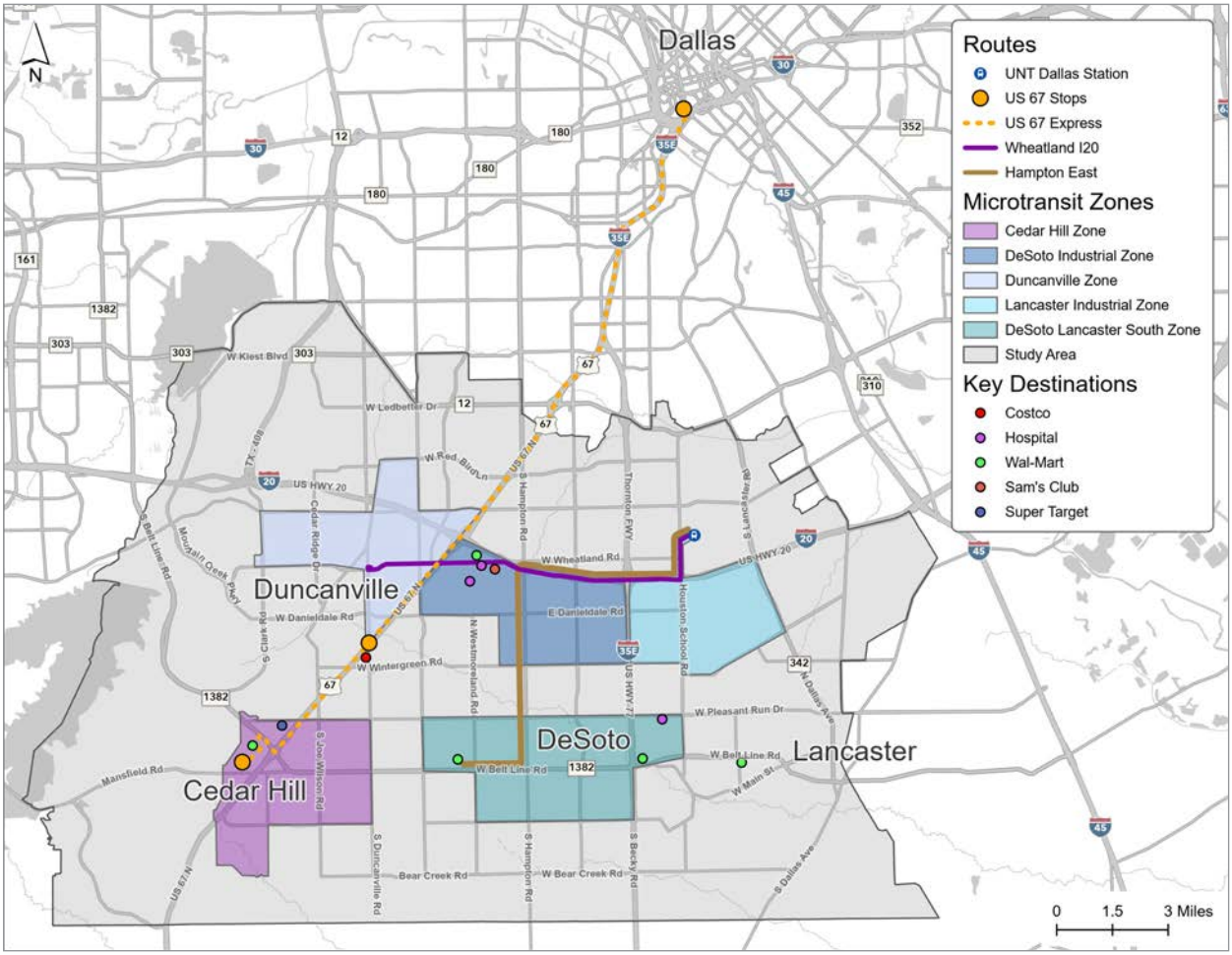


Figure ES-3: **Southern Dallas County Recommended Alternative** *Source: ATG*

Phased Implementation

The transit recommendations for this plan will begin with a strong core network of routes and microtransit zones that are a result of the technical analyses, prioritization process and public and staff input. This approach will allow for a phased, equitable, and sustainable implementation of transit service in the study area. This will allow the Cities and NCTCOG to evaluate service after Phase 1 and use valuable data to inform and finalize Phase 2 recommendations.

Phase 1 (1-5 Years)

The final recommendations of the prioritization process represent the first phase the implementation process for the Southern Dallas County Transit Plan.

Phase 1 will build the foundation of transit service in the area. The goal of this phase is to provide transit service that connects directly to regional transit nodes from each of the four cities. In addition, microtransit zones are proposed in each city to provide local circulation and lifeline service for vulnerable communities such as seniors.

Phase 2 (5-10 Years)

Phase 2 focuses on reinvesting in the core service of Phase 1 and expanding coverage through the addition of a new fixed route and microtransit zone. Phase 2 recommendations should be reevaluated prior to implementation, using data from Phase 1 service to understand how the community is using the new transit service. The following metrics should be evaluated to inform and prioritize Phase 2 recommendations: ridership, travel patterns, cost, and on-time performance.

Phase 3 (11 – 20 Years)

Phase 3 is a long-range service plan that includes targeted zones for future transit service between years 11 and 20 of the plan. The goal of Phase 3 is to further improve the system by extending service to new growth markets including planned passenger rail stations in Cedar Hill and Duncanville. In addition, Phase 3 includes new transit service to future employment growth in the Inland Port area in the cities of Lancaster and DeSoto.

ES-3. Financial Plan

Based on the financial analysis the estimated operations cost for the recommended transit service would be $1.29M for Phase 1 and $2.12M for Phase 2.

The 10-year financial plan presents these costs alongside typically available revenue sources and identifies additional revenue needed to fund the project. A variety of non-traditional revenue options (e.g. value capture, fees, taxes) were assessed to determine their potential for generating additional revenue for transportation and infrastructure projects.

Table ES-2 presents a 10-year financial plan for the recommended Phase 1 and Phase 2 transit services. It is assumed that Phase 1 capital improvements and service costs would start in 2023. Capital improvements for Phase 2 could occur in 2026 with additional service costs starting in 2027. All costs and revenues include a 3% annual escalation compared to the 2021 estimates described in Sections 3.1 and 3.2 and are rounded to the nearest $1,000 (YOE).

It is anticipated that Federal revenues could support approximately 50% of annual costs.

Year	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Existing Service Costs	$(139)	$(143)	$-	$-	$-	$-	$-	$-	$-	$-
Infrastructure Costs	$-	$-	$(58)	$-	$-	$(56)	$-	$-	$-	$-
New Service Costs	$-	$-	$(1,229)	$(1,266)	$(1,304)	$(1,343)	$(2,121)	$(2,184)	$(2,250)	$(2,317)
Total Cost of Service	**$(139)**	**$(143)**	**$(1,287)**	**$(1,266)**	**$(1,304)**	**$(1,398)**	**$(2,121)**	**$(2,184)**	**$(2,250)**	**$(2,317)**
Federal Revenue [1]	$-	$-	$661	$633	$652	$716	$1,060	$1,092	$1,125	$1,159
Advertising Revenue [2]	$-	$-	$5	$11	$11	$12	$12	$12	$13	$13
Transportation Dev. Credits [3]	$-	$-	$9	$-	$-	$9	$-	$-	$-	$-
Cedar Hill Local Share	$-	$-	$100	$100	$103	$107	$132	$136	$140	$145
DeSoto Existing Budget [4]	$139	$143	$147	$152	$156	$161	$166	$171	$176	$181
DeSoto Additional Share	$-	$-	$46	$46	$47	$50	$104	$107	$110	$114
Duncanville Local Share	$-	$-	$159	$160	$165	$170	$241	$248	$256	$263
Lancaster Local Share	$-	$-	$159	$164	$169	$174	$405	$417	$430	$443
Total Revenue	**$139**	**$143**	**$1,287**	**$1,266**	**$1,304**	**$1,398**	**$2,121**	**$2,184**	**$2,250**	**$2,317**

Table ES-2: **10-Year Financial Plan** (Thousands $)

[1] *Assumes 80% federal match for capital and 50% match for service costs*
[2] *Assumes $500 ad sales per month less 20% marketing and maintenance, x 6 months in 2023 and x 12 months thereafter*
[3] *Pending Confirmation of available amounts, assumes 20% of Federal share*
[4] *Assumes city of DeSoto's current budget for existing transit services would be reallocated for proposed services*

ES-4. Freight and Goods Movement Plan

The Inland Port has seen rapid and significant growth - gaining jobs at a faster rate than that of Dallas County, the Dallas-Fort Worth Metro Area, and the US. Over the past decade, 17% of all job growth in the Dallas-Fort Worth Metro Area occurred in the Inland Port.

If the historic pace of growth continues, the Inland Port activity is poised to more than double over the next 10 years, with the potential to see more than 100 million square feet of new industrial development.

Infrastructure Recommendations

Analysis of existing truck traffic over the past five years shows a handful of key Inland Port intersections are approaching thresholds where capacity concerns would become apparent. Experience suggests that intersections where more than 10-15% of all existing traffic comes from trucks, begin to warrant significant increases in congestion, and drive improvements to support growing truck volumes.

Roads and intersections currently fielding maximum truck traffic must be sized to deal with growing demand for the movement of goods and workers in and out of the area.

Broadly, recommendations for Inland Port road infrastructure are intended to ensure that the area is prepared to accommodate continued growth in truck volumes.

Side street improvements will be particularly important in areas where planned developments are already in the pipeline. The types of infrastructure projects to ensure the Inland Port remains competitive, and estimated costs,[1] include:

Focus Area	Details	Est. Cost	Priority
Local Roads	Tactical improvements to aging, outdated local roads near warehousing/distribution centers	$120-200 per linear foot	Near-Term
Stoplights / Signal Timing	Signal timing in response to changing truck volumes along primary arterials (i.e. ITS)	$600,000 per full inter-section	Medium-Term
Interstate Interchanges	New and updated interchanges and reevaluation of the condition, status and capacity of frontage roads on either side	$3-4 million for full interchange (including exits, bridges, signals)	Long-Term

Table ES-3: **Future Inland Port Focus Areas** *Source: CoStar, AECOM*

ES-5. Implementation Plan

This section discusses the steps that cities should take to implement the recommendations of the plan and the sequence in which they need to be done. Since implementation dates have not been selected, this section generally describes key tasks through years and phases of the project.

[1] *Cost estimates provided by AECOM. Estimates are for materials only and do not include anticipated labor costs*

Table ES-4 presents a summary of the key implementation milestones and a suggested schedule for implementation. The schedule is set up to provide detailed plans for the first five years and more general recommendations for outer years of the planning horizon. The schedule is flexible and can be implemented starting at a later date.

Time Period	Implementation Milestones	
Year 1 – August 2021-November 2021: Contracting and System Start-up	• Designate a staff representative from each city to coordinate transit planning • Develop a transit steering committee for the four cities to coordinate planning effort • Present Plan for adoption to city councils • Meet with potential bus operations contractors • Engage businesses for funding partnerships through public private partnerships • Coordinate funding for plan between cities and NCTCOG • Maintain existing STAR Transit service until new services begin • Set system start-up date and schedule	• Establish fare program for the service • Cities and bus contractor enter into an agreement • Develop Capital Plan • Procure bus stop amenities – stops, benches, and shelters • Initiate marketing campaign to promote new service. • Cities coordinate outreach to the public about service and implementation date • Road test all routes • Begin bus stop placement • Coordinate service with Inland Port TMA service • Begin service
Year 2 – 2022 – Implementation and Monitoring Service	• Develop method for collecting feedback from clients – customer comments should be documented by contractor for analysis by the cities • Assess microtransit zone ridership activity to determine if boundaries should be updated • Update service based on development of new transit generators including high density residential, large shopping centers, and new employers. Assess changes to fixed route service with relation to ADA and paratransit requirements	• If service changes are needed, prepare Title VI review to ensure that the level and quality of fixed-route and demand-response services are provided in a non-discriminatory manner • Update and establish regular procedures for maintaining system goals, objectives, and strategies based on first six months of service • Track service data for service standards • Begin to plan a mobility hub plan based ridership activity
Year 3 – 2023	• Conduct on-board counts and rider survey. Travel patterns and utilization by passengers should be established by then	• Assess service for potential service improvements or changes for implementation
Year 4 – 2024	• Continue to monitor service • Make adjustments to routes based on	demand including updates to frequency, service hours, routing and zones
Year 5 – 2025	• Assess Phase 2 implementation based on needs and budget	• Assess financial plan and funding opportunities to implement Phase 2
Years 6-10	• Continue to monitor service and make adjustments as needed • Coordinate implementation with service contractor	• Develop a schedule for implementation of Phase 2 • Develop a marketing plan • Implement Phase 2 recommendations • Market new service
Years 11-20	• Continue to monitor service and make adjustments as needed • Assess growth and development in the four cities and need for new services • Assess the expansion of high capacity transit in the study area	• If regional rail is extended to area, begin developing service plan to connect into stations. This can include new microtransit zones or fixed routes that feed into the rail service

Table-ES-4: **Key Implementation Milestones**

1. Introduction

AECOM was tasked by North Central Texas Council of Governments (NCTCOG) to develop a transit planning study for the Southern Dallas County communities of Cedar Hill, DeSoto, Duncanville, Lancaster and the Southern Dallas Inland Port (Inland Port) area. Therefore, our study area for this project includes those four communities and the Inland Port area. The study focuses on the strategic implementation of transit and mobility services in a part of the North Texas region that has limited access to existing transit services. As a part of the study, this report includes recommendations for transit and mobility services over the next 20 years. The services are proposed to be implemented over three phases including Phase 1 (Years 1-5), Phase 2 (Years 6-10) and Phase 3 (Years 11-20).

The proposed service scenarios focus on developing a foundation of equitable transit services that provide service within the study area and connections to the regional transit network. The routes were developed to provide direct, efficient service and to fit each community's mobility needs. To that end the recommendations include a combination of service delivery options including microtransit, fixed route and express services.

In addition, the project includes an evaluation of goods movement and freight services within the Inland Port area. This report provides recommendations for infrastructure improvements needed to accommodate the rapid growth in the Inland Port.

Report Structure

This report is structured in six chapters:

Chapter 1 - Introduction: This chapter is divided into four subsections. **Section 1.1** presents a discussion of the market analysis and overview of the four cities within the study area. The chapter presents information including travel patterns, transit dependency analysis and existing transit services provided by STAR Transit and DART. **Section 1.2** provides an overview of the existing freight and goods movement in the Southern Dallas Inland Port. The section identifies demographic and employment trends in the area. **Section 1.3** provides a summary of the public involvement for the project. The section documents the input received by the public and stakeholders through meetings with the Project Advisory Committee and the general public. **Section 1.4** outlines the key transit needs in the study area based on the technical analysis and the public input.

Chapter 2 – Scenario Recommendations: This chapter provides an overview of the scenario evaluation process and proposes a recommended transit service scenario that includes fixed-route, microtransit and express service. Transit service is proposed to be implemented in three phases over the 20-year planning horizon.

Chapter 3 – Financial Plan: Presents the operating costs and potential revenue sources for the three phases of transit service recommendations.

Chapter 4 – Freight and Goods Movement Plan: Provides an analysis of the future growth in the Inland Port area and the impacts it will have on transportation and infrastructure.

Chapter 5 – Future Mobility Enhancements: Focuses on future mobility enhancements that could complement and enhance the transit services. The chapter presents information related to emerging technologies such as connected and automated vehicles, Mobility as a Service (MaaS) and mobility hubs.

Chapter 6 – Implementation Plan: Provides information and steps that the cities can take to implement the recommendations of the plan.

1.1. Transit Existing Conditions and Needs Assessment

1.1.1. Study Area

As shown in Figure 1-1, the study area includes the four city boundaries of Cedar Hill, DeSoto, Duncanville, and Lancaster, and the Inland Port boundary containing the cities of Hutchins and Wilmer. The cities are not currently member cities of Dallas Area Rapid Transit (DART), however STAR Transit provides limited fixed route and demand response coverage to the cities of DeSoto and Lancaster with connections to the DART Blue Line light rail service at the UNT Dallas Station. Additionally, the Inland Port boundary extends into the DART service area in the city of Dallas and has fixed route and demand response service.

1.1.2. Data Analysis

A market analysis and a review of previous planning studies were completed for the study to provide detailed insight into the study area cities' demographic makeup, land use patterns, commuting patterns, and into potential transit needs for the study area. The assessment was conducted using data from the US Census Bureau (USCB) American Community Survey (ACS) 2018 5-year estimates and location based services data, LOCUS. Additional data has been sourced from NCTCOG related to employers, land use, and mobility.

Information gathered from the Document Review was also utilized for a qualitative assessment of potential need in the study area, particularly the Inland Port area. The following subsections provide an assessment and key takeaways for the demographic topics studied.

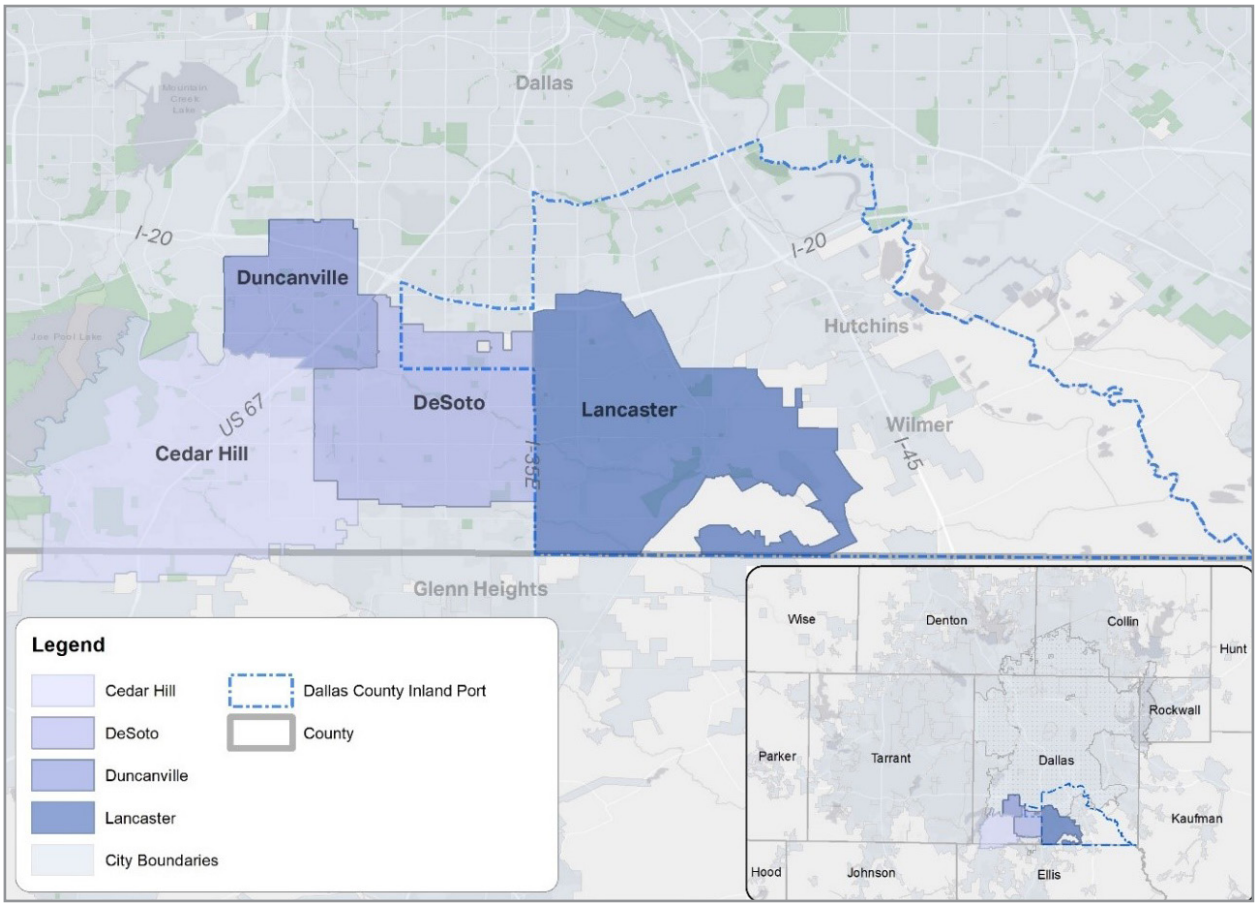


Figure 1-1: **Southern Dallas County Study Area** *Source: AECOM, 2020*

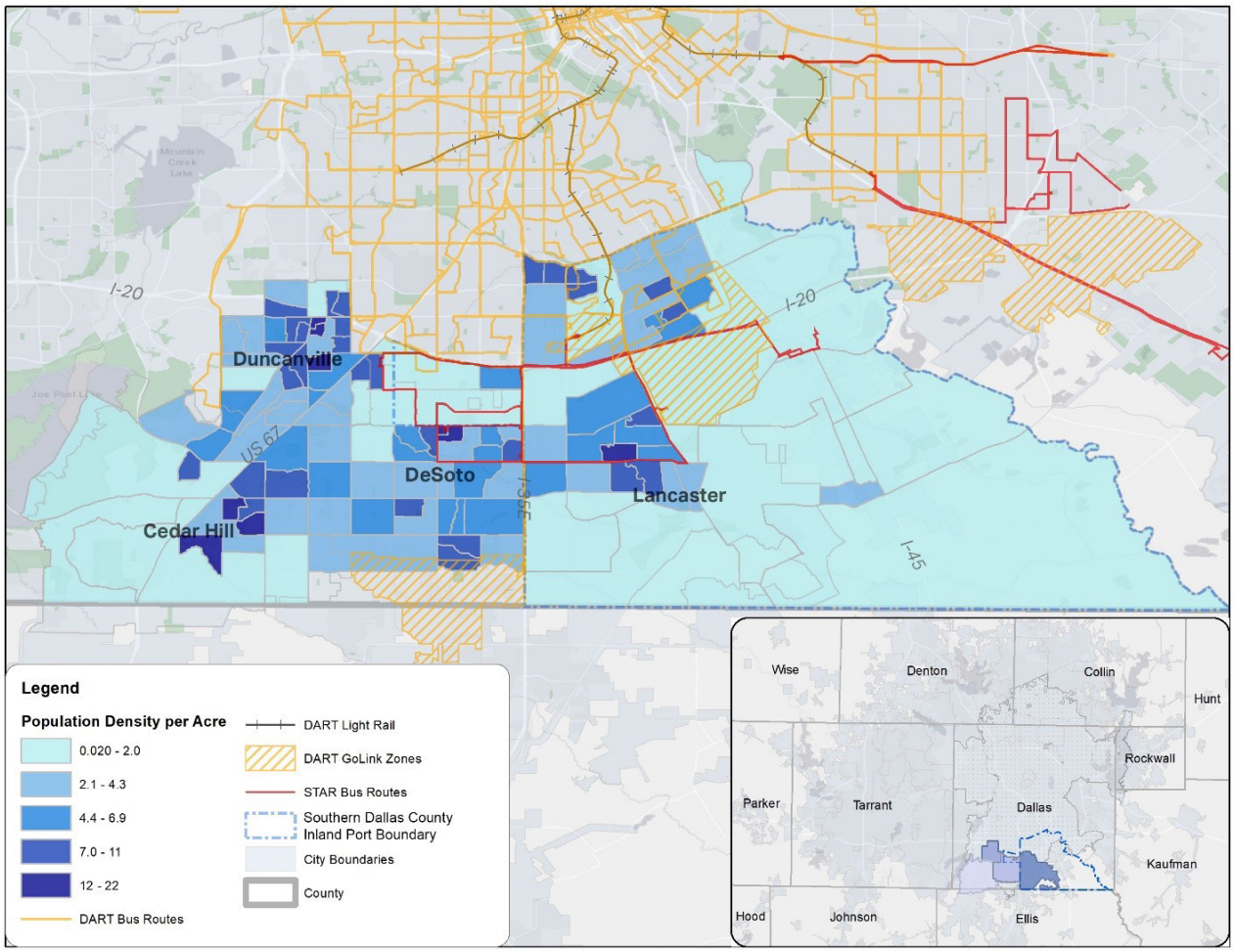


Figure 1-2: **Study Area Population Density** *Source: USCB ACS 2018 5-year estimates, NCTCOG, DART, STAR Transit*

Population Characteristics

This section provides information related to demographic characteristics of the study area, which include population density, employment types and density, transit-dependency, and commuting trends. These demographic categories are important to the study to identify potential higher density populations and jobs which could support various types of transit modes.

Population Density

Population data was mapped geographically at a block group level to identify density per acre. **Figure 1-2** displays darker shaded regions where a higher density was calculated.

The highest density areas range from 12 to 22 persons per acre and are near geographic centers of each city in the study area. These locations tend to align with major transportation infrastructure such as I-35E in DeSoto and Lancaster, and US-67 in Cedar Hill and Duncanville. Notably, the Inland Port area has the lowest population density with two or less persons per acre for large tracts of land.

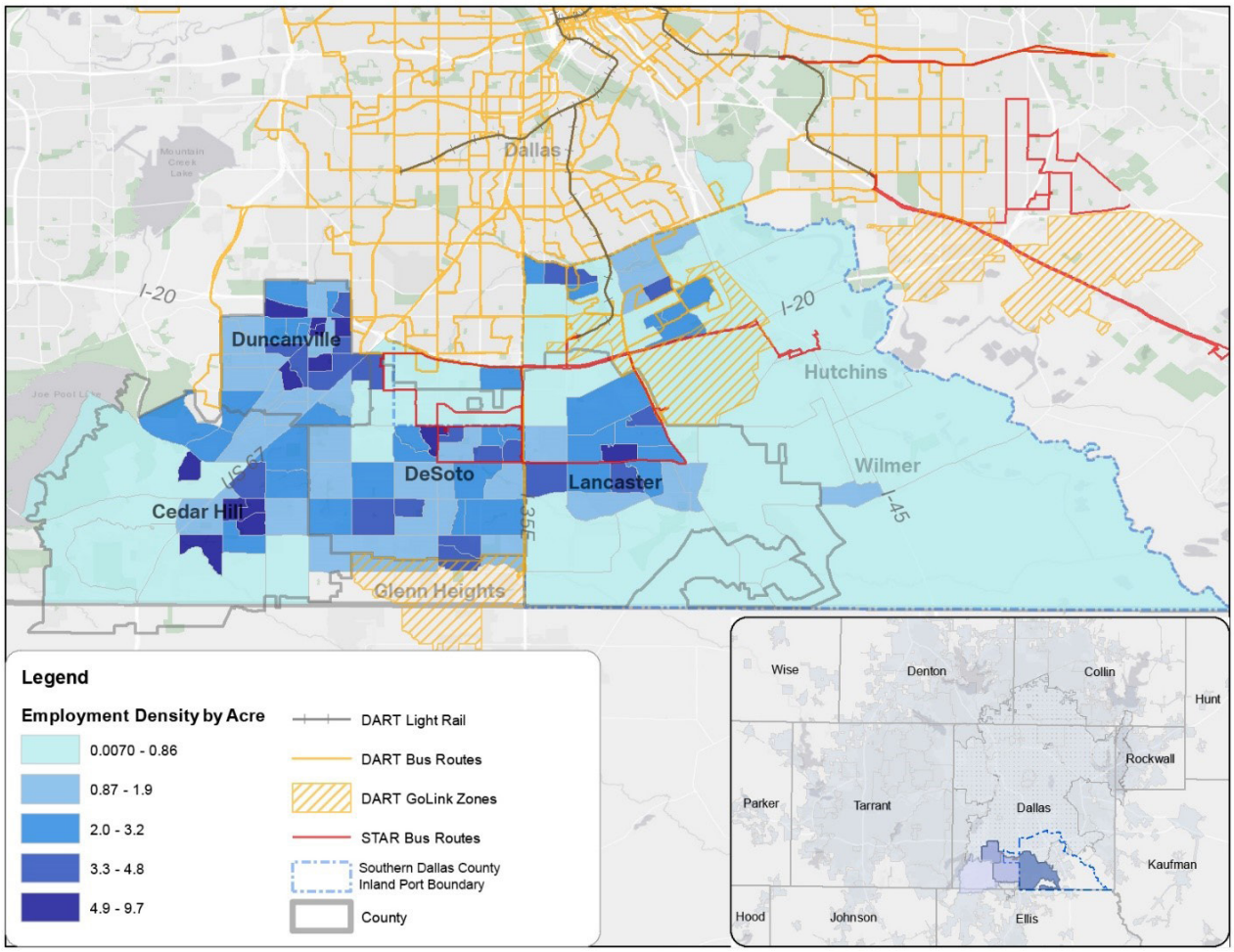


Figure 1-3: **Study Area Employment Density** *Source: USCB ACS 2018 5-year estimates, NCTCOG, DART, STAR Transit*

Employment Density

Transit often serves as a primary transportation option for commuting to work. **Figure 1-3** shows employment densities within the study area using employment status information from the USCB.

Highest employment block groups are shown in similar areas to locations of high population density. Duncanville, DeSoto, and Lancaster have pockets of high employment density areas adjacent to existing transit routes. Employment densities in the Inland Port are generally low, however there are a number of larger employers spread out throughout the area.

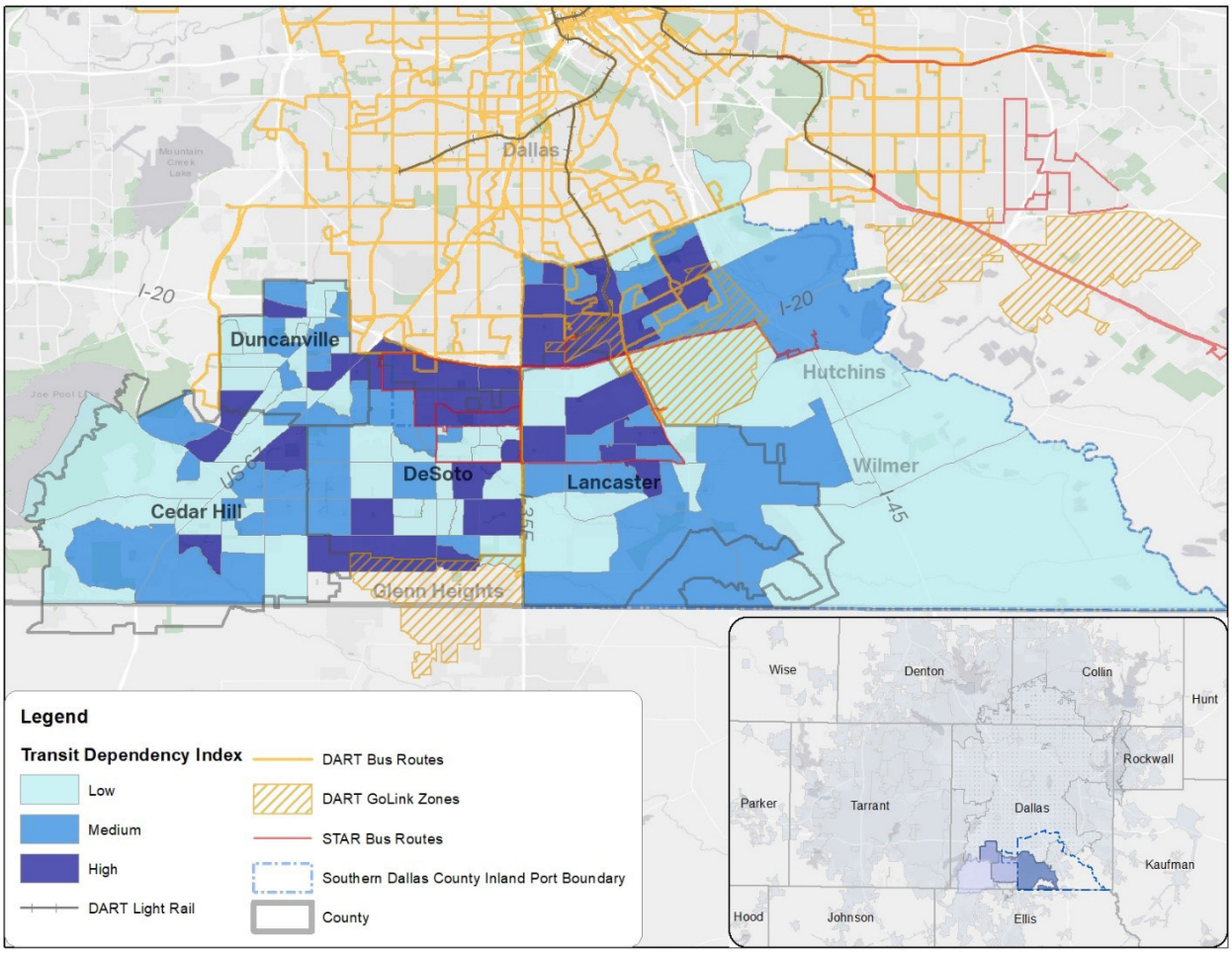


Figure 1-4: **Transit Dependency Index** *Source: USCB ACS 2018 5-year estimates, NCTCOG, DART, STAR Transit*

Transit Dependency Index

The transit depedency index map is a composite of five datasets from the USCB including: Households without access to a vehicle, persons with disabilities, low-income, youth population (under 18 years of age), and elderly populations (over 65 years of age). Information is overlayed and mapped at a block group level and then scored to identify areas where transit service and access may be an individual's primary form of transportation. **Figure 1-4** displays the results of the overlaid information.

From low to high, the index displays the presence of populations with a higher propensity for transit need. The highest needs appear in the northern sections of DeSoto and in parts of south Dallas between I-35E and I-45, and north of the city of Lancaster. Existing transit service from DART and STAR Transit are provided or adjacent to some of these areas of need. However, in the southern areas of the study area and in the cities of Cedar Hill and Duncanville with higher transit dependency there is no available transit service.

Commuting and Travel Characteristics within the Study Area

This section provides an analysis of travel characteristics and travel patterns within the study area. The analysis looks at commute times identified from USCB and travel patterns using location based data sources.

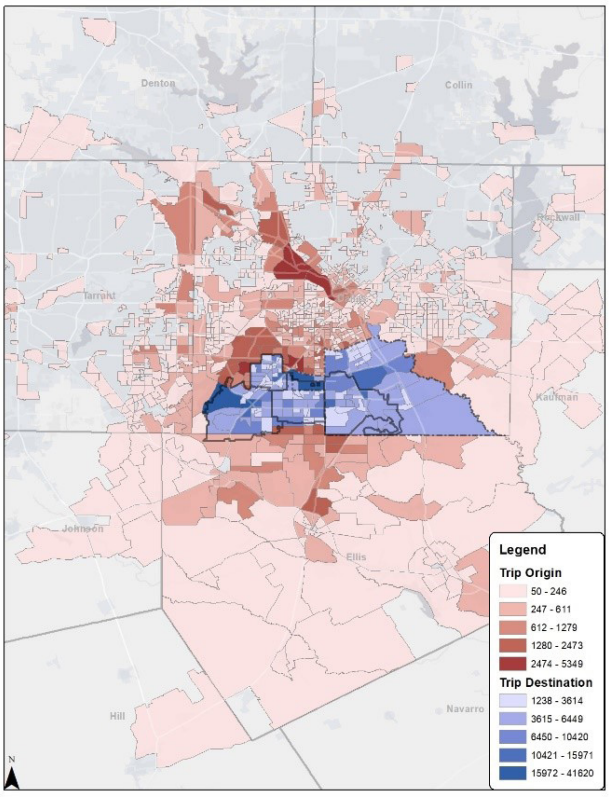
Travel Patterns and Travel Demand Model Assessment

The section provides an overview of location-based data collected from the entire study area and narrowing down to each individual city. The location-based data is calculated from anonymous location-based services data typically sourced and anonymized from mobile devices.

Southern Dallas County Study Area

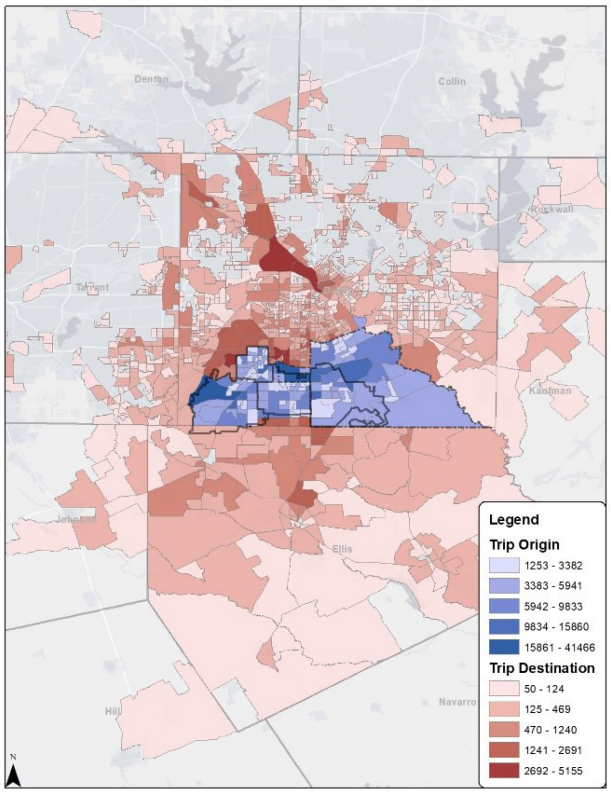
Beginning with the location based dataset for the Southern Dallas County area, **Figures 1-5** and **1-6** show weekday trip patterns with origins beginning both from inside and outside of the study area, respectively. Data used to create these maps estimates weekday travel based on trends in data collected in 2019. Notably, trip origins begin and end in many locations in adjacent counties. As shown in **Figure 1-5**, high trip origins were seen adjacent to the study area near Duncanville and DeSoto, in the medical district in north Dallas, and the city of Irving area. Other large trip originators are DFW International Airport and locations in northern Ellis County.

Figure 1-6 shows trips originating in the study area block groups with destinations outside of the study area. This map is very similar to **Figure 1-5**, with notably more trips ending in northern Ellis County. Potential return trips occur in Dallas as well as just north of the study area.



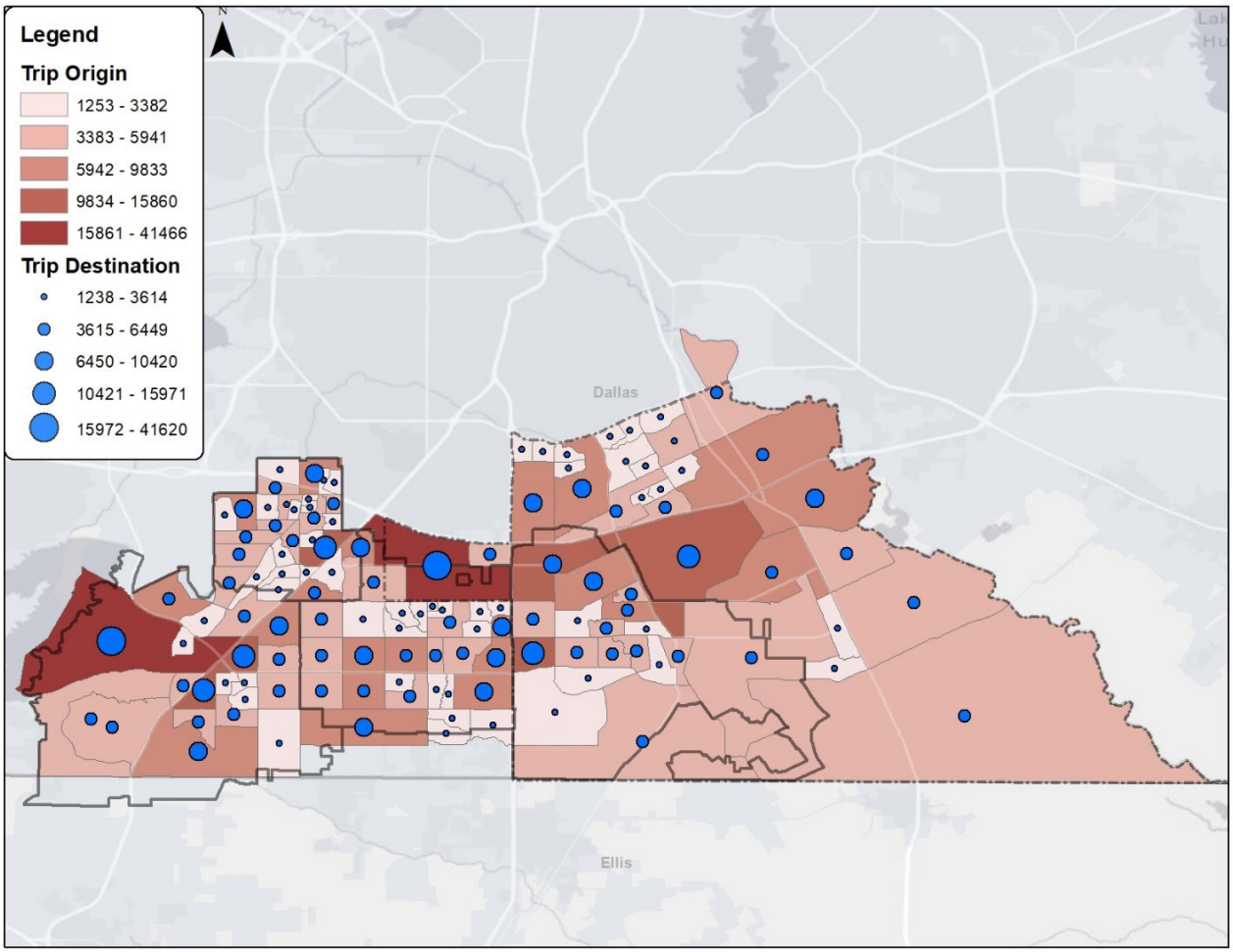
Source: Cambridge Systematics LOCUS Data, 2020

Figure 1-5: **Travel Patterns for Weekday Trips with Origins Outside the Study Area**



Source: Cambridge Systematics LOCUS Data, 2020

Figure 1-6: **Travel Patterns for Weekday Trips with Origins Within the Study Area**



Source: Cambridge Systematics LOCUS Data, 2020

Figure 1-7: **Travel Patterns for Weekday Trips with Origins and Destinations in the Study Area**

Travel patterns observed in **Figure 1-7** occur entirely within the study area. In most cases, locations with high trip origins are also locations with high destinations. Notably fewer trips travel to the southeastern portions of the study area. Overall, high numbers of origins and destinations occur in Cedar Hill, DeSoto, along the I-35E corridor and within the Inland Port area and nearby Cedar Valley College, which is served by DART Route 555 and links to the DART Blue Line Camp Widsom Station.

1.1.3. Existing Transit Services

Dallas Area Rapid Transit

DART provides 15 bus routes and one light rail line into the cities within the study area and the Inland Port boundary. However, cities in and adjacent to the Inland Port are not within DART's service area (Cedar Hill, DeSoto, Duncanville, and Lancaster). The majority of bus routes are crosstown or local bus routes. There are two express routes providing service into downtown Dallas from the city of Glenn Heights and from the Red Bird Transit Center in southern Dallas.

GoLink

In the Inland Port area, DART provides an on-demand transit service in partnership with UberPool that offers integration with DART Light Rail and local bus service. GoLink is provided with a regular DART fare at no additional cost and provides curb-to-curb transportation service.

STAR Transit

Routes 401 & 501

STAR Transit Routes 401 and 501 serve the Southern Dallas County study area with fixed route service to the cities of DeSoto and Lancaster. Major connections are provided at The Crossing Shopping Center, Methodist Charlton Medical Center and the DART Blue Line UNT Dallas Station. Service operates primarily in the Centre Park Boulevard, Hampton Road, Wintergreen Road and Pleasant Run Road corridors in DeSoto.

Inland Port Transportation Management Associations (TMA)

The Inland Port TMA introduced microtransit service to the TMA area in November 2020. The dynamic demand response service is integrated into DART GoPass app and is operated through a partnership between the TMA, DART and STAR Transit. The city of Lancaster and portions of the city of DeSoto are within service boundaries. The TMA is anticipated to update the service boundaries and policies in October 2021.

Key Findings:

- The Document Review provided a qualitative lens touching on a variety of mobility topics in which to view planning efforts within the study area.
  - Overall findings identify that each city faces challenges related to land use regarding the potential for catalyst areas
  - Public transit consideration is found in nearly all of the reviewed comprehensive plans
  - East-west travel throughout the study area remains challenging
- Population, employment and transit dependent populations generally are found adjacent to or nearby the major arterials (I-20, US-67, I-35E) in the study area
- Overall a high number of trips are interlocal
- High number of trips with destinations in the study area originate within Dallas County, generally north of the study area
- Fixed routes for STAR Transit provide east-west travel to commercial and retail destinations
- Low population density within the study area may best be suited for on-demand transit services
- There is a strong travel pattern between the study area and the Stemmons Corridor near the Southwestern Medical District in Dallas

1.2. Summary of Comprehensive Goods Movement Needs Assessment

1.2.1. Study Area

As shown in Figure 1-8, the study area includes the four cities of Cedar Hill, DeSoto, Duncanville, and Lancaster, and the Inland Port. The Inland Port is located just south of the heart of the city of Dallas, along both sides of I-45 in Dallas County. The Inland Port also includes approximately 120 square miles (76,000 acres) and encompasses the cities of Lancaster, Hutchins, and Wilmer, and portions of Dallas and DeSoto.

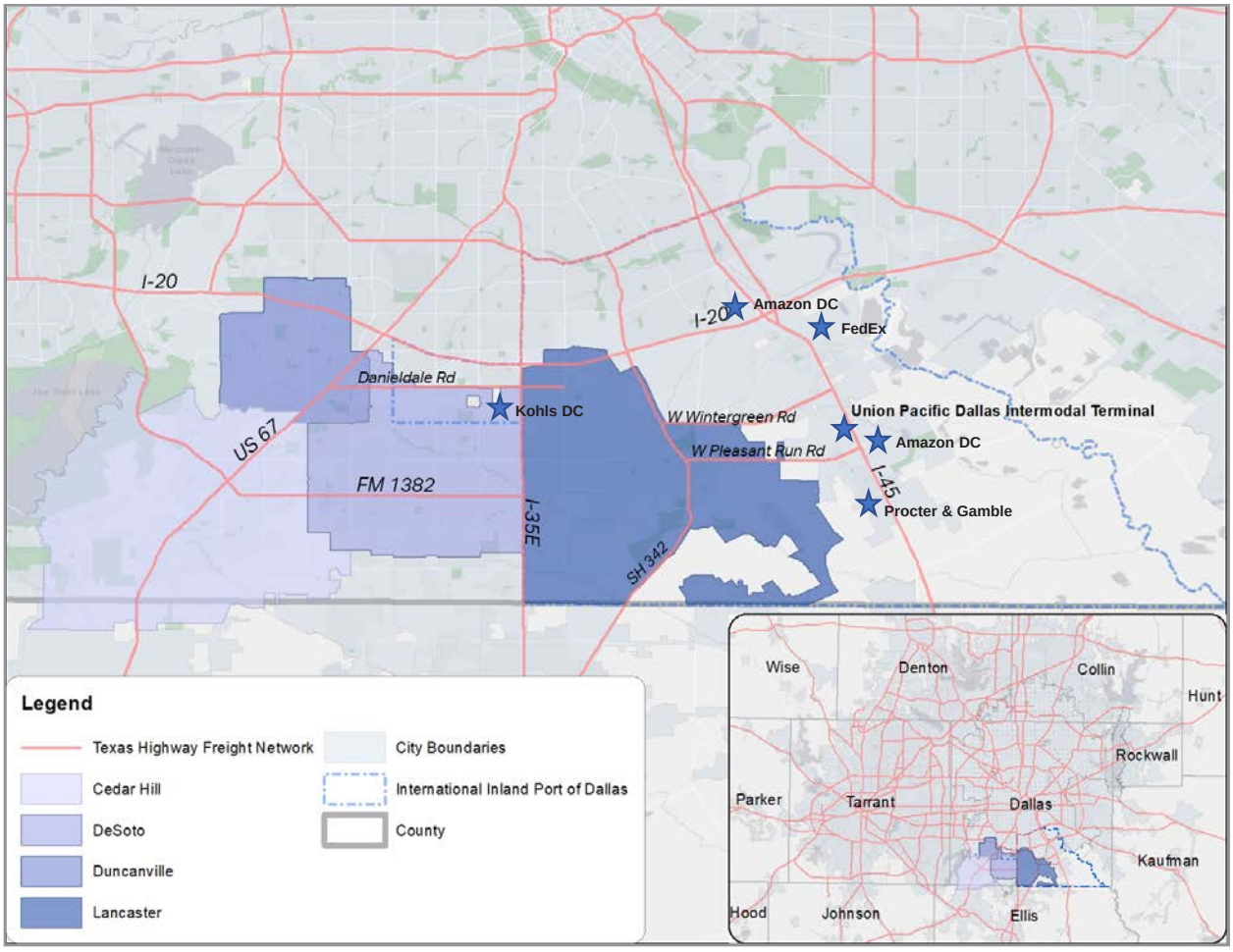


Figure 1-8: **Southern Dallas County Inland Port** *Source: NCTCOG, TxDOT*

1.2.2. Inland Port Perspectives

The Inland Port follows a path of intermodal-anchored ports that have seen significant growth in manufacturing and industrial development, anchor tenant clustering, freight movement increases – and direct rail and transit implications. Growing warehouse demand in coastal ports (East Coast and in Southern California) has led to increased costs and shortages of space. To relieve congestion, private developers and state governments are investing in various types of inland ports to directly move containers away from the coasts for storage and distribution. Recent changes in federal hours of service regulations for truck drivers have made some drayage trips more costly than rail moves, and broader cost growth in trucking may improve the relative attraction of short haul rail moves to inland distribution centers going forward. Rail-served inland ports are also part of a growing trend placing distribution centers closer to cities. Rising costs in

trucking, growing freight volumes, and congestion at coastal ports are creating demand for inland ports and inland intermodal facilities.

Our case study analysis of inland ports highlights the following implications for the Southern Dallas County Inland Port:

- Inland ports which leverage immediate access to larger Class 1 Railroad intermodal ramps appear capable of dramatic growth in industrial space (capacity to add > 1 million sf per year).
- It is important to distinguish between developer-driven projects on discrete sites, versus larger Inland Port districts (which include Will County, Illinois, and Southern Dallas) that cover multiple sites.
- As Inland Port districts expand, truck traffic will increase in step, so local connections to interstates need to be studied, to ensure that existing routes can remain congestion free.

1.2.3. Freight Plan Review

A review of previous and existing planning efforts relevant to freight/goods movement in Southern Dallas County and the Inland Port has been conducted, providing information to help identify existing conditions, deficiencies, opportunities, and future improvements of the region's freight network. Plans and documents from the following have been reviewed, including, but not limited to:

- Freight mobility plans and studies
- Truck parking studies, statewide (TxDOT) and region-specific (NCTCOG)
- Infrastructure analysis and freight resiliency plans

1.2.4. Inland Port Market Analysis

Job Growth

Along with its nearly 93,000 residents, as of 2019, the Inland Port study area includes 33,900 total jobs, more than 15,000 of which are in the industrial and manufacturing sectors. In the past two decades, the area has seen a net increase of 15,300 new jobs – including more than 14,000 added since 2010.

The Inland Port is characterized by significant industrial, manufacturing, warehouse, distribution, and fulfilment center employment. Key major employers include Amazon, Taylor Communications, Walmart, FedEx, Proctor & Gamble, Kohl's, Home Depot, United Natural Foods, Shippers Warehouse, and Brass-craft.

Industry Trends

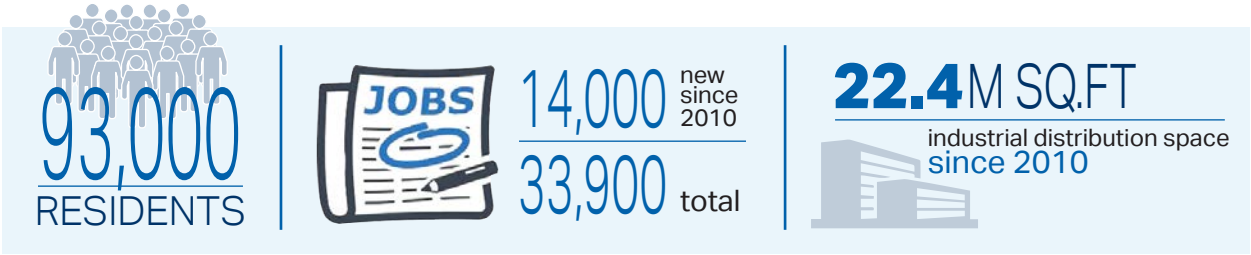
Of all industrial sector employment in the Inland Port, manufacturing, wholesale, transportation and warehousing, and e-commerce (i.e. Amazon fulfillment centers) make up close to half – or 46% - of total jobs. Manufacturing accounts for almost a quarter (23%) of all port employment, with Transportation and Warehousing accounting for 12% of all jobs. With recent growth in Fulfillment Centers on a national and local scale, including an increasing Amazon footprint, three E-Commerce businesses account for more local employment than all 81 Wholesale businesses combined.

Land Use

As shown in **Figure 1-9**, the Inland Port is characterized by significant commercial and industrial uses, residential land use clustered in the northwest portion of the area. While the Dallas Central Appraisal District (DCAD) land use data indicates only 800 acres of land in the Inland Port area currently designated as "vacant industrial," there is significant land currently designated as agricultural – 26,500 acres, or about one-third of the total Inland Port land area. AECOM's GIS analysis indicates 26,625 of total vacant industrial and agricultural parcels greater than five acres. In context with recent demand for industrial space absorbing about 230 acres per year since 2010, 26,000 acres would represent more than 110 years of future industrial development. In practical terms, however, the scale of modern industrial buildings (often in excess of 750,000 square feet), future planning will need to appreciate the capacity of the Inland Port to sustain absorption of more than 2,000 acres every 10 years.

Market and Real Estate

In addition to job growth, the Inland Port has seen rapid growth in industrial development and occupied square footage. Across the port, 70% of all Rentable Building Area (RBA) square footage (25 million square



feet) was constructed between 2010 and 2019, and 90% of all square footage within the Inland Port area has been developed in the past two decades. Nearly all of the new industrial construction since 2010 has been distribution space – 22.4 of the total 25 million square feet of new construction between 2010 and 2019 was industrial distribution space.

As of 2019, the Inland Port study area had seven industrial properties under construction, including three distribution center projects – and an expansion of the ACE Hardware Distribution Facility – as well as 32 proposed industrial developments in the pipeline (23 million square feet, or 530 acres), for a total of 23.7 million square feet of possible new construction coming to market in the next few years.

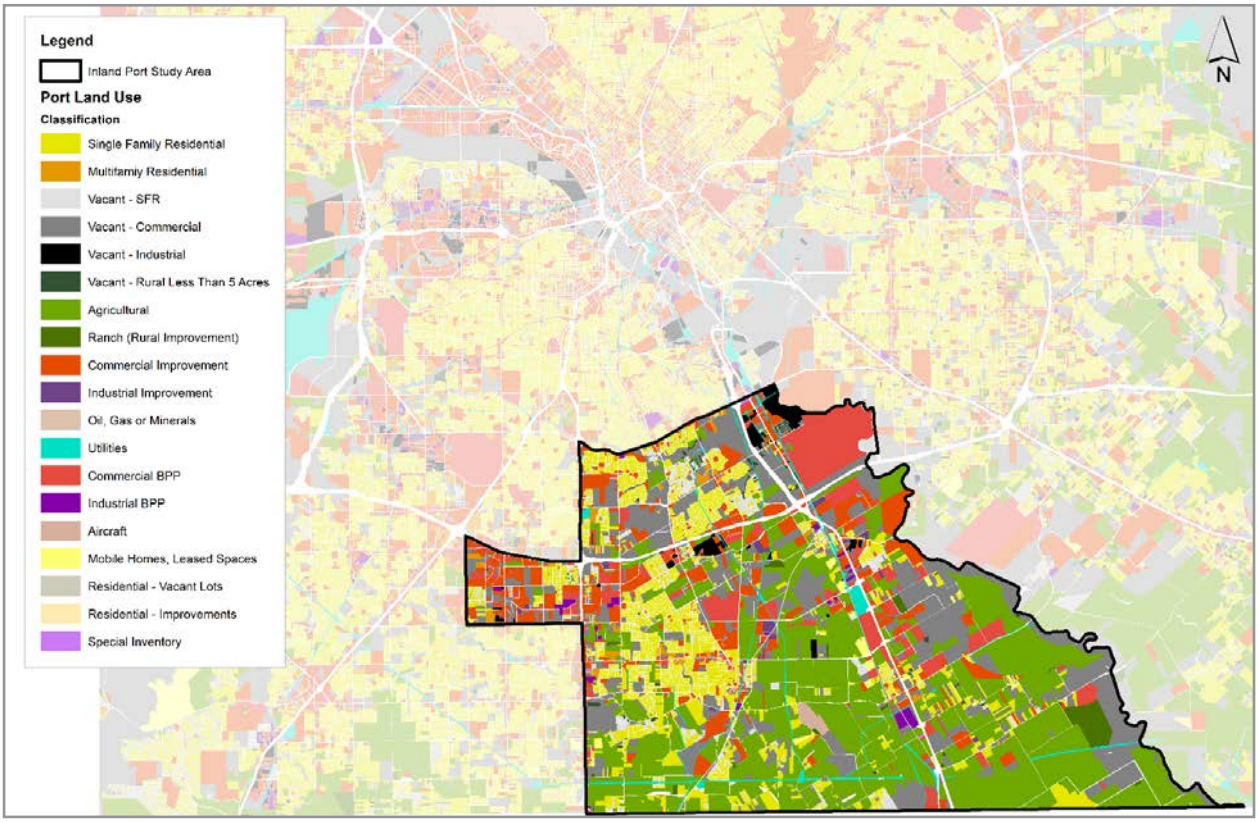


Figure 1-9: **Land Use** *Source: DCAD, 2019*

1.2.5. Southern Dallas County Freight Analysis

In aggregate, the analysis reinforces the prominence of trucks as the primary mover of freight into and out of the area by mode. As shown in **Table 1-1**, tonnage moved by air has seen the fastest growth since 2012, along with tonnage linked to multiple modes.

Vehicle Miles Traveled (VMT) is expected to increase by approximately 30 percent for the NCTCOG region and approximately 23 percent for Dallas County. The freight truck Vehicle Hours Traveled (VHT) in the NCTCOG region is expected to triple, while VHT within Dallas County is expected to increase by almost 70 percent. This county wide increase in VHT will cause additional stress to the transportation system, likely including the Inland Port infrastructure. The analysis also suggests the I-20 corridor is expected to see a high level of congestion by 2050.

Imports and exports in Dallas County are expected to increase by over 27 million tons from 2025 to 2050. Of this 27 million tons, 18 million tons are expected to be imports and 9 million tons are expected to be exports. The increase in truck tonnage is the most significant, as it is expected to increase by over 20 million tons (74% of growth) throughout the Southern Dallas County area. Intermodal rail is expected to see an increase of 3.5 million tons (13% of growth). Connections to three major railways: Union Pacific (UP), Burlington Northern-Santa Fe (BNSF), and Kansas City Southern (KCS), will help the Inland Port reach most of the US market and accommodate the expected growth.

Mode	2012	2020	Compound Annual Growth Rate
Truck	488,151.756	522,183.249	0.85%
Rail	26,314.303	29,687.721	1.52%
Air (include truck-air)	309.632	420.840	3.91%
Multiple modes & mail	20,185.579	25,071.339	2.75%
Other and unknown	106.701	146.897	4.08%
Pipeline	64,308.456	65,505.071	0.23%
Total Tonnage	599,376.428	643,015.118	0.88%

Table 1-1: **Dallas CSA Region, Freight Moving in and Out, 1,000's of Tons** *Source: FAF, 2020*

Key Findings

In the past decade, the Inland Port has seen significant growth in industrial and manufacturing development, with corresponding impacts on job and real estate markets.

- 17% of all Dallas-Fort Worth CSA job growth between 2010 and 2019 occurred in the Inland Port. As of 2019, the Inland Port supported an estimated 33,900 total jobs, with roughly 15,200 in manufacturing, transportation and warehousing, wholesale, and e-commerce sectors.
- The Inland Port supports a total of 53 million square feet of industrial space and has added 35 million square feet of new industrial space since 2010, and 21.6 million square feet since 2015 alone – alongside a 3% reduction in vacancy. 90% of all industrial space in the Inland Port has been built after 2000, with 70% of all industrial buildings constructed in the last decade.
- Over the past ten years, the Inland Port study area has been adding industrial square footage at a higher rate than job growth.
- As of 2019, there are an additional 530 acres of proposed industrial development opportunities in the pipeline across the Inland Port, particularly alongside of I-45. There are currently 800 acres of vacant industrial land (625 acres of parcels larger than 5 acres), and 26,500 acres of agricultural land (mostly parcels larger than 5 acres), per the Dallas Central Appraisers District. Growth since 2010 was enough to absorb roughly 2,300 acres of vacant land; as such, while the Inland Port has more than adequate vacant land remaining, the current pace of growth would place the Inland Port at 100 million square feet in 10 years, with potential for an addition of more than 30,000 jobs in industrial sectors.
- The Inland Port growth aligns with several factors:
  - A consequential Union Pacific (UP) intermodal ramp which offers "steel wheel" connections to Santa Teresa, NM, Los Angeles, CA, and Chicago, IL.
  - E-commerce rapidly creating demand for new warehouse and distribution space and pulling jobs out of traditional brick and mortar retail locations (department stores and malls in particular).
  - The continued significance of the North Central Texas region in anchoring a larger Texas "Mega Region," which supports in excess of 27 million residents and continues to be one of the fastest growing places in North America; these trends will continue to be supportive of growth for Inland Port facilities.
  - In general, as inland ports accelerate in size beyond 40 million square feet, they become more attractive for manufacturing development, with corresponding jobs that pay higher than average wages.
- COVID-19 has dramatically accelerated the shift to e-commerce, with US on-line sales growing from about 10% to 16% of total retail sales within a few months; this has also made clear the dependence of US consumers on foreign manufacturing locations. As a result, more manufacturing activity is expected to return to the US and Mexico in coming years, and locations such as the Inland Port would expect to compete for this activity.

Southern Dallas Inland Port

- Inland ports create unique challenges for transit:
  - Larger warehouses and e-commerce facilities often operate on a 24-hour schedule with multiple shifts, in context with typical transit operations which tend to focus on standard nine-to-five job schedules.
  - While job densities in manufacturing buildings can be attractive (<600 sf per worker), job densities in warehouse buildings can exceed 2,500 sf per employee.
  - A larger share of warehouse and trucking jobs pay wages generally less than $20/hour
  - Insights from larger inland ports suggest that individual companies (Amazon in particular) have responded to employment shortages in similar environments by paying for last mile connections from available transit locations.
  - Reflective of the impact of robotics and the scale of modern warehouses, these districts often add space at a faster rate than they add jobs.
  - Impending shortages of truck drivers are focusing interest on the need for these Inland Port districts to support autonomous trucking, alongside interest in support for alternative fuels (CNG / LNG) and electricity.
  - Given dynamic trends in local industrial markets linked to COVID-19, it is likely that available state level freight models will under-estimate the impact of emergence of inland port facilities.
- Trip generation data from the Institute of Transportation Engineers (ITE) Trip Generation Simulator reinforces that there is generally a significant linear relationship between industrial building size and truck counts – indicating that industrial buildings grow beyond 250,000 square feet to approaching 1 million square feet, on average, truck traffic grows in parallel.
- The 2015 NCTCOG Freight Congestion and Delay Study Report illustrated that the Inland Port focus area contains 29% more intersections that require low radius right turns than the Alliance focus area, and that truck routes in the Inland Port area are routed through 13 more railroad crossings than the Alliance area routes.
- As the Inland Port remains poised for continued future growth – with the potential to nearly double in size – there remain significant implications for future land use, economic, and transit policy considerations.

1.3. Public Involvement Summary

1.3.1. Public and Stakeholder Engagement

In coordination with the NCTCOG, public and stakeholder engagement was integral in developing a comprehensive and strategic public transportation plan for Southern Dallas County and the Best Southwest Partnership (BSWP) cities. This engagement and feedback, along with data research, helped formulate the specific goals and objectives that guided the study's implementation plan. Due to COVID-19 constraints, public involvement flexibly adapted to these conditions and conducted outreach through virtual meetings and online participation. An overview of the public engagement activities is summarized in Table 1-2.

Meeting	Date	Attendees/ Responses
Project Advisory Committee Meeting	July 2020	26
Public Meeting	September 2020	65
Project Advisory Committee Meeting	December 2020	35
Online Survey	December 2020	240
Public Meeting	February 2021	74
Meeting with DeSoto	March 2021	n/a
Meeting with Cedar Hill	April 2021	n/a
Meeting with Duncanville	April 2021	n/a
Meeting with Lancaster	April 2021	n/a
Project Advisory Committee Meeting	April 2021	39
Public Meeting	May 2021	50

Table 1-2: **Public Outreach Overview**

Project Advisory Committee (PAC)

The engagement with stakeholders was inclusive and collaborative, engaging a diverse audience including the four BSWP cities, the Inland Port TMA, DART, STAR Transit, railroad companies, and local freight associations. To guide the study and gather feedback from stakeholders, a Project Advisory Committee (PAC) was established, made up of technical staff, city and county staff, chambers, Inland Port representatives, railroads, transit operators, and other stakeholders.

The 45-member PAC met through live, virtual meetings at three milestones throughout the planning process: July 8, 2020, December 15, 2020, and April 28, 2021. The PAC provided information to the study related to transit and goods movement needs and received valuable feedback on the study recommendations. In addition to the PAC, state elected officials were notified by e-mail about the study and opportunities to participate and share feedback. The list of PAC members is provided in Appendix A.

July 8, 2020 PAC Meeting Summary – AECOM presented an overview of the study to focus on transit planning and freight and goods movement through: Project Background, Project Overview, Study Purpose and Scope, Inland Port TMA, Current State of Transit in Dallas County, Existing Freight Services and Demographic Information and Market Analysis. Comments from PAC members were the following:

- Encouraged support of transit within the Inland Port area due to increase in number of jobs with large employers.
- Asked about the methods/technology used to model traffic scenarios.
- Emphasized the importance of developing funding plans to implement study recommendations.
- Requested short term transit options and implementation plan along with a long-term plan that includes commuter rail.
- Requested development of a funding plan and partnership opportunities in coordination with the study recommendations.
- Asked about the methods planned for public outreach.

December 15, 2020 PAC Meeting Summary – AECOM and K Strategies provided information on the Project Schedule, Study Purpose, Needs Assessment, Online Survey Results, Transit Planning 101, and Conceptual Planning Workshop. Summary discussion of PAC members included:

- How was the freight origin and destination travel pattern data collected?
- What is the timeline for the phased implementation plan?

- Emphasized the importance of regional transit connectivity to our higher education centers, healthcare centers and large employers in southern Dallas County and throughout the region.
- Discussed survey results and comparing it with other data in evaluating transit needs, locations, and scenarios.
- Discussed major transit generators, types of business and multi-family developments/zoning and types of service considered to those areas.
- Received input on the best fit for regional connectivity.
- Discussed the regional connectors and local transit circulation routes working together and complementing service options
- Gathered further information on current and future developments/traffic generators for study planning purposes
- Supported routes and transit solutions that linked the cities and the region
- Discussed the need for last-mile connectivity from the transit stops to neighborhoods and types of last-mile service options.

April 28, 2021 PAC Meeting Summary – AECOM and K Strategies presented the Project Overview and Schedule, Summary of Public/Stakeholder Input, Technical Analysis – Transit Needs, Scenario Development, Recommended Alternatives, Financial Planning, Freight/Goods Movement and Project Study Next Steps. A phased approach for each city was provided with short-, mid- and long-term phases, types of vehicles and service recommendations, cost sharing and funding scenarios, outlining the proposed alternatives and prioritization methodology. Summary feedback from the PAC included:

- There were questions regarding the limits of specific routes, route scoring, routes connecting to healthcare and complementing the Inland Port Go Link service.
- How does micro transit fit into the scenarios?
- Do the cost estimates consider potential route expansion to new developments?
- What is the estimated cost per ride estimated to be?
- Does return on investment or sales tax affect the financial models presented?
- Discussed the availability and application of federal funding for implementing transit improvements including federal funding match.
- Discussed the study feedback encouraging regional connectivity with local circulation; connectivity to major traffic generators such as the medical districts and large employers; and the interest to use transit to attend entertainment venues.
- Overall, there was support for the proposed study recommendations.

Funding Options Online Survey

A funding options online survey was presented to the PAC and received seven total completions.

Below is a summary of key findings:

- Cities that have already committed their maximum allowable sales tax collections should consider diverting resources to fund transit.
- The cities' existing economic development programs should be expanded to allow for transit as an eligible economic development expense.
- Gas tax and value capture are the most appropriate alternatives (non-sales tax) for funding transit.
- Tax on tangible property (cars, boats, etc.) is the most appropriate property tax mechanism as a funding source for transit.
- Respondents opted to not add a local option gas tax strategy to their lobbying agenda.
- Transit would be an acceptable use of a local option gas tax (full or in part).

Public Meetings

Three public meetings were held during the study: September 24, 2020, February 4, 2021, and May 6, 2021. The live, online public meetings also had phone access to ensure equitable access for participation. Meetings were interactive with polling questions and opportunity to chat and verbally ask questions.

September 24, 2020 Public Meeting Summary – AECOM and K Strategies presented Study Purpose and Scope, Current State of Transit in Southern Dallas County, Demographic Information and Market Analysis, Existing Freight Services and Next Steps. Feedback from participants included:

- Impact of COVID-19 pandemic on travel trend data
- Importance of customizing transit for the individual cities
- Transit funding options and opportunities
- Concern that transit increases crime
- Transit should be tied to improving social issues like poverty, unemployment, and health/wellness
- Concern that transit will increase traffic congestion
- Commuter/light rail opportunities

Polling questions revealed that:

- Most participants believe "lack of transportation options" is the most important issue in their city.
- Most participants ranked the availability of transit options as "very important".

February 4, 2020 Public Meeting Summary – The Team presented Project Schedule and Study Purpose, Needs Assessment, Online Survey Results, Transit Planning Overview, Conceptual Planning Workshop, and Next Steps. Feedback from participants included:

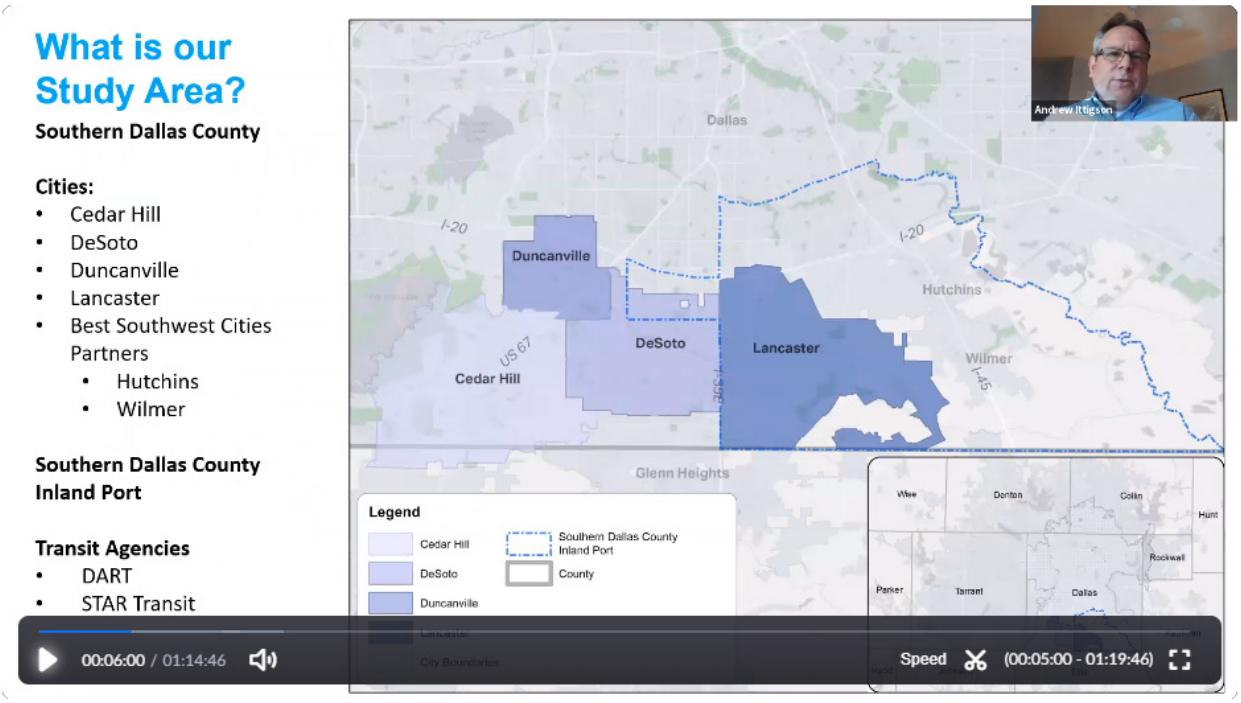


Figure 1-10: **Engaging the community through live online Zoom public meetings** *Source: AECOM*

- Requests to consider the following in the study: Redbird Mall, Hillside Village, new 300-person apartment complex in Highland Hills, downtown DeSoto destination along Hampton and between Belt Line and Pleasant Run, new development in DeSoto near Glenn Heights and Cockrell Hill and Parkerville, intersection of US-67 and Joe Wilson, Danieldale PID, Highway 67 and I-35
- How the study team is keeping stakeholders, especially BSWP city residents, informed on ways to provide input.
- Importance of relaying study findings directly to cities in the study area
- Work with stakeholders to achieve best connectivity for the region
- Will new transit increase my taxes?
- No fixed bus routes in residential areas
- Align with BSWP cities planned development
- Concern that transit will increase traffic congestion and poor air quality
- Consider NCTCOG's traffic survey zone numbers

May 6, 2020 Public Meeting Summary – The AECOM Team presented the Project Overview and Schedule, Public/Stakeholder Input, Technical Analysis–Transit Needs, Scenario Development, Recommended Alternative, Financial Planning, Freight/Goods Movement and Next Steps. Feedback from participants included:

- Clarification on who was identified as "transit dependent" and how that was determined
- Are you recommending a regional transit agency to manage?
- Are the companies that have warehouses in key areas being asked to contribute to these expenses since it helps provide workers to their locations?
- An express bus route service on I-35 in DeSoto seems more cost effective for citizens.

Online/Virtual Engagement

A project website (www.sdctransitstudy.com) was created to provide the public an opportunity to learn about and participate in the study. Project study information, reports and flyers were available to the public for viewing. The PAC and public meeting presentations in addition to the online survey were also posted on the website for public review and comment. The website received nearly 1,000 unique visitors with over 1,500 total site visits. Most of the site visits were directly to the website with over 200 referred to the site through the study's Facebook account. Most of the website users were located within the project study area.

Figure 1-11: **www.sdctransitstudy.com** *Source: AECOM*

Email and Social Media Campaigns

To increase awareness of the study, website, survey and public meetings, a stakeholder e-mail database was sent flyers advertising the public meetings and the online survey. Southern Dallas County stakeholders included cities, chambers, ISDs, churches and community centers. A project phone line was advertised as another means to contact project staff to ask questions and provide feedback to accommodate those with limited access to the internet. A project Facebook account afforded an opportunity for Facebook campaigns to encourage awareness and participation in the public meetings and online survey.

One-on-one Meetings with Stakeholders

The project team held multiple meetings with each city, the Inland Port TMA, railroads, and transit agencies to discuss and finalize the transit and goods movement vision for their respective areas and funding scenarios for transit service and improvements. These meetings were very effective in developing a plan that would be supported, guide them in future planning and seek out partnerships.

Online Public Survey

The online public survey was administered in December 2020 and January 2021, and received 240 total completions from residents and commuters across Southern Dallas County, which provided input that guided the development of the implementation plan. Below is a summary of key findings:

- Most respondents have used DART or STAR Transit before.
- The top three most used transit services among respondents were DART Bus, DART Light Rail and Trinity Railway Express (TRE).
- Most respondents currently drive to transit stops/stations or are dropped off by a family member or friend.
- Most respondents would most like to use transit for entertainment/recreation, work, and to shop/run errands.
- Most respondents indicated that if transit access was easy, they would use public transit 1-3 times per week.
- Most respondents would like to take transit to downtown Dallas, DFW International Airport and other areas within Southern Dallas County.
- Most respondents indicated the longest amount of time they will wait for a transit vehicle is 11-20 minutes.

1.4. Transit Needs Assessment

The detailed existing conditions assessment of travel needs in Southern Dallas County was provided in previous reports for this project, setting the groundwork for service and organizational strategies outlined in this report. Meetings with stakeholders and the general public throughout the study helped us to identify and prioritize key unmet needs. The following is a summary of critical issues and unmet transportation needs identified through our assessment of socio-economic conditions, travel patterns and the public involvement effort.

Among the key public transportation needs identified in the study are:

- **Connections to regional transit services:** Stakeholders expressed the need for direct connections to regional transit hubs such as UNT Dallas station, Westmoreland Station and DART and STAR Transit bus routes. The connections are needed for regional trips to access jobs, schools and colleges, medical appointments, shopping, entertainment, and social services agencies. The Market Analysis showed a strong connection between the study area and the Southwestern Medical District in central Dallas.
- **Local circulators for seniors and lifeline trips:** With limited mobility options available in the study area, there is a critical need for services for vulnerable communities to access services. A demand response transit service to local medical offices, hospitals, social services and grocery stores would provide a baseline service to the communities in the study area.
- **Connections between the study area cities and to the Inland Port and Southern Dallas:** There is a high density of trips between the communities south of I-20. With the projected rapid employment growth in the area, the need to travel east-west between cities will be even more important in the future. New mobility options between cities would provide an opportunity to live and work within the Southern Dallas County cities.
- **Service to future growth areas including employment hubs and downtown areas:** The number of employers in the Inland Port area is expected to double over the next 10 years. In addition, the downtown districts in Cedar Hill and Duncanville are expected to add density through future residential and commercial developments. Future plans for passenger rail stations in three of the four cities in the study area may also include transit-oriented development and growth within the station areas. A comprehensive and nimble transit and mobility service will be needed to connect to the new growth areas.
- **Flexible and innovative services to serve the various land uses:** The cities in the study have a range of development patterns and land uses from dense retail areas, suburban single-family homes, multifamily and industrial commercial zones. Although some corridors such as Hampton Road and Wheatland Road have areas near transit generators with some density, there are few high density fixed route type corridors. A combination of service delivery options such as microtransit, fixed route and other route types may work best to accommodate the varying land uses.

2. Scenario Recommendations

The following section details the methods used to generate a preferred alternative and phased implementation plan for the study. The project team used data and findings from the existing conditions analysis to score and identify key market areas to help guide the alternative scenario development process. Following the creation of transit alternatives, a prioritization process was applied to all individual fixed routes and microtransit zones to create a preferred alternative. Results from the scenario development and prioritization processes also informed the creation of later phases to create a long-term vision for transit in the study area.

2.1. Scenario Development

Generating transit scenario alternatives is a complex process involving many aspects of transit planning. In order to create a successful transit system, it is imperative that the proposed alternatives are tailored to community needs, are appropriate for the existing transit landscape, and are feasible for implementation.

The project team used previous analyses and public input to create a viable list of transit service types, identify areas primed for transit service, draft alternative transit scenarios, and prioritize proposed service types to create a recommended transit alternative scenario for Southern Dallas County.

2.1.1. Service Delivery Options

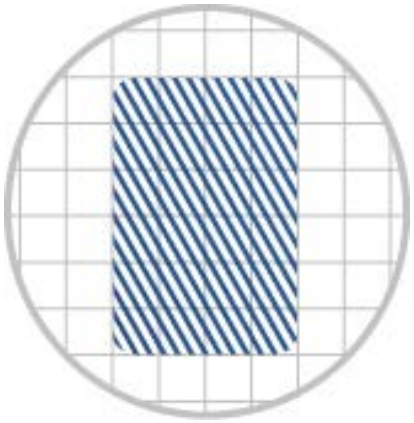
Effective transit for the study area is not a one size fits all solution as transit markets throughout the area are inherently variable. The project team created a 'menu of options' to provide feasible service types for the various markets identified in the existing conditions analysis. Viable transit service delivery options were established by reviewing 'service type indicators', which include:

- population and employment density,
- transit need populations,
- adjacent land uses,
- existing roadway geometry, and
- connectivity to existing DART and STAR Transit services.

Following the review of service type indicators, five service types were selected as being feasible service types for Southern Dallas County, and are listed as follows:

Microtransit

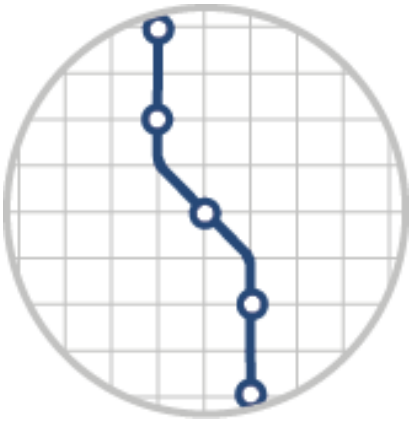
Microtransit refers to demand response transit service that operates within a specified geographic area. Microtransit does not run on a set schedule or route and requires passengers to contact the provider and schedule service through an app or by calling customer service. Microtransit often uses smaller vehicles for service such as cutaway buses or vans.



Population Density	Moderately Low
Employment Density	Low to Moderate
Transit Need	Low to Moderate
Land Use	Lower density urban or suburban residential
Existing Roadway	Varies
Connectivity to Existing Transit	May operate adjacent to other transit service as a first/last mile solution

Fixed Route Urban

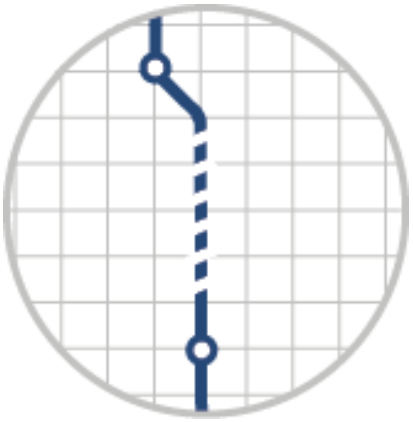
Local fixed routes form the core of the transit system. Routes are placed with a focus on balancing coverage and frequency. Coverage refers to a transit system that uses limited resources to provide transit service to more areas, often with a lower frequency. A frequency-based service focuses transit on the major corridors with more frequent service. Linear fixed routes are direct and make stops frequently, making service ideal for local trips.



Population Density	Moderately High
Employment Density	Moderate to High
Transit Need	Moderate to High
Land Use	Varied – urban core, commercial, residential
Existing Roadway	Major arterials and corridors
Connectivity to Existing Transit	Maximize connections to other fixed routes to form a network

Fixed Route Commuter

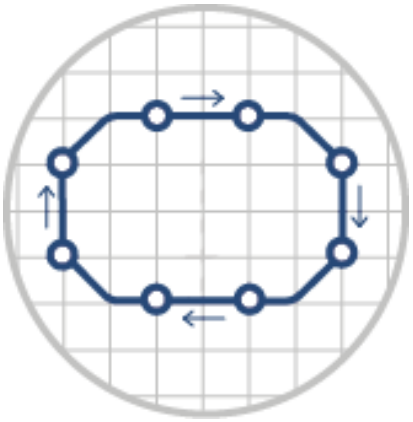
Commuter routes operate during peak travel times, covering longer distances and making few stops to allow for higher-speed travel. May be scheduled at lower frequencies.



Population Density	Moderately High
Employment Density	Moderate to High
Transit Need	Moderate
Land Use	May provide a connection between various types
Existing Roadway	Major arterials or highways
Connectivity to Existing Transit	Close proximity to transit facilities including park & rides and terminals

Local Circulator/Collector

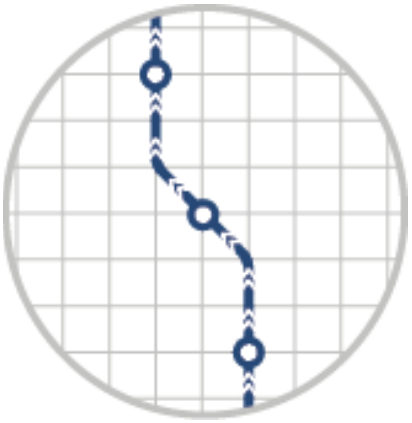
Circulators are short- to medium-distance, continuous routes that form a closed loop. They usually have closely spaced stops and higher frequencies.



Population Density	Low to Moderate
Employment Density	Low to Moderate
Transit Need	Moderate to High
Land Use	Residential neighborhoods and downtown/ urban centers
Existing Roadway	Local Neighborhood streets, minor roads/ arterials
Connectivity to Existing Transit	May connect to other higher-capacity routes

Express/High Frequency

Express transit service offers higher frequency, higher speed service than local routes. Express routes are usually more direct and have fewer stops.



Population Density	Moderately High to High
Employment Density	Moderate to High
Transit Need	Moderate
Land Use	Denser commercial and residential districts, may connect serveral
Existing Roadway	Higher speed corridors that may connect activity centers
Connectivity to Existing Transit	Lower priority if demand is sufficient to justify service

Accordingly, these service types were considered for the development of transit alternatives following the identification of key market areas which is detailed in the following section.

2.1.2. Transit Market Identification

The project team built off the service type options analysis by focusing on metrics indicative of potential for transit ridership. This includes ACS/LEHD data related to employment and population density, employment generators, and transit-dependent population (e.g., households without vehicle access, persons with disabilities, low-income households, youth, and elderly populations).

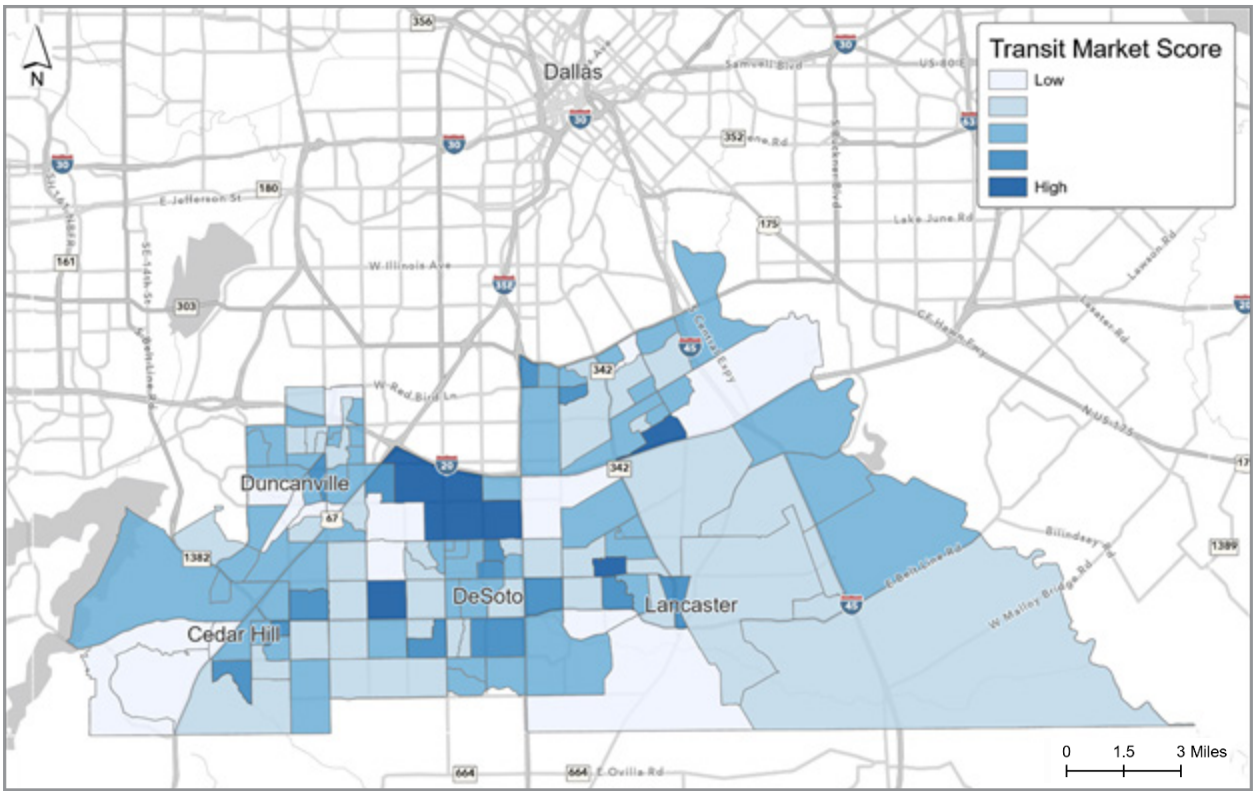


Figure 2-1: **Southern Dallas County Total Market Scores by Block Group**

Source: USCB ACS 2018, LEHD (2018), NCTCOG (2018)

Metrics were scored individually by census block group delineations. In turn, individual scores were combined to create a total transit market score for each block group within the study area. Total scores were then used to evaluate existing transit markets. Block groups containing higher total scores were assumed to contain higher population/employment densities, employment generators, transit-dependent population, or a combination of the listed metrics. These higher scoring block groups were then isolated to spatially identify key market areas, further highlighting where potential for transit ridership exists within Southern Dallas County. Moreover, the identified key market areas served as anchors for the development of fixed route and on-demand transit service recommended in the latter stages of the scenario development process. **Figure 2-1** displays total market scores for the study area – block groups displayed as darker blue represent those with the highest potential for transit ridership based on existing demographic and socioeconomic data.

2.1.3. Overlay Analysis and Alternative Development

Demographic and socioeconomic data displayed at the block group level provides a high-level understanding of where transit service types may be best suited for users and which areas transit should be serving. However, block group data is not perfect – variables such as polygon size, jurisdictional boundaries, and existing transit service areas have the potential to skew results. For example, a large block group may contain a key development essential for transit ridership and overall connectivity, however, the block group size may dilute the development's draw when symbolizing by density.

In addition to identifying key market areas, the project team conducted an overlay analysis using point and line feature data to ensure the recommended routes provide the most beneficial and effective coverage to Southern Dallas County. Employment hubs (e.g., employment centers with greater than or equal to 100 employees), key destinations (e.g., retail, service, medical, recreational, multifamily housing, etc.), and

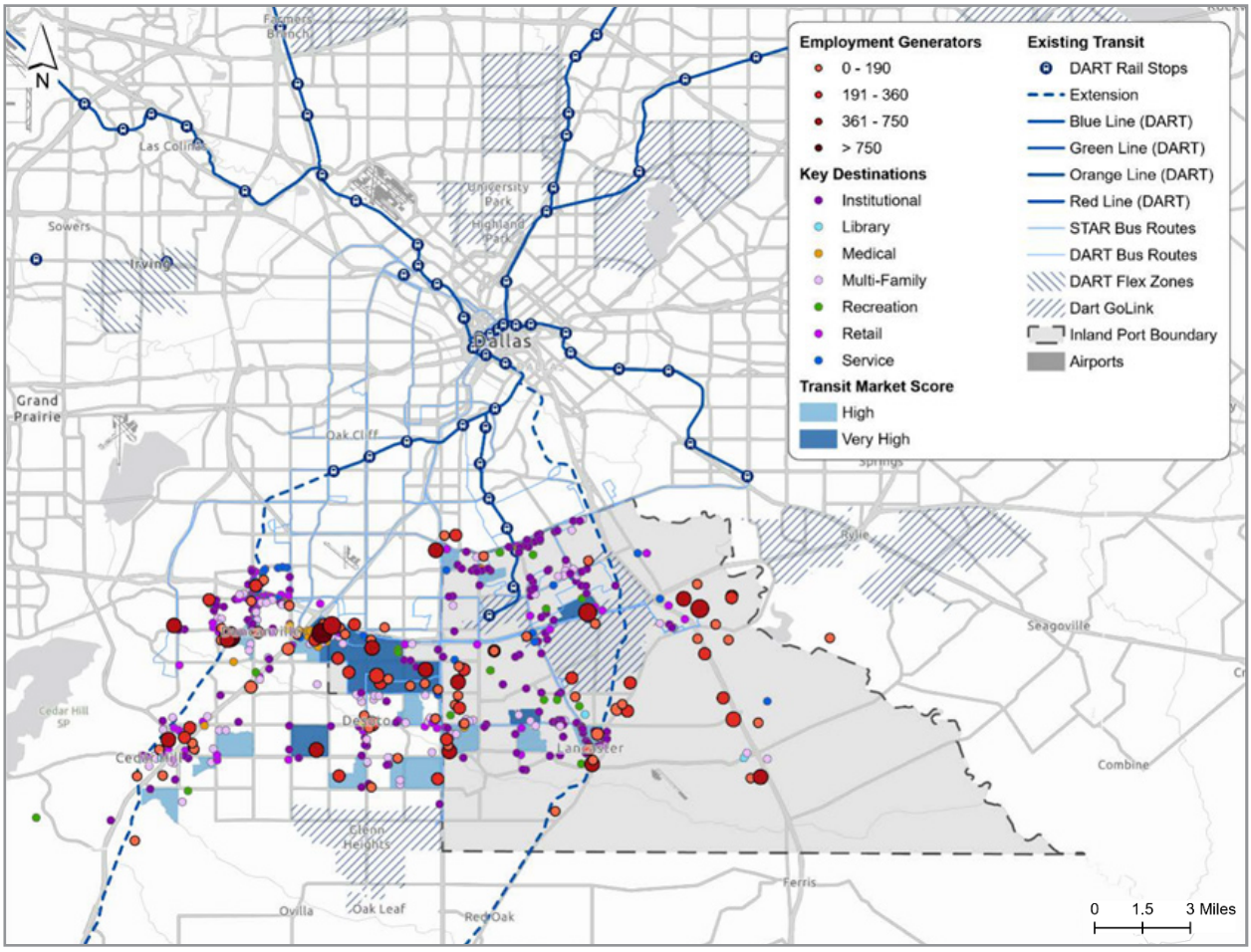


Figure 2-2: **Southern Dallas County Scenario Development Overlay Analysis**

Source: US Census Bureau (2018), LEHD (2018), NCTCOG (2018)

existing DART and STAR Transit services were overlaid with key market areas to create a complete picture of the existing transit market in Southern Dallas County. Figure 2-2 displays the overlay analysis used for the scenario development process, which served as the base for the development of alternative transit scenarios.

Using the overlay and GIS analysis, the project team iteratively drafted conceptual route alignments and zones based on optimal coverage of key transit market areas, employment hubs and key destinations, and connections to existing transit services in the region. Stakeholder input and public feedback was also considered and applied throughout the drafting process. Once general alignments and zones were finalized, the project team applied principles from the service delivery options analysis to allocate service types based on the identified service type indicators. Accordingly, a total of eight fixed routes and five microtransit zones were drafted for the study area Fixed route recommendations included express, urban, and circulator service types.

Fixed route and microtransit recommendations were grouped into two separate alternatives to allow the project team to better understand each service type's strengths and weaknesses. Table 2-1 and Table 2-2 present service types and their respective alternative.

Route Name	Alt 1	Alt 2
Cedar Hill Old Town (8)		●
Duncanville Main St (4)	●	
Hampton East (6)		●
Hampton West (2)	●	
Lancaster Cedar Hill (7)		●
US 67 Express Stops (1)	●	●
Wheatland Extension (5)		●
Wheatland (3)	●	

Table 2-1: **Proposed Fixed Routes**

Zone Name	Alt 1	Alt 2
Cedar Hill Zone	●	
Duncanville Zone	●	●
DeSoto - Lancaster South Zone	●	●
DeSoto Industrial Zone	●	●
Lancaster Industrial Zone	●	●

Table 2-2: **Proposed Microtransit Zones**

Figure 2-3 and Figure 2-4 display both alternative options, containing proposed fixed route and microtransit services. While fixed routes and microtransit zones were initially separated by alternatives, this was not done to pit alternatives against one another. Rather, the alternative structure served to organize the proposed fixed routes and microtransit zones to further analyze their benefits to the study area, and in turn apply qualitative and quantitative methods to rank each service and create a preferred alternative pulling from alternatives 1 and 2. The following section details the methods to rank and prioritize each service type and generate a final preferred alternative.

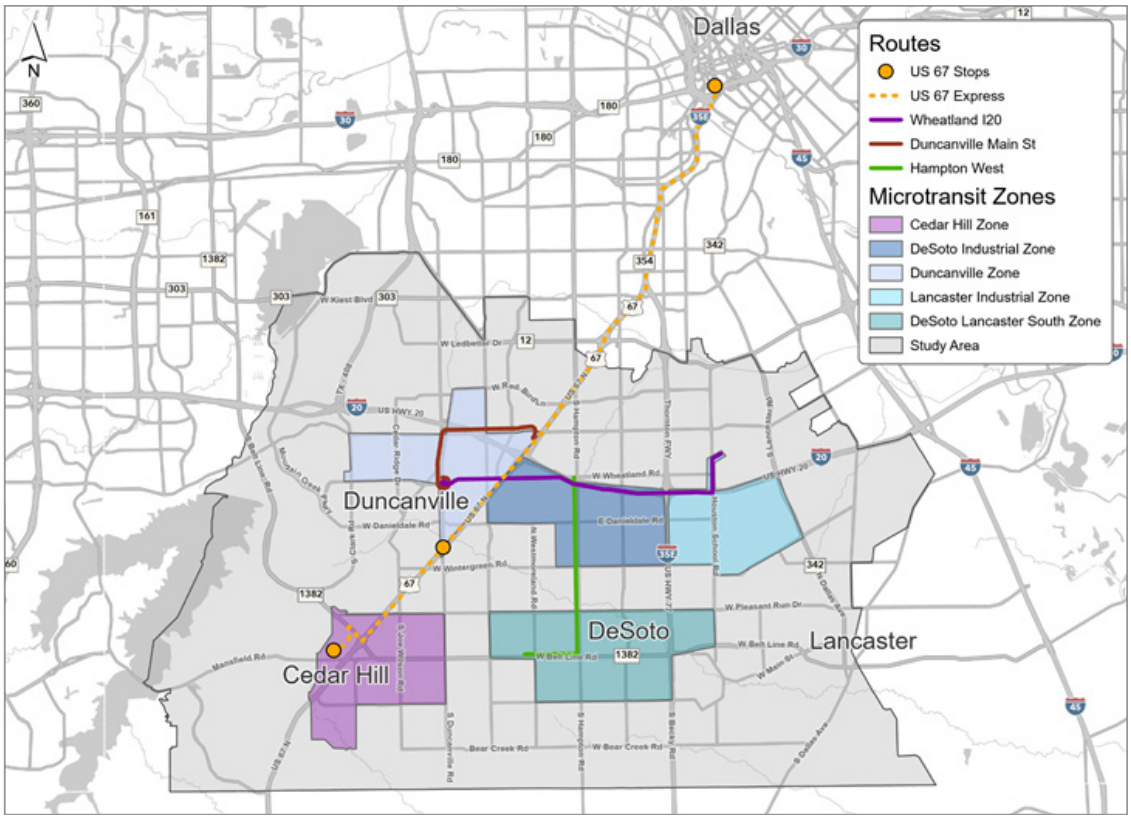


Figure 2-3: **Alternative 1** *Source: ATG*

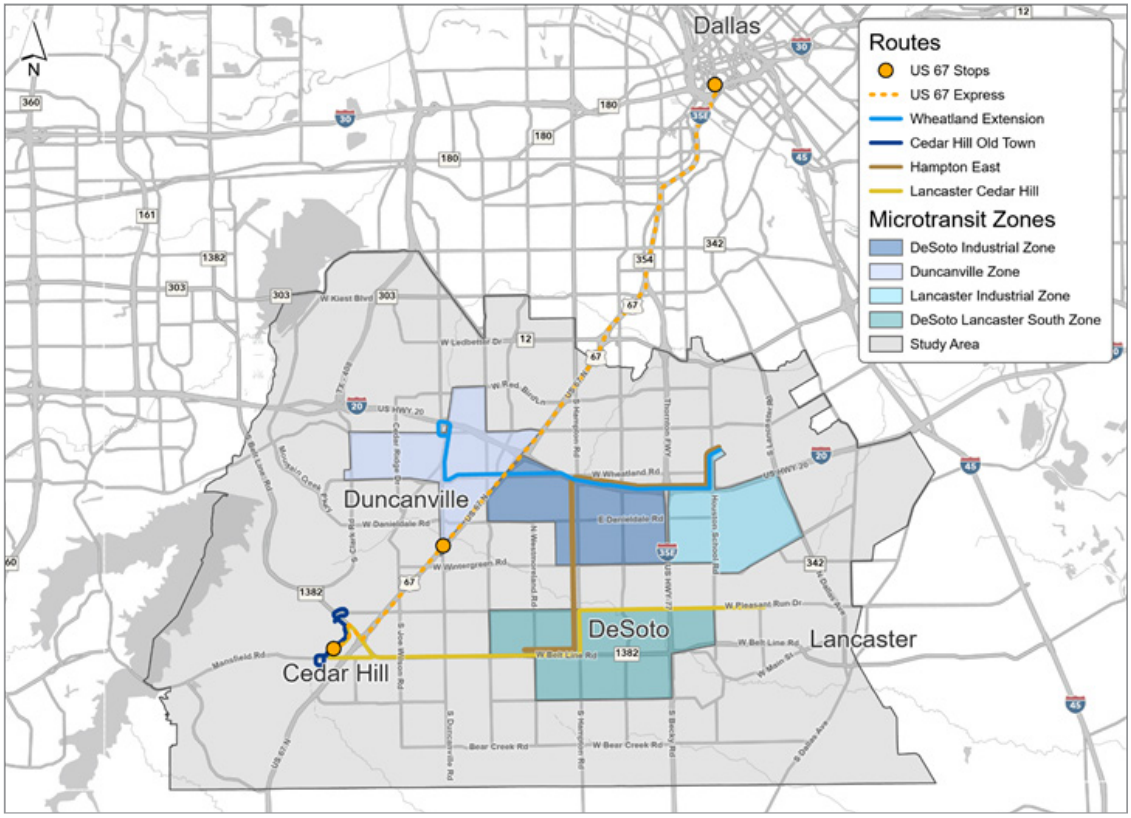


Figure 2-4: **Alternative 2** *Source: ATG*

2.2. Route Prioritization and Ridership Forecasting

Most of the study area is currently without transit service. While all proposed fixed routes and microtransit zones within Alternatives 1 and 2 have potential to provide mobility and accessibility benefits to the community, it is also important to provide the area with realistic options regarding funding and implementation. Accordingly, a prioritization process was created to select a preferred alternative package of fixed routes and microtransit zones, as well as a phased implementation strategy to follow. The prioritization process allowed the project team to select a combination of routes and zones which provide the most benefits to the region and are feasible for short-term implementation within the next five years. The process also allowed the project team to recommend appropriate route and zone additions, as well as service upgrades for future implementation once initial transit investments are established in the region. Ridership forecasts show the potential ridership expected from the preferred alternative package. The NCTCOG Travel Demand Model produced ridership estimates for all the fixed routes and a peer review of existing Microtransit Zones in the region produced ridership estimates for all the proposed Microtransit zones.

2.2.1. Prioritization Process

To understand benefits created by individual routes and zones, a buffer analysis was conducted to quantify the amount of transit-dependent population, current and future population and employment, key destinations, and regional transit connections, referred to as transit indicators, each proposed service type captured and/or provided (Figure 2-5). Each service type was scored based on the amount of service and connectivity provided. Higher scores are attributed to a higher need for prioritization. The data used in this analysis is both proportional to the area and population within the buffered region.

To calculate a "Prioritization Score", each transit indicator was weighted and added together. These scores represent a "Rank" to allow the user to easily discern which route/zone to prioritize. Similarly, each alternative was given an "Alternative Score", which is the average of the route prioritization scores that define the alternative. Alternative scores served as a base for comparison of recommended alternatives to ensure the final recommendation provided optimal transit benefits to the study area. Figure 2-6 provides an example of the prioritization tool after all inputs were finalized.

Figure 2-5: **Transit Indicators and Prioritization Methodology**

Due to inherent differences between fixed route and microtransit service types, the two were grouped, scored, and ranked separately to properly compare and select the service types for the recommended alternative. The final recommended alternative contains three fixed routes and all five proposed microtransit zones, generating an alternative score substantially higher than scores for both alternative 1 and 2. Figure 2-7 displays the recommended alternative, and the following sections detail each fixed route and microtransit zone provided by the recommended alternative.

PRIORITIZATION SCORES

			Quantitative: 1 to 4 (Geometric Breaks)			Qualitative: 1 to 5 (low - high)	Qualitative: 0 to 2 (low - high)	Quantitative: 1 to 100 (low - high)		
		Weights	25%	25%	10%	20%	20%			
Name	Route or Zone	Alternative	Pop & Emp Density	Transit Dependency Index	Future Pop & Emp Density	Land Use/Key Destinations	Regional Connectivity	Prioritization Score	Rank by Service Type	RA
Wheatland I20	Route	1	2.60	2.35	3.00	2.81	2.00	93	1	Y
Hampton West	Route	1	2.38	2.44	3.00	2.29	1.00	43	6	N
Duncanville Main St	Route	1	3.00	2.44	3.00	1.52	1.00	57	5	N
Cedar Hill Old Town	Route	2	1.86	2.00	2.00	2.44	1.00	7	8	N
Lancaster Cedar Hill	Route	2	2.43	2.17	3.00	2.43	1.00	21	7	N
Wheatland Extension	Route	2	2.71	2.39	3.00	1.91	2.00	79	2	N
Hampton East	Route	2	2.22	2.48	3.00	2.31	2.00	71	3	Y
US 67	Route	1 & 2	2.50	2.17	3.00	2.00	2.00	64	4	Y
Cedar Hill	Zone	1	2.10	1.80	3.00	2.43	2.00	50	2	Y
DeSoto Lancaster South	Zone	1 & 2	2.14	2.18	2.00	2.50	1.00	14	5	Y
DeSoto Industrial	Zone	1 & 2	2.40	2.33	3.00	2.71	2.00	86	1	Y
Duncanville	Zone	1 & 2	2.70	2.36	3.00	1.94	1.00	36	3	Y
Lancaster Industrial	Zone	1 & 2	1.90	2.40	2.00	2.37	2.00	29	4	Y

Overall Alternative Score	Average Score
Alternative 1 (Route) Score	64.23
Alternative 2 (Route) Score	48.52
Alternative 1 (Zone) Score	42.82
Alternative 2 (Zone) Score	41.03
Recommended Alt. (Route) Score	76.13
Recommended Alt. (Zone) Score	42.82

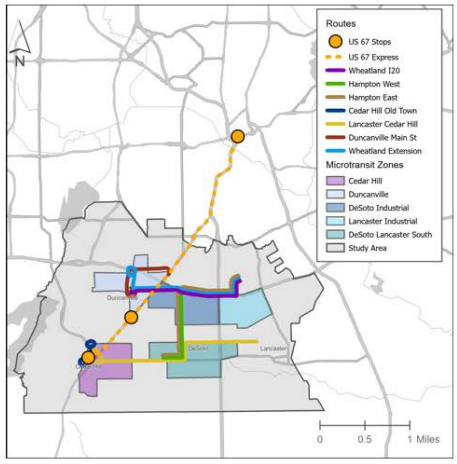


Figure 2-6: **Prioritization Scoring Example** *Source: US Census Bureau (2018), LEHD (2018), NCTCOG (2018), ATG (2021)*

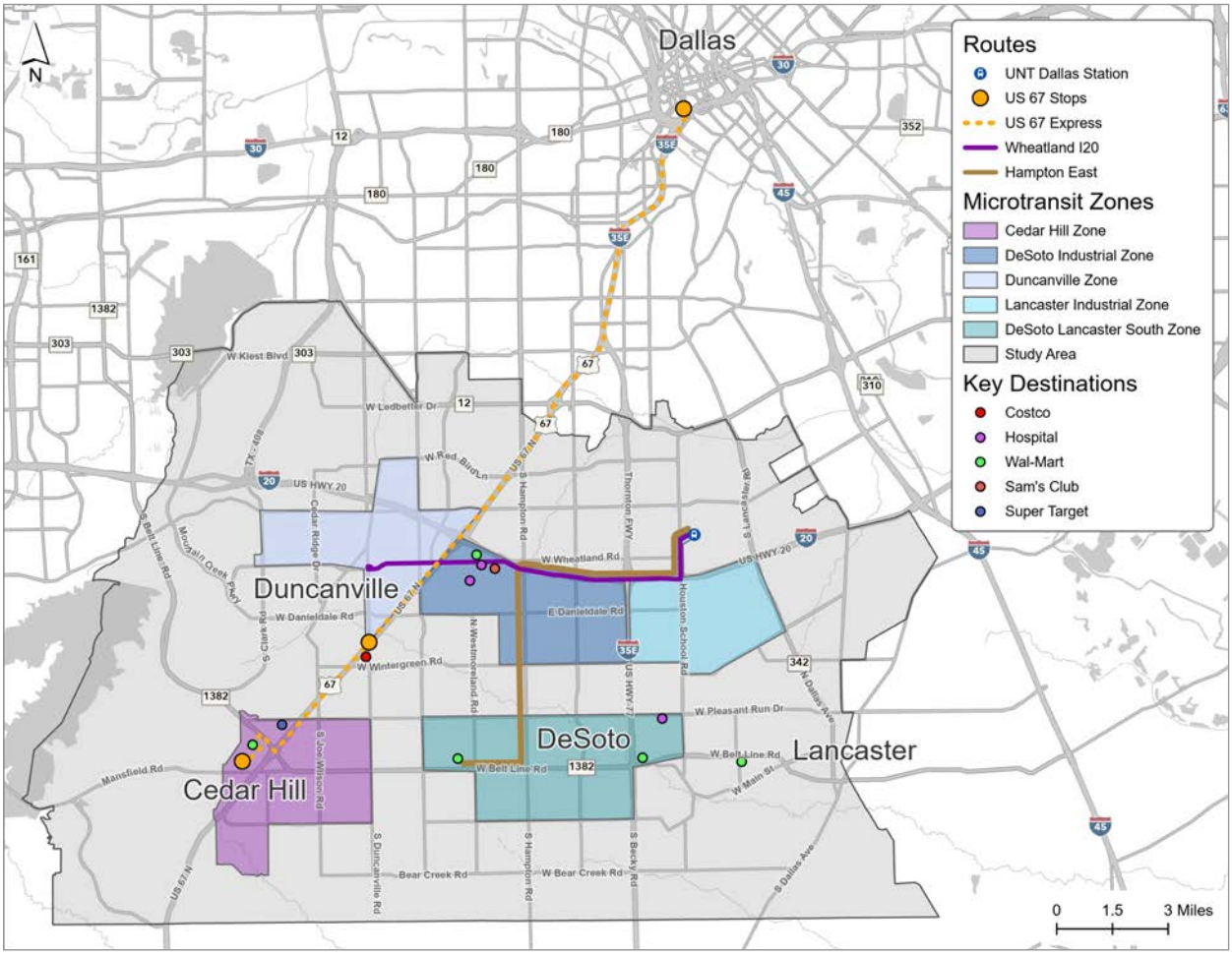


Figure 2-7: **Southern Dallas County Recommended Alternative** *Source: ATG*

2.3. Phased Implementation

The transit recommendations for this plan will begin with a strong core network of routes and microtransit zones that are a result of the technical analyses, prioritization process and public and staff input. This implementation plan will allow for a phased, equitable, and sustainable implementation of transit service in the study area. This will allow the Cities and NCTCOG to evaluate service after Phase 1 and use valuable data to inform and finalize Phase 2 recommendations.

2.3.1. Phase 1 (1-5 Years)

The final recommendations of the prioritization process represent the first phase the implementation process for the Southern Dallas County Transit Plan.

Phase 1 will build the foundation of transit service in the area. The goal of this phase is to provide transit service that connects directly to regional transit nodes from each of the four cities. Service in Lancaster and DeSoto will connect to the DART UNT Dallas Station. Duncanville's service will connect to the DART bus routes at the Southwest Center Mall and will have Express bus service to the West Transit Center in downtown Dallas. Cedar Hill will have Express service to downtown Dallas as well. In addition, microtransit zones are proposed in each city to provide local circulation and lifeline service for vulnerable communities such as seniors. The service will use smaller cutaway buses on all routes except the express bus route which will use a larger 40-foot bus or over-the-road coach.

Paratransit

The Americans with Disabilities Act (ADA) of 1990 requires that comparable service be provided to all individuals within the service area located within ¾ mile of a fixed route bus network. This means that individuals who are unable to access a fixed route bus stop or understand how to board and alight in the correct locations on a fixed route bus need to have access to complementary curb-to-curb service. For Phase 1 route recommendations there will be no complementary paratransit service required. The two fixed route services, Wheatland 1-20 and Hampton East, both operate within ¾ miles of a demand response microtransit zone. There is a segment along Hampton Road between Belt Line Road and Pleasant Run Road where microtransit trips can be extended to cover the gap for ADA trips.

Source: DART

Figure 2-8: **US-67 Express Route** *Source: ATG*

Fixed Routes

US-67 Express Route

The US-67 express route serves as an anchor to the recommended alternative and provides a one-seat ride from Cedar Hill's Government Center to the West Transit Center in downtown Dallas. The route also includes one stop at the Duncanville Costco (near US-67 and South Main Street), which aims to attract riders and serves as a park and ride facility, and kiss and ride location.

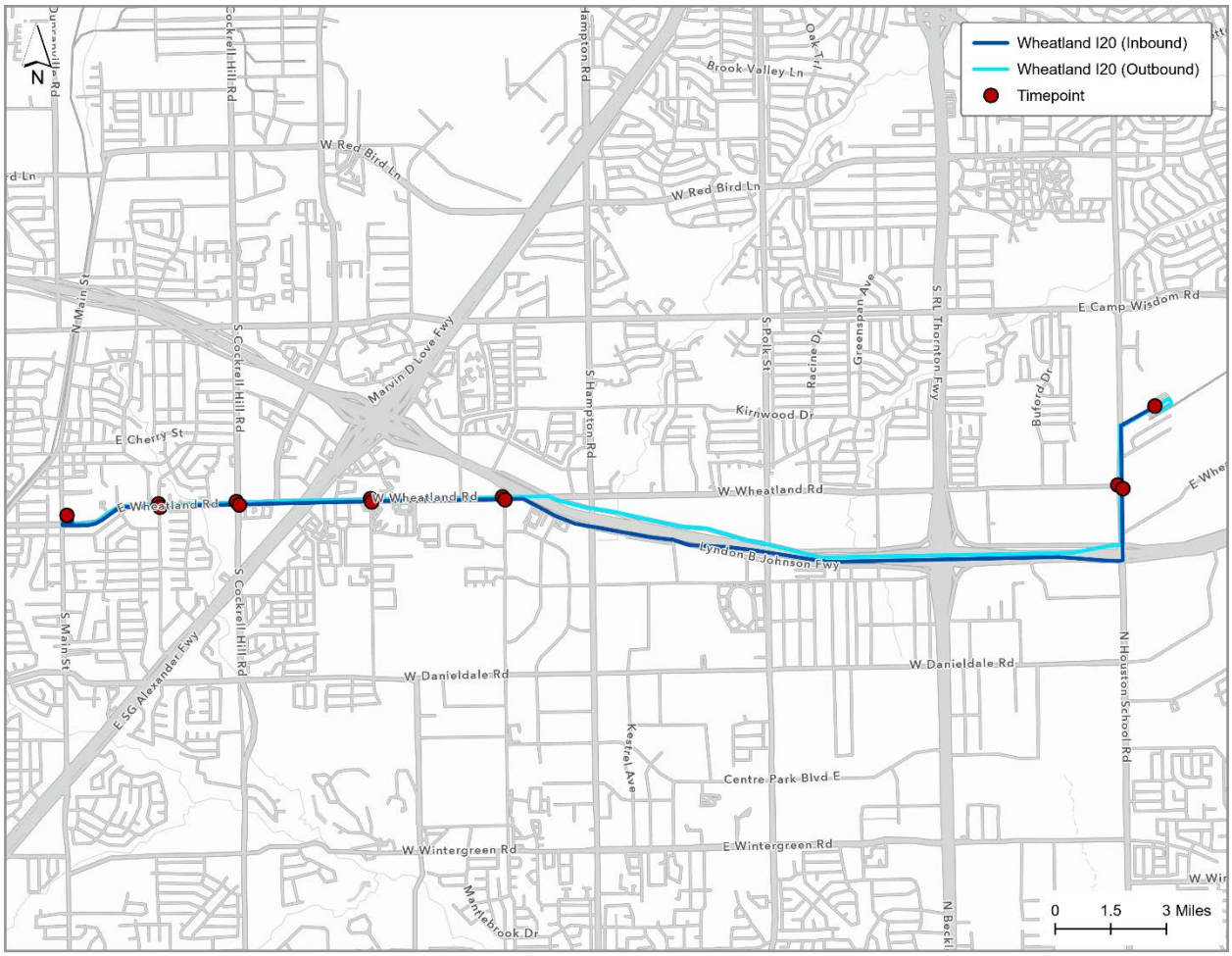


Figure 2-9: **Wheatland I-20 Route** *Source: ATG*

Wheatland I-20

The Wheatland I-20 route provides east-west connectivity, linking Duncanville City Hall to the UNT Dallas Station. The route also provides important connectivity to the medical district located just south of the US-67/I-20 junction along Wheatland Road. In addition to the medial district, the Wheatland I-20 route would provide connections between residential and commercial areas along E Wheatland Road. This route also provides connections to community resources such as the Duncanville Public Library.

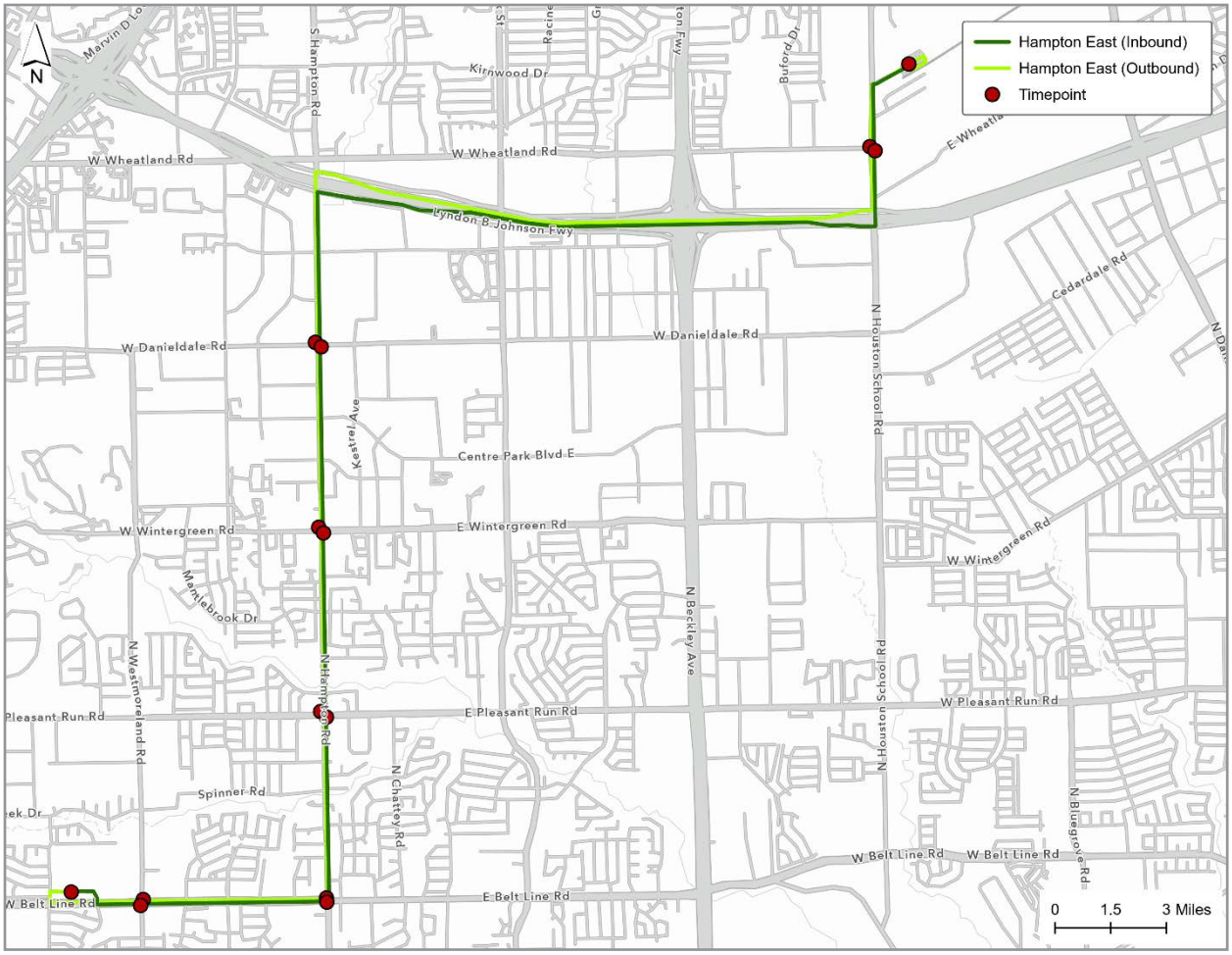


Figure 2-10: **Hampton East Route** *Source: ATG*

Hampton East

This route adds to the region's connectivity to existing transit services by connecting the DeSoto Walmart to the UNT Dallas Station. The route largely uses Hampton Road and I-20 to provide a direct, bi-directional route between the termini, and traverses the DeSoto employment zone south of I-20.

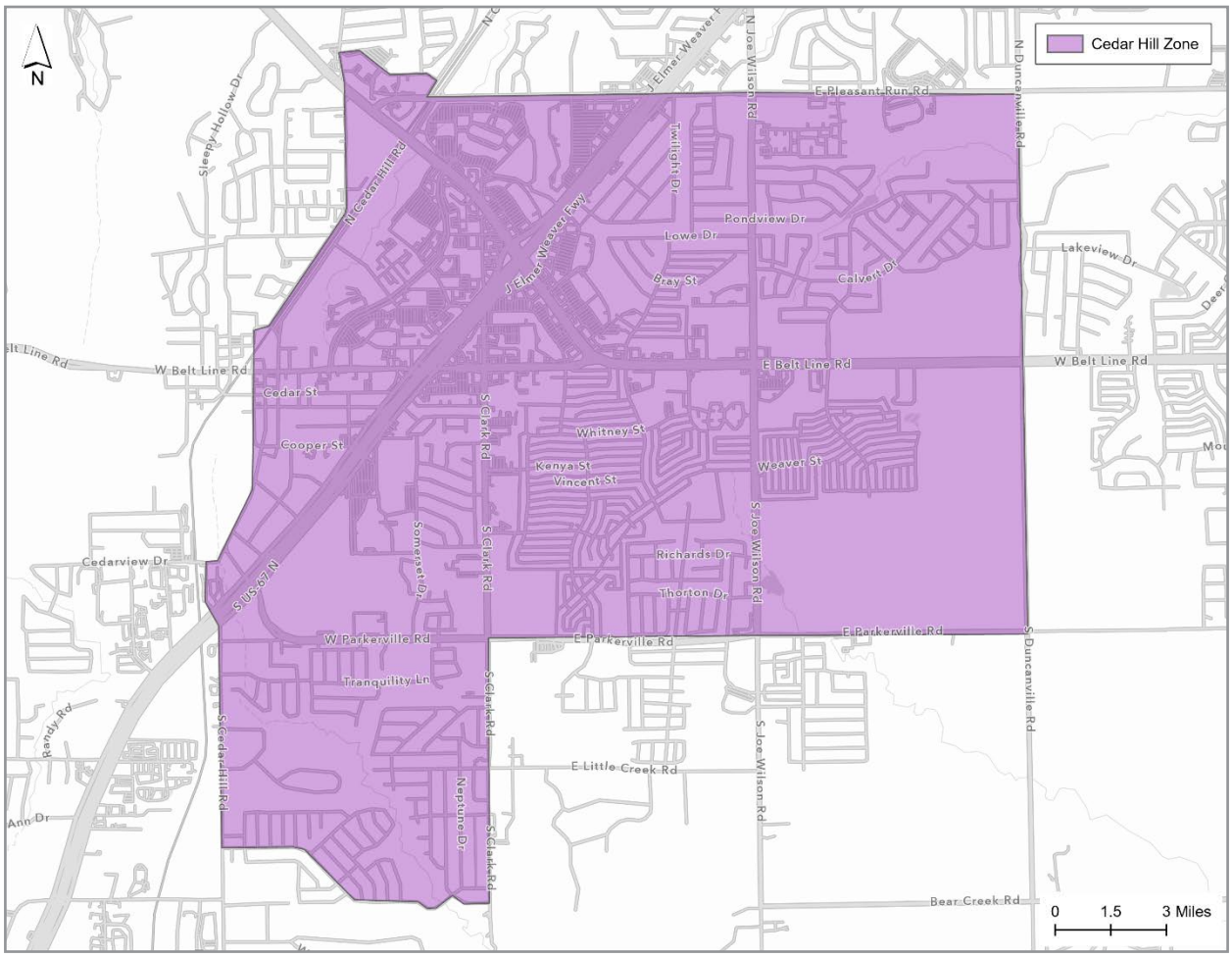


Figure 2-11: **Cedar Hill Zone** *Source: ATG*

Microtransit Zones

Cedar Hill

The Cedar Hill microtransit zone provides service to the markets that surround the US-67 Express stop at the Government Center. This includes retail centers such as Hillside Village, the Plaza at Cedar Hill, and various other shopping and entertainment developments. The zone also provides on-demand service to the residential areas east and south of the Uptown Cedar Hill Area.

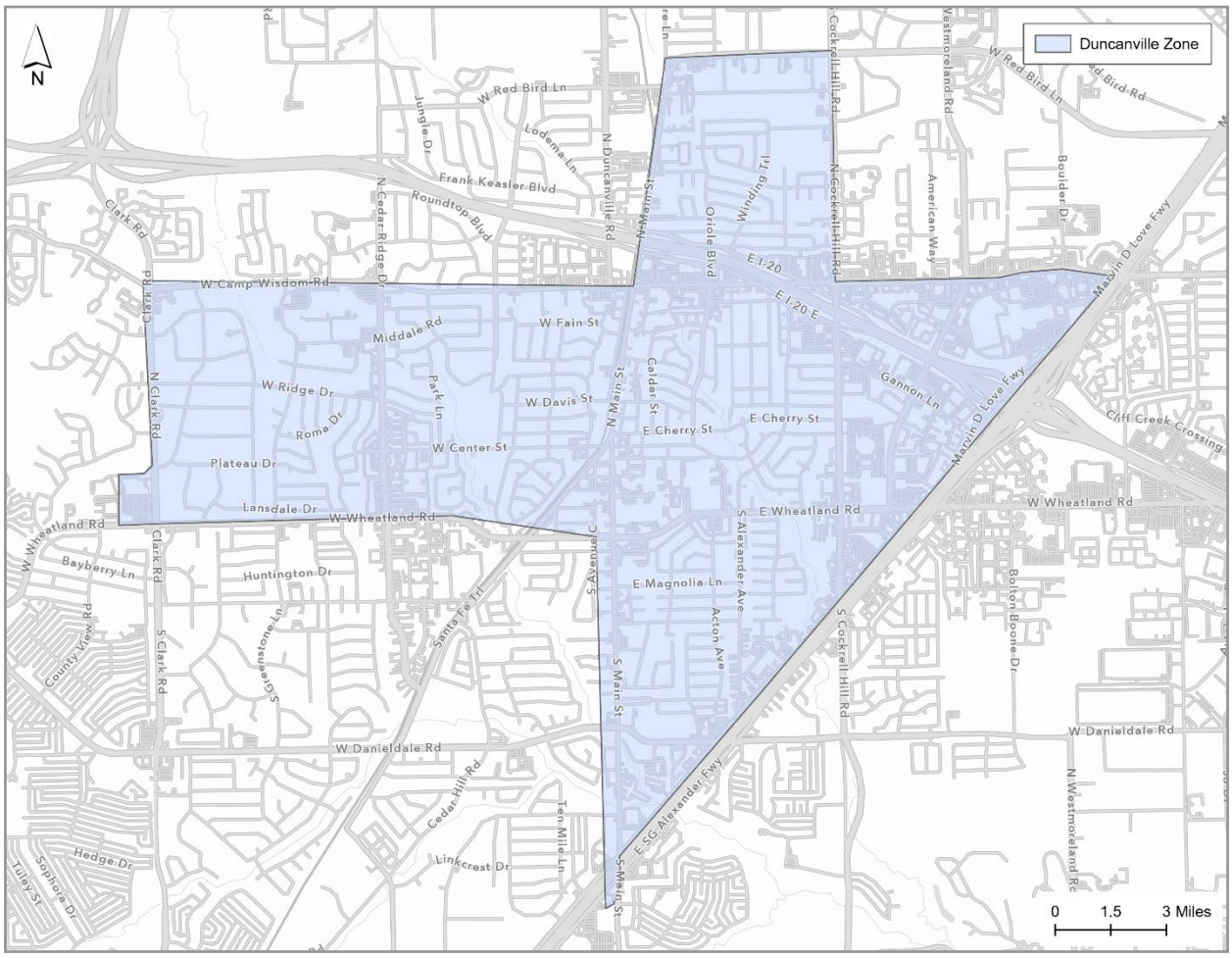


Figure 2-12: **Duncanville Zone** *Source: ATG*

Duncanville

The Duncanville Microtransit zone provides coverage to key market areas identified in earlier stages of the scenario development process, as well as connectivity to the US-67 Express and Wheatland I-20 fixed routes; in turn, the zone provides access to fixed routes which connect to downtown Dallas. The zone also provides connectivity to existing DART fixed route service found west of the city. Moreover, the proposed Duncanville Zone provided the greatest number of connections to key destinations for all zones and routes recommended in Phases 1 and 2.

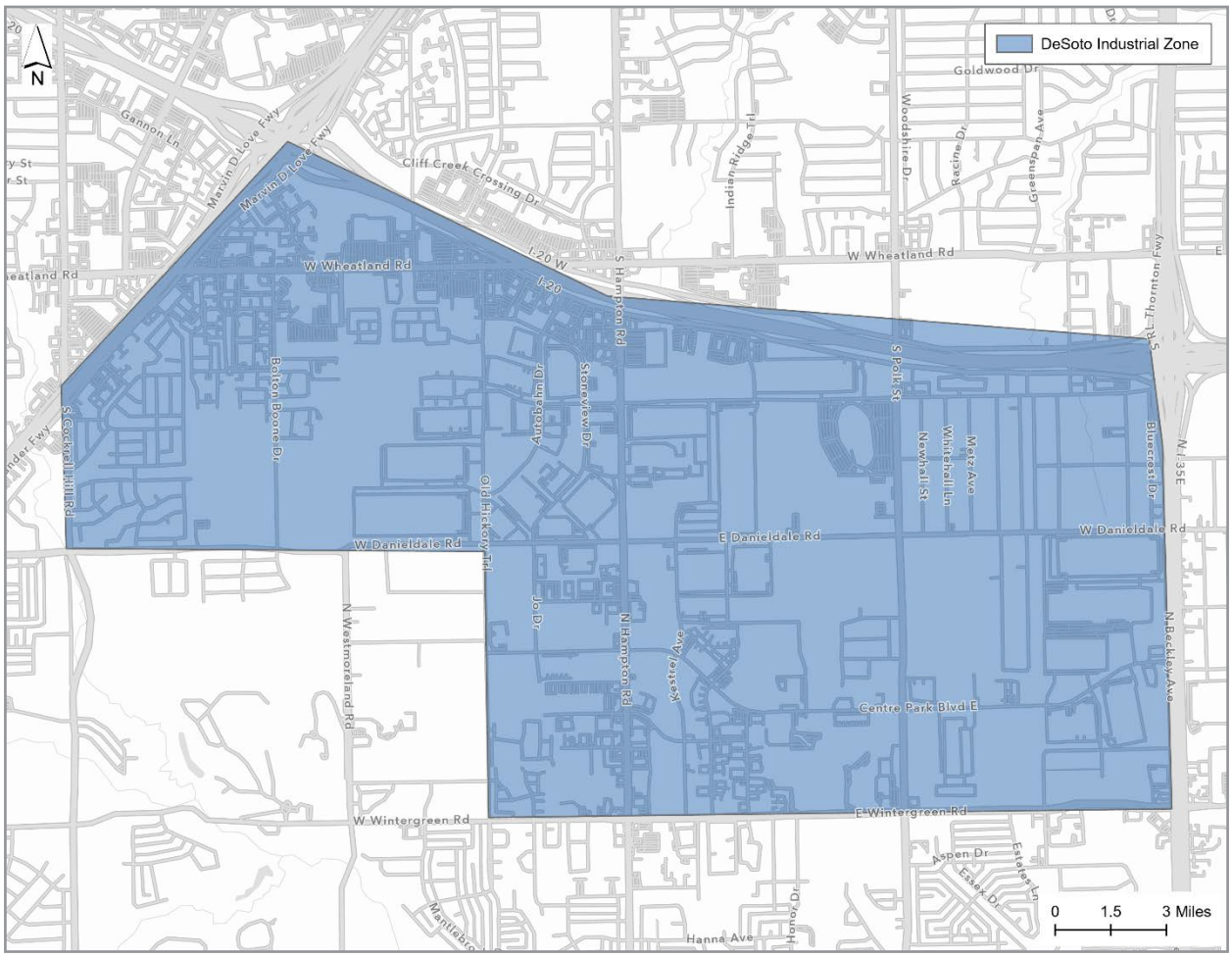


Figure 2-13: **DeSoto Industrial Zone** *Source: ATG*

DeSoto Industrial

The DeSoto Industrial Microtransit zone covers an area that was consistently flagged as a key market area throughout the planning process in both technical analysis and public/stakeholder input. The zone provides connectivity to the Wheatland I-20 and Hampton East fixed routes and covers major warehouse facilities and medical centers (i.e. Dallas Behavioral Healthcare Hospital, Methodist Rehabilitation Hospital, Hickory Trail Hospital, etc.). Community resources and major retail services that have also been identified as key destinations include the Kincaide Stadium, Sam's Club, and Walmart Supercenter.

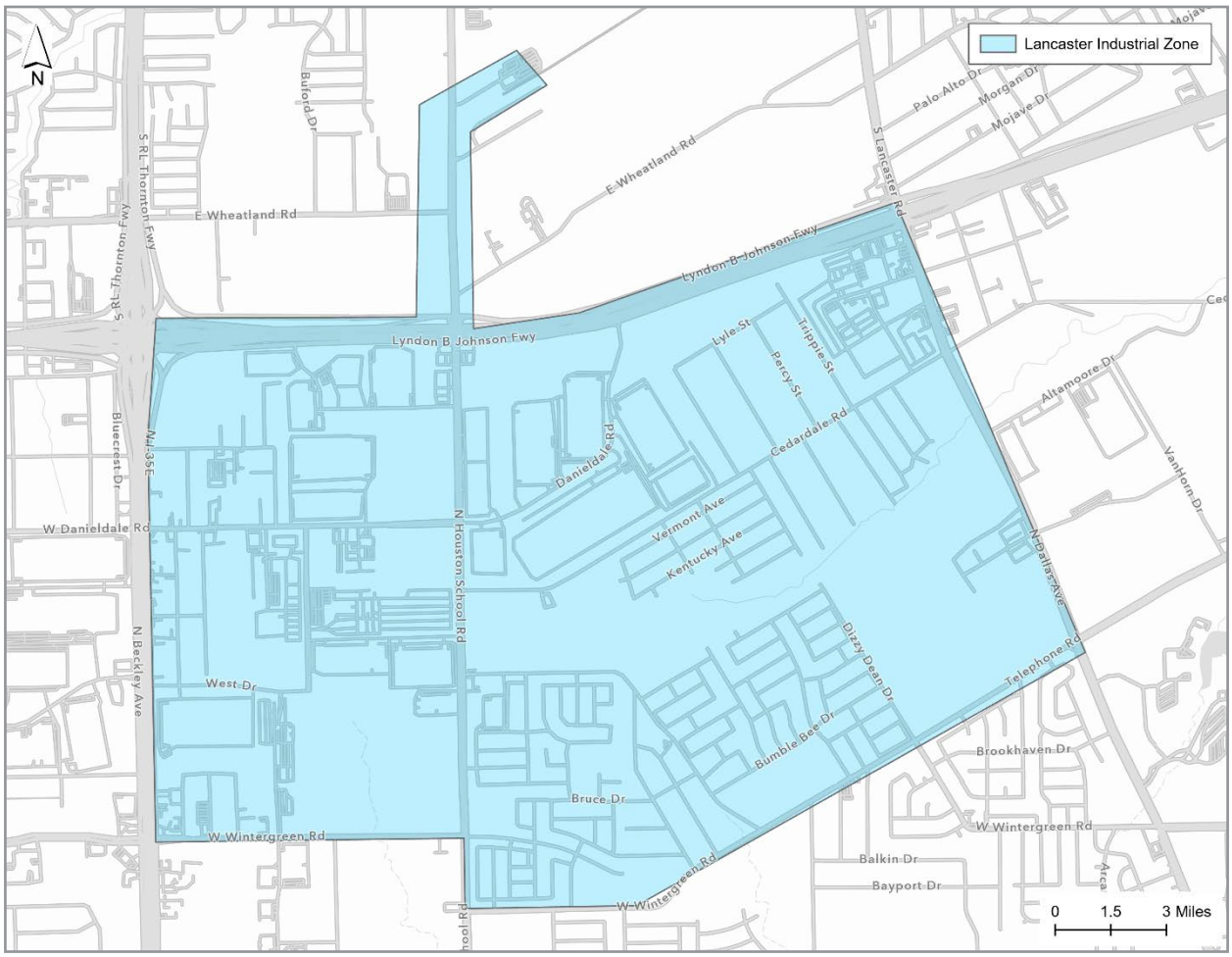


Figure 2-14: **Lancaster Industrial Zone** *Source: ATG*

Lancaster Industrial

This zone provides similar benefits as the DeSoto Industrial zone in that it provides connectivity to proposed fixed routes and covers areas containing large employment generators. The zone is also augmented by an existing DART transit route that serves Dallas College Cedar Valley Campus and the Cedardale Park & Complex, which serves as a major recreational arena/stadium.

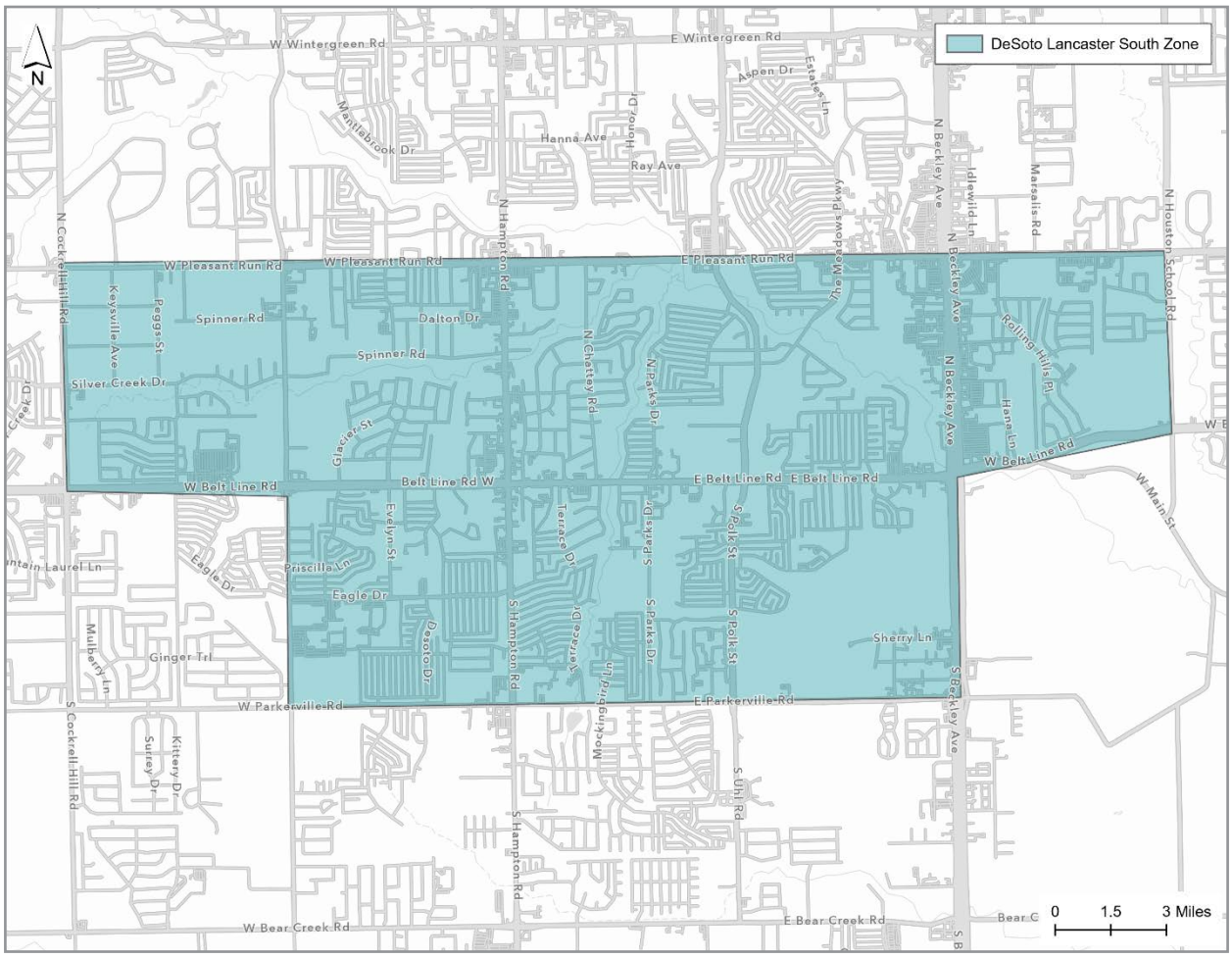


Figure 2-15: **DeSoto Lancaster South Zone**

Source: ATG

DeSoto/Lancaster South

The DeSoto/Lancaster South microtransit zone provides connectivity between the two cities and is anchored by DeSoto Walmart and Lancaster Fiesta Mart. Similarly, it provides essential connections to over ten multifamily apartment complexes within the zone, supporting local trips to commercial and residential areas. Additionally, it supplements the Hampton East fixed route, also proposed in Phase 1.

Phase 1 Transit Benefits

As the majority of the study area contains no existing transit service, the recommended alternative would provide numerous benefits in terms of coverage, travel time savings, and regional connectivity. The scenario provides direct access to regional transit center locations and provides local circulation within each community with microtransit. The recommendations are designed to improve access to jobs, medical services, schools/colleges, shopping and social services. Figure 2-16 displays the benefits provided by increased coverage from the proposed fixed routes and microtransit zones. The recommended alternative would provide coverage to roughly 116,000 residents, 51,000 jobs, 300 key destinations, and 80,000 transit-dependent persons. Further, each proposed fixed route and microtransit zone provides connectivity to existing regional transit service, increasing connectivity to areas outside of the study area.

	Wheatland I20 Route	Hampton East Route	US 67 Express Route	Cedar Hill Zone	DeSoto Lancaster South Zone	DeSoto Industrial Zone	Duncanville Zone	Lancaster Industrial Zone	Total
Existing Population	10,205	13,133	1,577	22,945	22,369	11,983	25,664	8,497	**116,373**
Existing Employment	5,705	4,487	345	5,326	7,627	15,597	8,864	3,236	**51,187**
Future Population	10,416	14,640	1,340	32,085	32,260	15,609	29,830	9,235	**145,414**
Future Employment	12,550	8,402	3,186	17,534	12,246	22,932	22,802	5,314	**104,966**
Key Destinations	37	29	4	37	38	38	102	19	**304**
Transit Dependent Population	7,367	9,634	1,270	14,139	14,206	8,959	18,797	4,652	**79,025**
Regional Connections	Fixed Route & HCT	Fixed Route & HCT	Fixed Route & HCT	Fixed Route & HCT	Fixed Route Only	Fixed Route & HCT	Fixed Route Only	Fixed Route & HCT	

Figure 2-16: **Benefits from Recommended Alternative**

Source: ATG

Title VI Analysis

Title VI of the Civil Rights Act of 1964 ensures that "no person in the United States shall, on the basis of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving Federal financial assistance." Although there is limited current transit service in the study area, this section will provide an initial assessment of conformity with Chapter IV of the FTA's Circular 4702.1B for future transit services in the area, with a focus on equity. The services recommended as part of the plan do not change the coverage and reach of mobility in the area; however, it is important moving forward that all future service changes conform to the Title VI standards. This section is not intended to be a complete Title VI analysis, instead it provides an overview of the services in relation to protected populations.

As shown in Figure 2-17, the Phase 1 recommended system provides coverage within each of the four cities to most low income population areas. Currently, areas of low income population in south and east Lancaster have service through the Inland Port TMA.

An assessment of minority populations in the study area show that all areas with the highest population of Hispanic or Latino and African American populations are within close proximity of Phase 1 transit service other than areas of south DeSoto and east Lancaster.

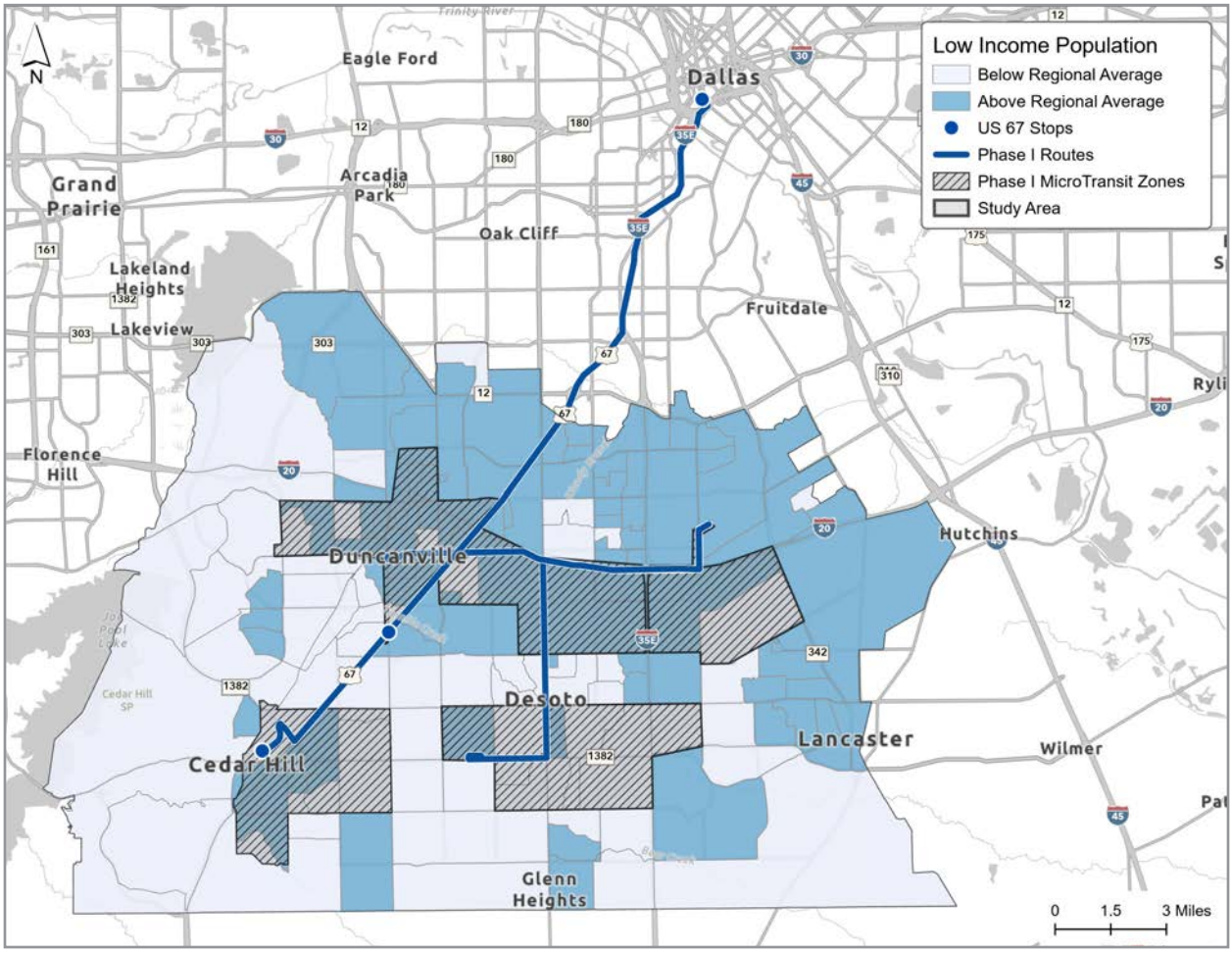


Figure 2-17: **Low Income Population**

Source: NCTCOG EJ Layer (2019)

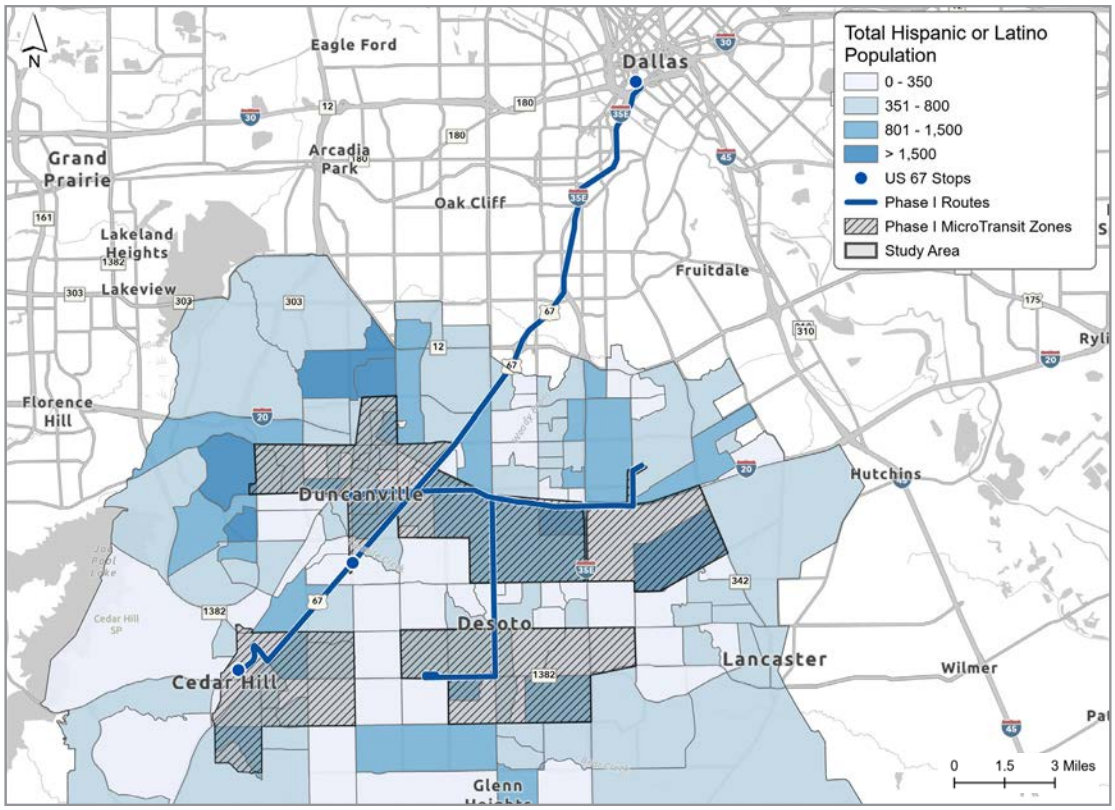


Figure 2-18: **Total Hispanic or Latino Populations** *Source: NCTCOG EJ Layer (2019)*

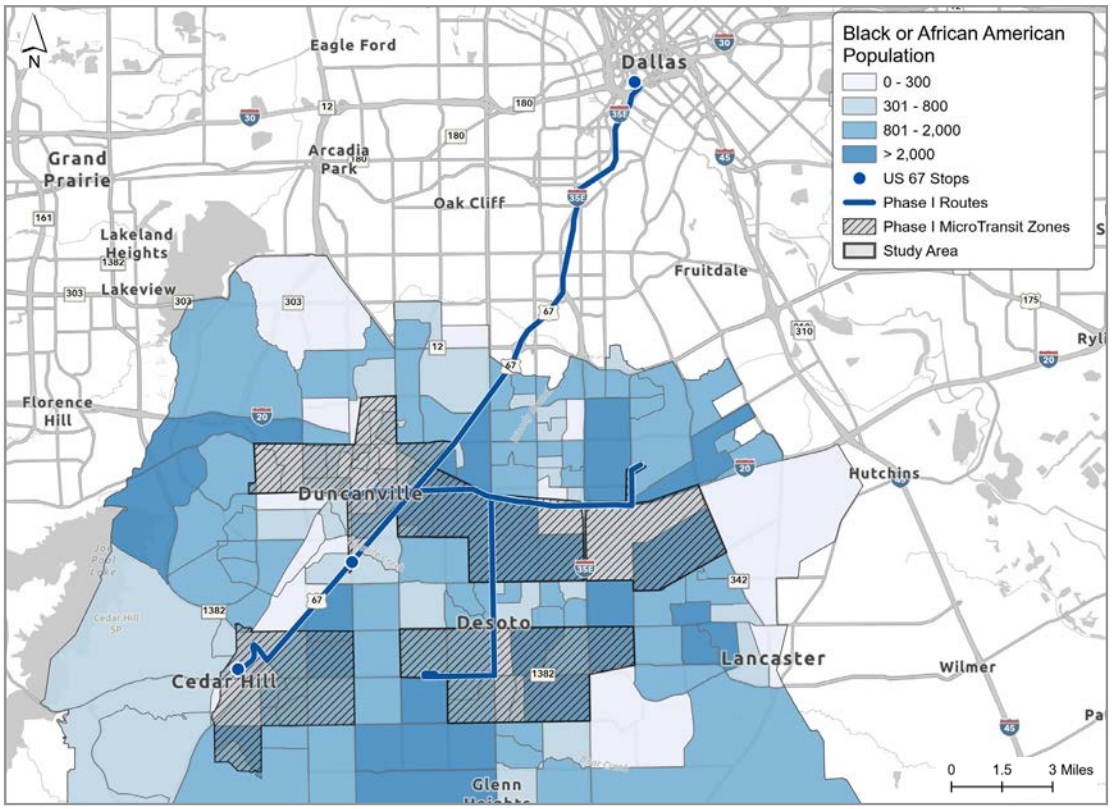


Figure 2-19: **Total Black and African American Population** *Source: NCTCOG EJ Layer (2019)*

2.3.2. Ridership Forecasting

Recommended fixed route alternatives were coded into the NCTCOG Travel Demand Model (TDM) according to NCTCOG instructions. The routes were coded using TransCAD 5 r2 Build 1730. Hampton East and Wheatland I-20 were coded as local bus service with headways of 75 minutes and 60 minutes, respectively. The US-67 Express was coded as express bus service with a 90 minute headway. The ridership estimates for these three routes are depicted in **Table 2-3** below. The model estimates 342 weekday daily ridership for the Wheatland I-20 route, which is the highest of the three recommended routes.

The stops and estimated weekday daily ridership on the Hampton East route are presented in **Table 2-4** and **Figure 2-20**. About 90 weekday daily riders (28% of the total weekday daily ridership) on the Hampton East route is estimated at the UNT Dallas Station, which suggests that this route would act as a major connection between UNT Dallas and DeSoto. The ridership at the UNT Dallas Station is estimated to be transfer related. The stop at Hampton Road and Hanna Avenue accounts for about 58 weekday daily riders (18% of the total weekday daily ridership), as this stop would serve the residential neighborhoods on both sides of Hampton Road.

Route	Walk On/Off	Transfer On/Off	Total On/Off
Hampton East	183	138	321
Wheatland I-20	181	161	342
US-67 Express Route	24	22	46

Table 2-3: **NCTCOG TDM Weekday Daily Ridership Estimates** *Source: ATG (2021)*

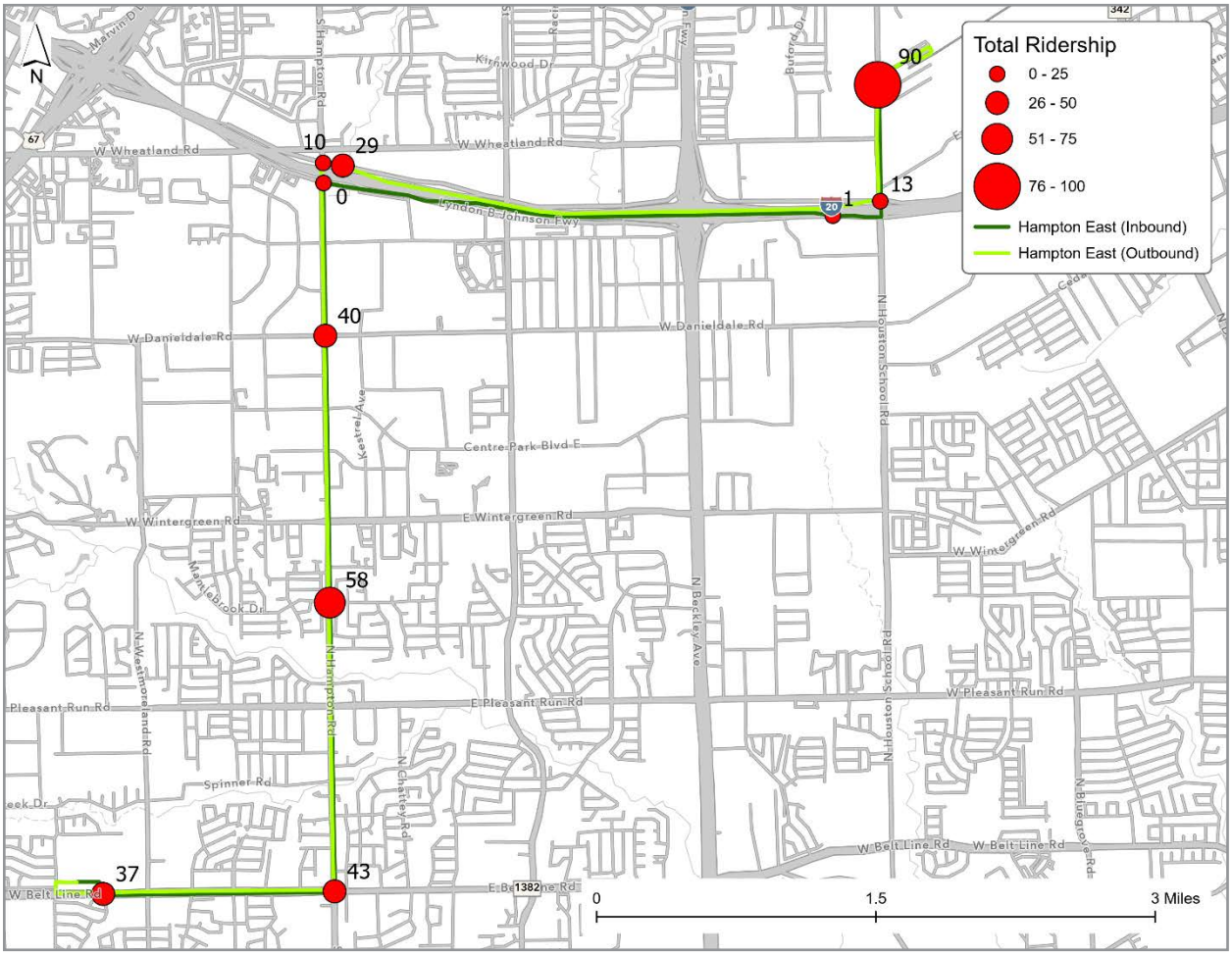


Figure 2-20: **Estimated Total Weekday Daily Ridership – Hampton East Route** *Source: ATG (2021)*

Location	Walk On/Off	Transfer On/ Off	Total On/Off	Percent of Total Ridership
W Belt Line Rd at S Westmoreland Rd	34	3	37	11.5%
W Belt Line Rd at Hampton Rd	39	4	43	13.4%
Hampton Rd at Hanna Ave	58	0	58	18.1%
S Hampton Rd at E Danieldale Rd	29	11	40	12.5%
S Hampton Rd at I-20 EB Frontage Rd	6	23	29	9.0%
I-20 EB Frontage Rd at University Hills Blvd	1	0	1	0.3%
UNT Dallas Station	0	90	90	28.0%
I-20 WB Frontage Rd at University Hills Blvd	13	0	13	4.0%
At I-20 WB Frontage Rd	0	0	0	0.0%
Hampton Rd at I-20 WB Frontage Rd	3	7	10	3.1%
Total	183	137	321	100.0%

Table 2-4: **Hampton East Estimated Ridership by Stop** *Source: ATG (2021)*

Figure 2-21 and Table 2-5 depict the stops and estimated weekday daily ridership for the Wheatland I-20 route. The stop at E Wheatland Road and S Main Street near the Duncanville City Hall accounts for about 110 weekday daily riders (32% of the total weekday daily estimated ridership) on the Wheatland Road I-20 route. Since this route provides important connectivity between the medical district, residential, and commercial areas along W Wheatland Road, the stop at W Wheatland Road at S Westmoreland Road has about 63 weekday daily riders (18% of the total estimated weekday daily ridership). A majority of the ridership at this stop is transfer related.

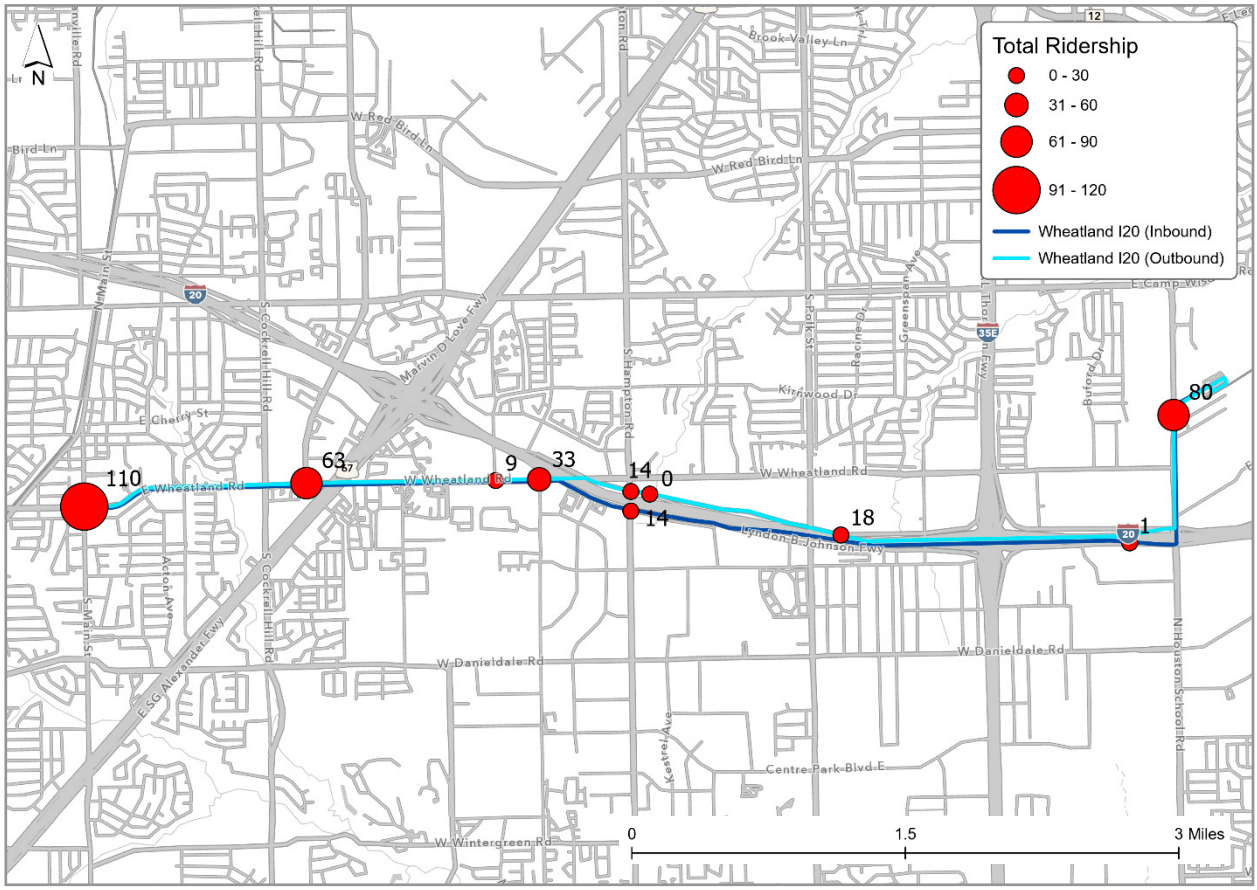


Figure 2-21: **Estimated Total Weekday Daily Ridership – Wheatland I-20 Route** *Source: ATG (2021)*

Location	Walk On/Off	Transfer On/ Off	Total On/Off	Percent of Total Ridership
E Wheatland Rd at S Main St	110	0	110	32.2%
W Wheatland Rd at S Westmoreland Rd	5	58	63	18.4%
W Wheatland Rd at E Kirnwood Dr	7	2	9	2.6%
W Wheatland Rd at Old Hickory Trail	32	1	33	9.6%
S Hampton Rd at I-20 EB Frontage Rd	6	8	14	4.1%
I-20 EB Frontage Rd at University Hills Blvd	1	0	1	0.3%
UNT Dallas Station	0	80	80	23.4%
I-20 WB Frontage Rd at S Polk St	18	0	18	5.3%
At I-20 WB Frontage Rd	0	0	0	0.0%
S Hampton Rd at I-20 WB Frontage Rd	2	12	14	4.1%
Total	181	161	342	100.0%

Table 2-5: **Wheatland I-20 Estimated Ridership by Stop** *Source: ATG (2021)*

The US-67 Express route establishes fast connectivity between Cedar Hill and downtown Dallas. The stop at S Main Street and Silver Creek Drive serves the residential and commercial areas on either side of US-67 in the Cedar Hill area and accounts for 26 weekday daily riders (about 45% of the total weekday daily estimated ridership). Estimated total daily ridership by stop for the US-67 Express route is presented in **Figure 2-22** and **Table 2-6**.

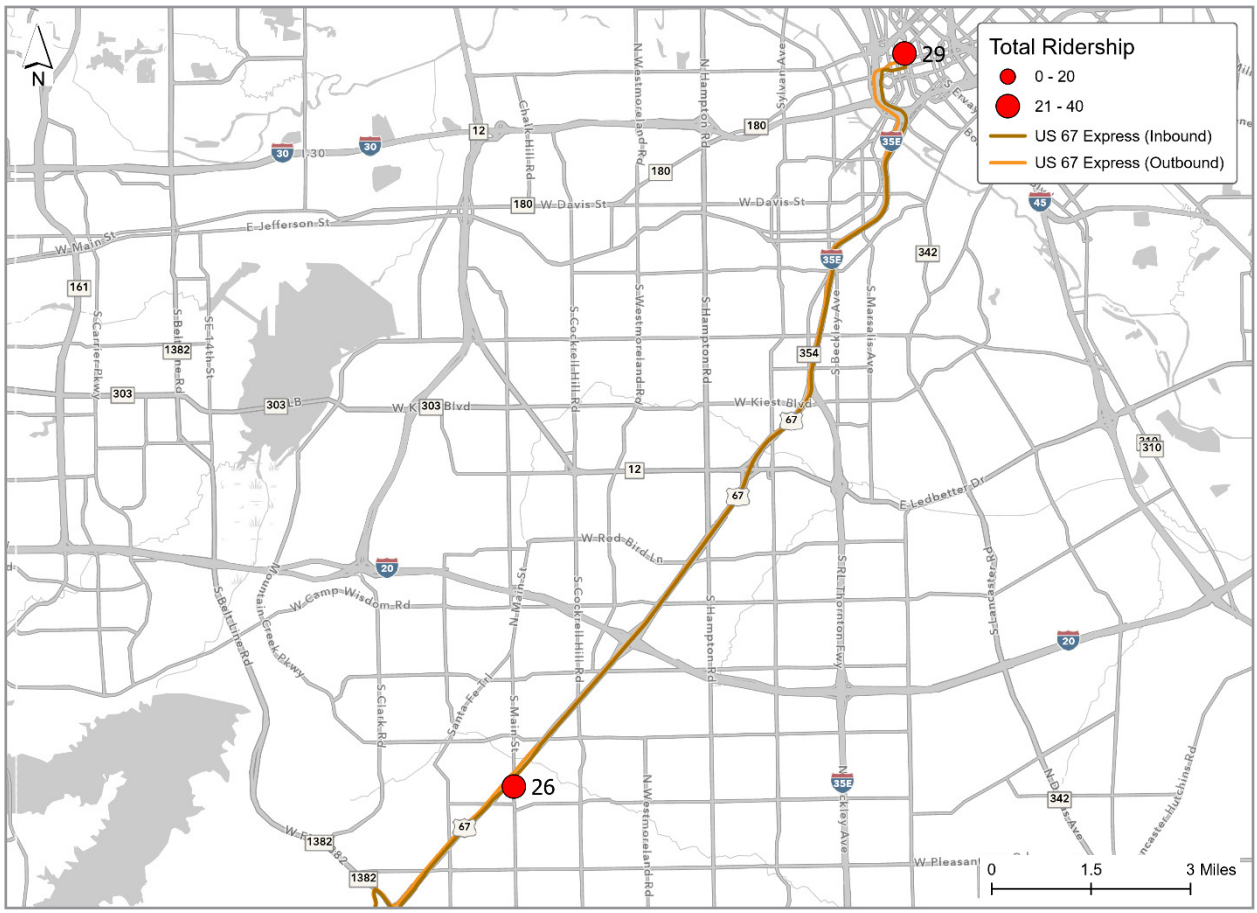


Figure 2-22: **Estimated Total Weekday Daily Ridership – US-67 Express Route** *Source: ATG (2021)*

Location	Walk On/Off	Transfer On/ Off	Total On/Off	Percent of Total Ridership
W Belt Line Rd at Uptown Blvd	3	0	3	5.2%
S Main St at Silver Creek Dr	26	0	26	44.8%
Dallas Downtown Convention Center	4	25	29	50.0%
Total	33	25	58	100.0%

Table 2-6: **US-67 Express Estimated Ridership by Stop Stations** *Source: ATG (2021)*

Microtransit

Ridership estimates for the proposed microtransit zones were based off available ridership data for three existing microtransit zones:

- Inland Port (GoLink)
- Mesquite (STAR Transit)
- Terrell/Kaufman (STAR Transit)

The Inland Port GoLink is a 120 square mile microtransit zone operated by DART GoLink, which serves the UNT Dallas Station, providing crucial connection between DART rail and bus routes. Mesquite is a 18.6 square mile microtransit zone operated by STAR Transit. It serves the DART Lake Ray Hubbard Transit Center (6151 Duck Creek Dr), Eastfield College (3737 Motley Dr) and Hanby Stadium (410 East Davis St), connecting riders to DART rail and bus services. Terrell/Kaufman is a 14.3 square mile microtransit zone operated by STAR Transit that travels between Terrel and Kaufman. For this zone, it is important to note that while service can travel between Terrell and Kaufman, pick-up and drop-off points must be within the designated travel zones.

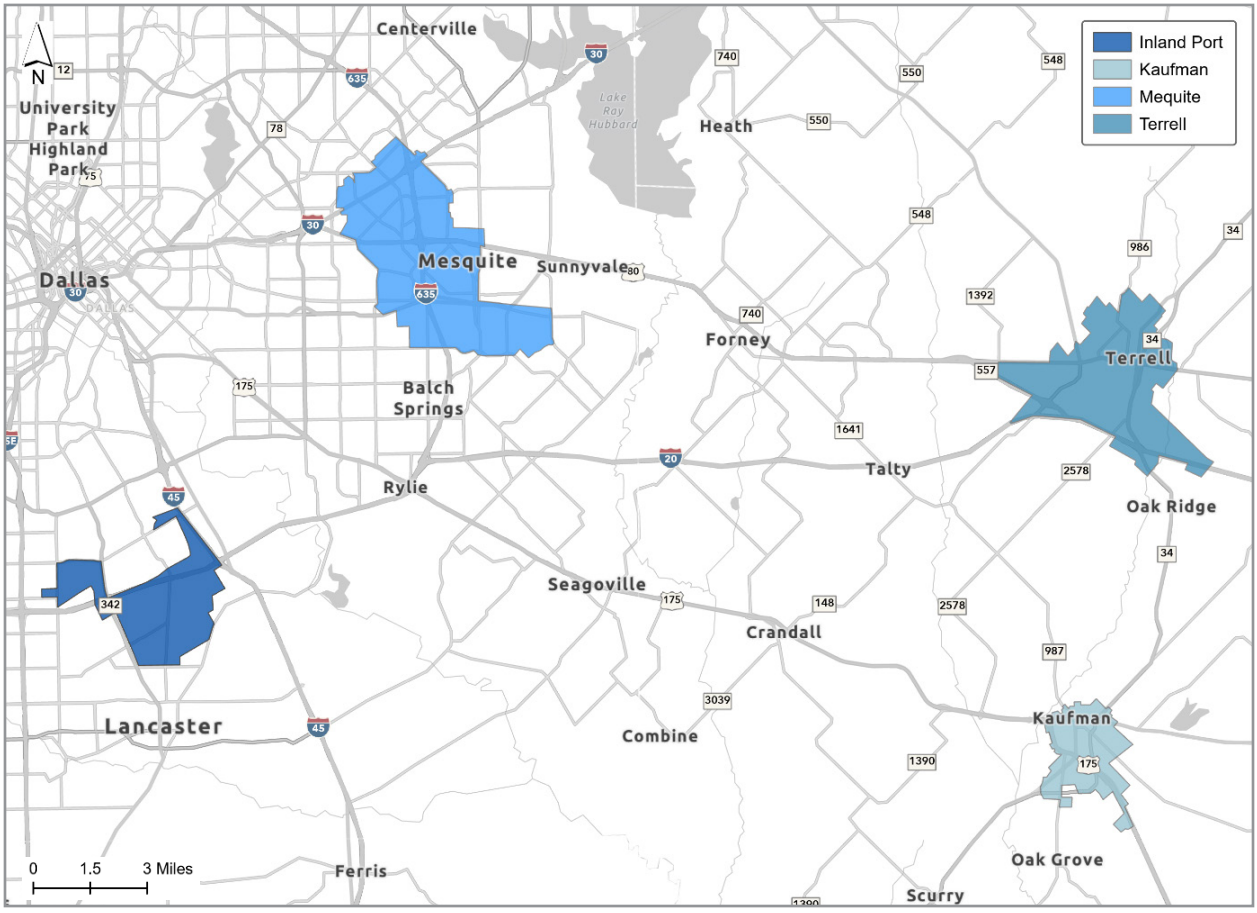


Figure 2-23: **Existing Microtransit Zones** *Source: ATG (2021)*

Location	Average Ridership	Population	Employment	Retail Emp.	Service Emp	HH with <$25k Income	HH <$25K Density	Connect to DART Rail	Employment Density (per SqMile)
Inland Port	54	1,254	1,083	184	158	96	14	Yes	156
Mesquite	8	76,941	31,467	6,253	19,939	4,578	262	No	1,800
Terrell	14	9,720	7,542	620	2,912	871	93	No	806
Kaufman [1]		8,657	3,295	514	2,119	617	115	No	614

Table 2-7: **Basic Demographics Information of Existing Microtransit Zone** *Source: ATG (2021)*

Since there are only three observed average ridership estimates available, the estimates of potential microtransit zone ridership are done by investigating the existing microtransit zone characteristics and identify factors that may contribute to the microtransit zone ridership and formulate reasonable assumptions on the potential ridership.

Using 2019 ACS 5-Year block group level population and household income data, and 2018 Longitudinal Employer-Household Dynamics (LEHD) Origin-Destination Employment Statistics (LODES) worker at the place of work block level data, a broad picture of the microtransit zones is summarized first.

Table 2-7 does not indicate there is clear pattern between average weekday daily microtransit zone ridership and the microtransit zone's demographics. A qualitative aerial assessment was done to identify similarities between the existing microtransit zones. Inland Port has the most transit ridership, but the higher ridership does not link to higher low-income households or high employment density. This microtransit zone provides access to the DART Blue line and the Amazon facility, which may potentially bring in microtransit riders from outside of the zone. The STARNow Mesquite zone, a microtransit service by STAR Transit, only serves limited destinations and does not have direct access to DART rail line. This zone has the least ridership. The STARNow Terrell zone allows for the travel between Terrell and Kaufman, which may partially explain a slightly higher ridership than the Mesquite microtransit zone ridership.

Based on the observations above, it is assumed that the primary function of existing microtransit zones in this area is targeted to three types of customers: low-income riders, people who use another mode of transportation within 30 minutes of their place of work, and those connecting to an existing DART rail service. To estimate total ridership for the proposed microtransit zones, average ridership per work for these target groups was estimated using existing ridership figures, ACS data, and LEHD employment data.

First the number of workers within the microtransit zone was estimated by applying a ratio of people currently in labor force to zone's total population. Then employees who work within 30 minutes and employees who use other modes of transportation (taxis, bicycle, etc.) were estimated using ACS travel data at the county level.

To obtain an average ridership per low-income household, the total ridership in Mesquite and Terrell was divided by the total number of low income households (<$25k) in the zones.[2]

To obtain the average ridership for workers who used another mode of transportation within 30 minutes of their destination, the total number of riders from low-income households was subtracted from the total ridership for Mesquite and Terrell. It was assumed that this number represents those who use the service and are not from a low-income household.[3] The remainder is then divided by the total workers taking other modes (taxis, carpooling, bicycling, etc.) within 30 minutes, to get an average ridership per worker that are currently using other modes within 30 minutes.[4]

Existing Inland Port ridership was used to estimate the average number of riders that can be attributed to DART rail and are pulled outside the zone. After removing ridership due to low-income households and local workers taking other modes, the remaining ridership can be attributed to the DART rail line. It is estimated about 0.07 microtransit riders per workers that pulled from the other areas.

[1] *Ridership for the Kaufman microtransit zone is not available. Since STAR Transit now allows travel between Terrell and Kaufman, Kaufman data is listed here for reference*
[2] *0.004 rider per low income household*
[3] *Note, Mesquite and Terrell do not have an existing connection to DART rail line, therefore after removing those who use the service due to financial constraints (low income households) the only target remaining would be those who actively participate in carpooling, taxi pool services, bicycling, etc*
[4] *0.24 ridership per worker that are using other mode within 30 min*

MicroTransit Zone	Population	Employment	HH with Income <$25k	Connect to DART Rail
Cedar Hill	21,851	4,441	874	No
DeSoto Industrial	10,383	14,139	1,813	No
DeSoto Lancaster South	22,850	7,069	936	No
Duncanville	25,158	7,653	2,556	No
Lancaster Airport	22,575	2,924	1,577	No
Lancaster Industrial	7,908	3,115	194	Yes

Table 2-8: **Proposed Microtransit Zone Summary** *Source: US Census Bureau (2019-2013), LEHD (2018)*

Southern Dallas County Zone	Ridership from low-Income HH	Ridership from TaxiCab Pool	Ridership from Connection to DART Rail	Total Ridership
Cedar Hill	4	24	-	28
DeSoto Industrial	8	12	-	19
DeSoto Lancaster South	4	25	-	29
Duncanville	11	28	-	39
Lancaster Airport	7	25	-	32
Lancaster Industrial	1	9	72	82

Table 2-9: **Estimated Microtransit Zone Average Weekday Daily Ridership** *Source: US Census Bureau (2019-2013)*

Zone	Observed Average Ridership	Estimated Ridership
Inland Port GoLink Service Area	54	54
Mesquite*	8	105
Terrell	14	14

Table 2-10: **Estimated vs. Observed Ridership for Existing Microtransit Zones**
Source: US Census Bureau (2019-2013), COG (2018)

Table 2-8 shows the zonal demographics for the proposed microtransit zone based on 2019 ACS population and household data and 2018 LEHD LODES place of work data.

Table 2-9 shows the estimated average weekday daily microtransit ridership after applying the estimated average ridership for low-income household, workers taking other modes, and DART rail connectors to total number of low income households, workers currently taking other modes that are less than 30 min long, and potential number of workers from outside the area, respectively. As a validation check, the estimated ridership of the existing zones are presented in **Table 2-10** using the ridership rates discussed above. Note that Mesquite microtransit only provides service to a limited number of destinations and is not fully comparable. The estimated 105 riders per day reflects a scenario where STARNow offers full service within the Mesquite area.

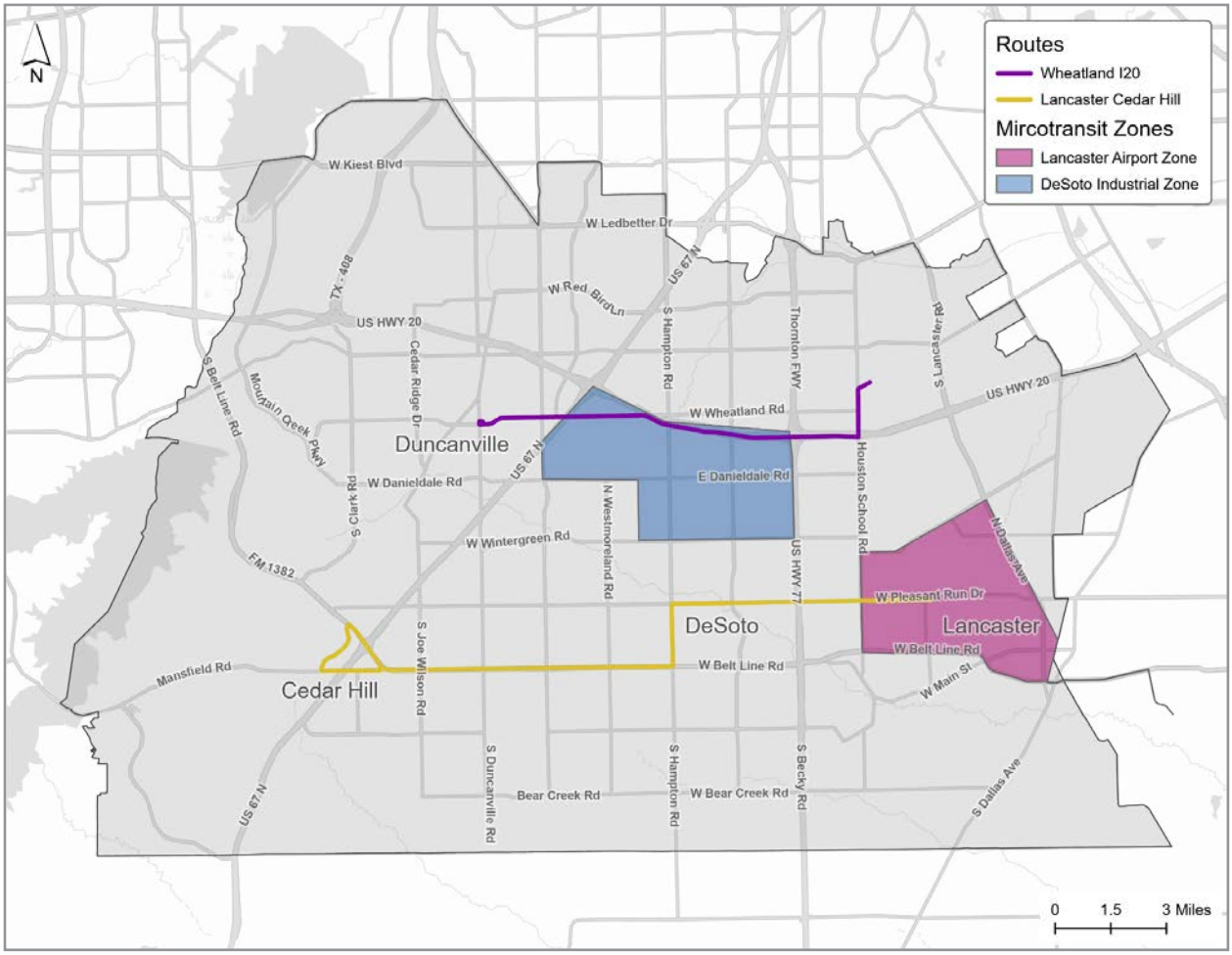


Figure 2-24: **Phase 2 Implementation Routes and Microtransit Zones** *Source: ATG*

2.3.3. Phase 2 (5-10 Years)

Phase 2 focuses on reinvesting in the core service of Phase 1 and expanding coverage through the addition of a new fixed route and microtransit zone (Figure 2-24). Connections to new regional nodes such as Westmoreland Station were evaluated. Due to the overlap of service by DART and the direct connections to DART services in downtown Dallas on the Phase 1 Express route, the Westmoreland Station connection was not recommended for Phase 2. Phase 2 recommendations should be reevaluated prior to implementation, using data from Phase 1 service to understand how the community is using the new transit service. The following metrics should be evaluated to inform and prioritize Phase 2 recommendations:

- **Ridership:** understanding the boarding and alighting data of the existing system will reveal the most productive and utilized segments/areas of the routes and zones.
- **Travel Patterns:** conducting an origin and destination survey will allow the cities to understand how the community is using transit to move through the network and what routes and zones share relationships or dependencies.
- **Cost:** the cities need to determine the cost per passenger to set a baseline for service.
- **On-Time Performance:** understanding if buses are running on time, late or early will allow the cities to optimize service, increase efficiency, improve reliability, and make more accurate assumptions when expanding new service in the area.

Using all available data possible the cities should reevaluate the draft Phase 2 recommendations prior to implementing and make adjustments as necessary

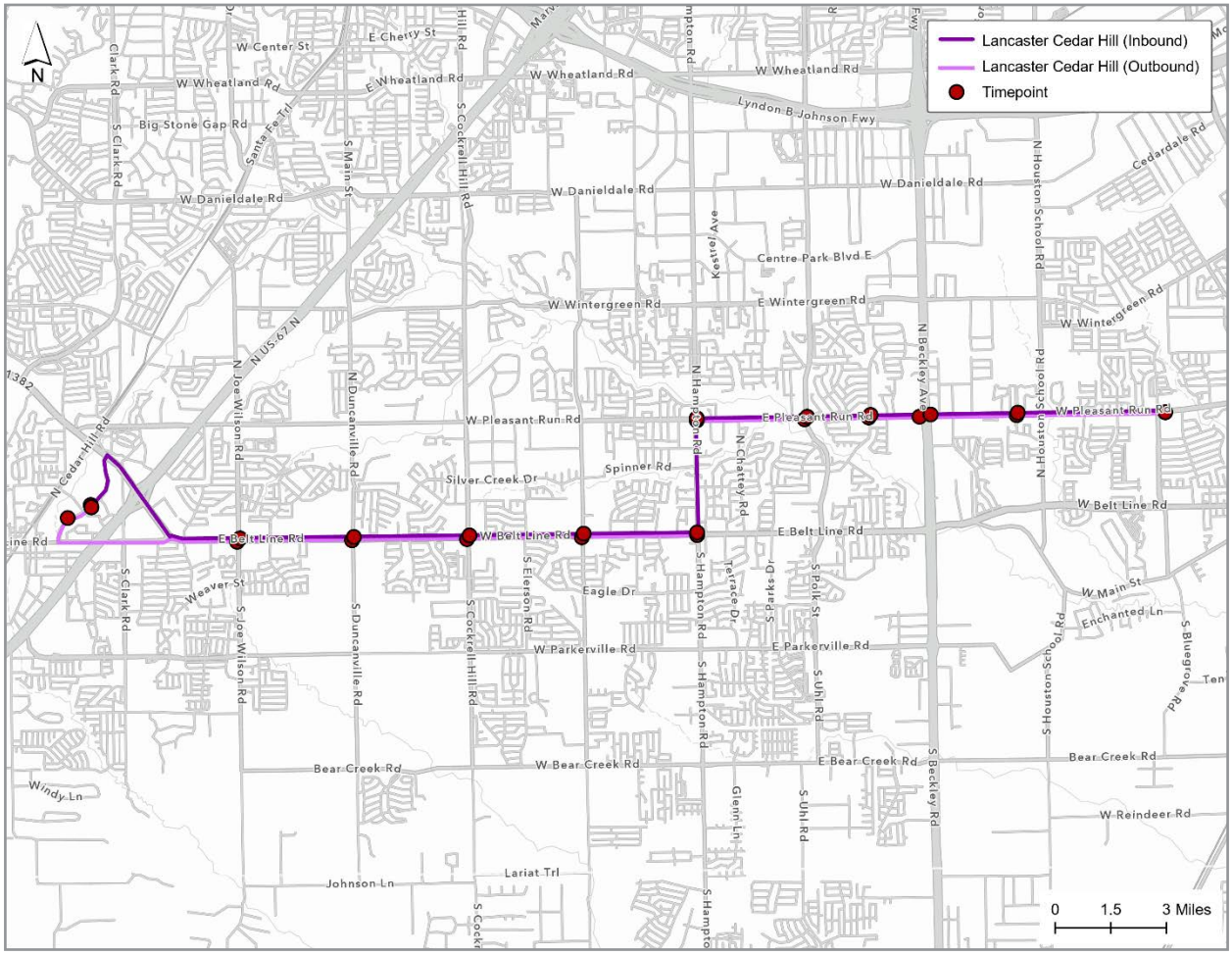


Figure 2-25: **Lancaster Cedar Hill** *Source: ATG*

Fixed Routes

Lancaster Cedar Hill

The Lancaster Cedar Hill Route runs primarily along E Belt Line Road and E Pleasant Run Road between the cities of Cedar Hill and Lancaster. This route provides an East-West connection across the study area to approximately 75 key destinations including multifamily residential areas, grocery stores and community resources—such as the DeSoto Public Library, Zula B. Wylie Public Library, and Crescent Medical Center.

Wheatland I-20

The Wheatland I-20 route was the highest-ranking fixed route among all the recommendations from the prioritization process used in Phase 1. This route serves over 35 key destinations and would provide service to ~ 7,000 transit dependent persons. Phase 2 would call for adding an additional bus to this route allowing it to operate at a 30-minute headway.

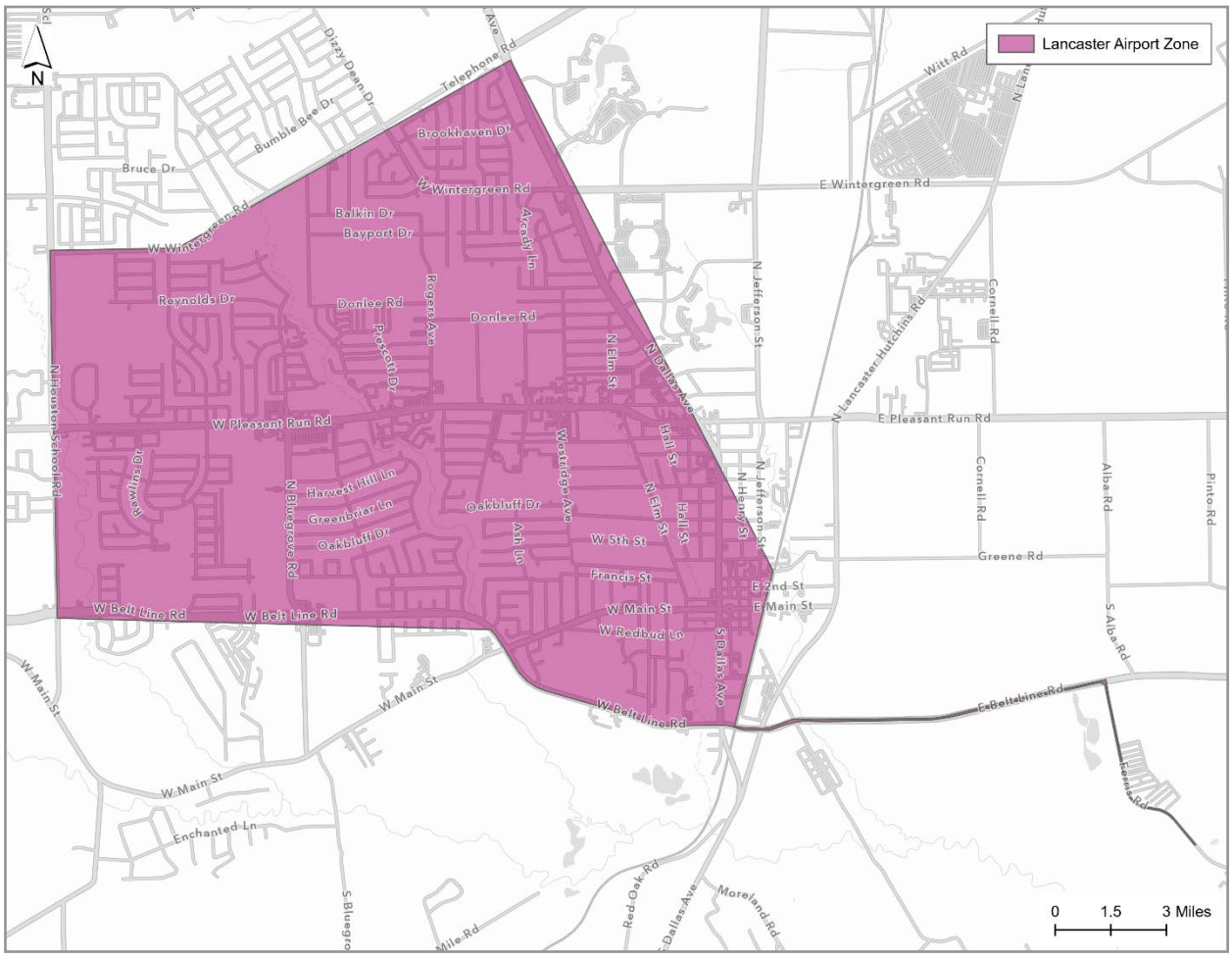


Figure 2-26: **Lancaster Airport Zone** *Source: ATG*

Microtransit Zones

Lancaster Airport Zone

The Lancaster Airport microtransit zone provides connectivity between the city of Lancaster and Lancaster Airport. Note that this area would connect to the proposed Lancaster Cedar Hill route. The Lancaster Airport Zone would also support connectivity between Phase 1 Zones, such as the DeSoto Lancaster South and the DeSoto Industrial Zone. This would allow for direct connections with UNT Dallas Station.

DeSoto Industrial Zone

The DeSoto Industrial Zone was the highest ranking microtransit zone from the prioritization analysis used in Phase 1. Phase 2 calls for adding an additional bus to this zone which would greatly improve the Microtransit zone response time to improve connectivity to the existing fixed routes, the medical district near I-20 and residential areas within the zone.

2.3.4. Phase 2 Transit Benefits

A majority of the study area contains no existing transit service, the recommended alternative would provide numerous benefits in terms of coverage, travel time savings, and regional connectivity. Figure 2-27 displays the benefits provided by increased coverage from the proposed fixed routes and microtransit zones. Phase 2 builds on the service from Phase 1 and adds service to the growing employment center in east Lancaster near the airport, and new service that provides east-west connections between the cities. The recommended alternative would provide coverage to roughly 40,000 residents, 8,000 jobs, 145 key destinations, and 27,000 transit-dependent persons. Further, each proposed fixed route and microtransit zone provides connectivity to existing regional transit service, increasing connectivity to areas outside of the study area.

	Lancaster Cedar Hill Route	Lancaster Airport Zone	Total
Existing Population	18,290	21,599	**39,889**
Existing Employment	4,960	2,558	**7,518**
Future Population	24,968	25,660	**50,629**
Future Employment	14,787	6,098	**20,885**
Key Destinations	75	70	**145**
Transit Dependent Population	12,083	14,706	**26,789**
Regional Connections	Fixed Route Only	Fixed Route Only	

Source: ATG

Figure 2-27: **Benefits from Recommended Alternative**

2.3.5. Accessibility Improvements with Implementation

As new transit services are introduced to the study area where the majority of it contains no existing transit service, attention should be given to existing conditions for sidewalks, shelters, signages, traffic signals and roadway crossings, considering first-and-last-mile accessibility for pedestrians and for transit users with mobility assistance devices (e.g. wheelchairs). The following locations are identified as areas of focus where pedestrian access improvements may be needed in conjunction with the implementation of Phase 1 and 2 routes and services. Priorities and needs for implementing pedestrian access improvements at the following identified locations should be evaluated as the transit system matures and service implementation progresses to the next phases. Figure 2-28 illustrates the identified areas of focus for initial accessibility improvements.

Duncanville

- **US-67 Express Stop:** implement sidewalk improvements around the proposed stop for the Express route, focusing on pedestrian accessibility to the proposed stop. Consider consolidating driveway access and curb-cuts on Main Street between downtown Duncanville and the proposed stop near Costco.
- **Wheatland Road:** close sidewalk gaps along Wheatland Road and install signalized pedestrian crossings, ensuring regular interval of crosswalks throughout the street.

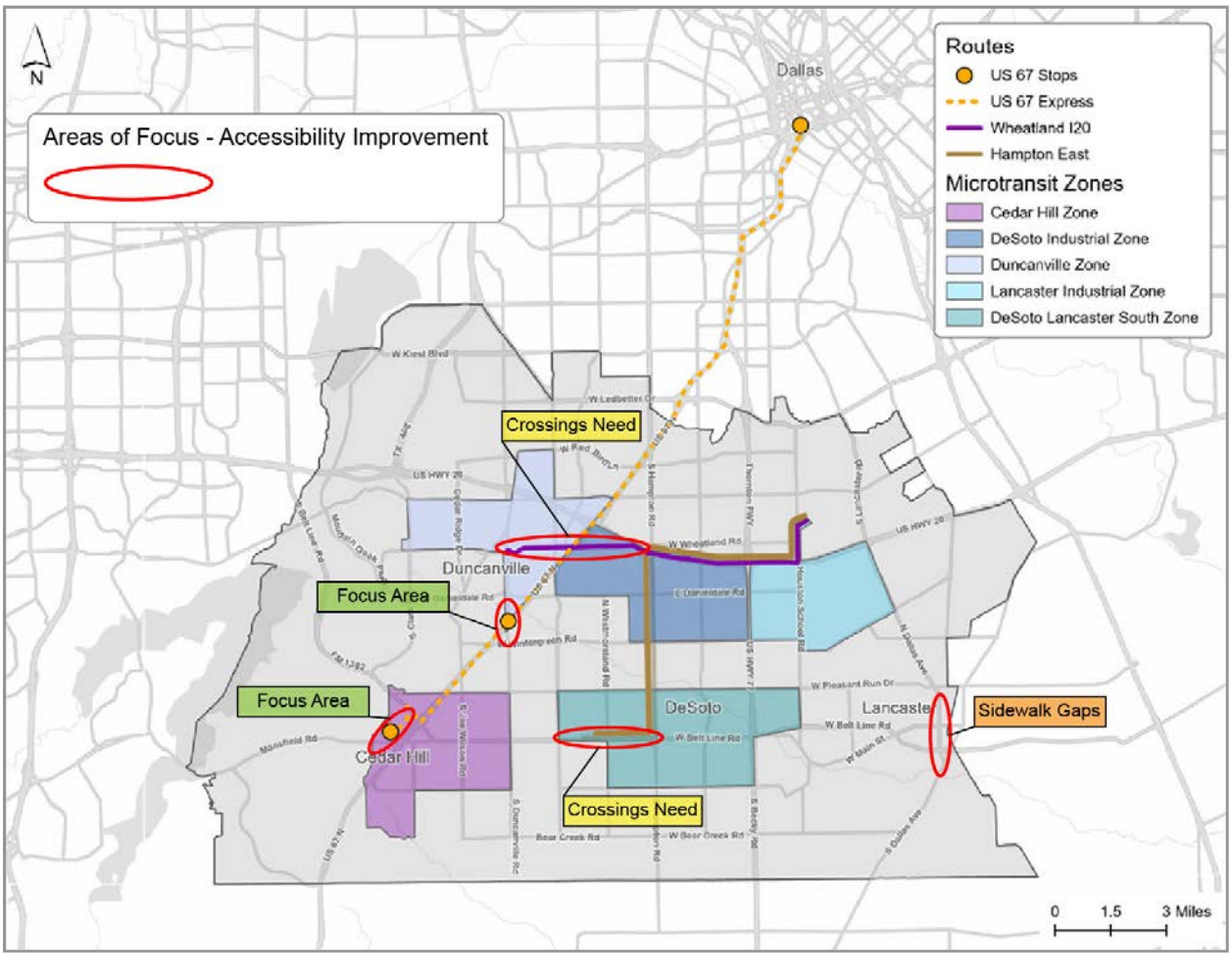


Figure 2-28: **Areas of Focus – Accessibility Improvement** *Source: AECOM/Google Earth*

DeSoto

- **Beltline Road:** implement crossing improvements (e.g. signalize existing crosswalks, paint and mark crosswalk boundaries, and install detection and warning devices for motorists as needed). Install additional crosswalks on Beltline Road. Close sidewalk gaps on the west side of Westmoreland.
- **Hampton Road:** install additional crosswalks on Hampton Road, ensuring regular interval of crosswalks throughout the street.

Lancaster

- **Downtown Lancaster:** leverage existing sidewalk coverage near Town Square and along Main Street, and on parts of Dallas Avenue. Implement targeted spot improvements and pavement repairs focusing on pedestrian and wheelchair accessibility. Close the sidewalk gaps on the eastside of South Dallas Avenue.

Cedar Hill

- **City Hall Stop:** consider the non-arterial residential and commercial streets near downtown Cedar Hill with narrow right-of-way for comprehensive sidewalk conditions review and targeted pedestrian-focused pavement improvements. Also consider additional crossing improvements near US-67 and West Belt Line Road, to better serve the proposed bus stop for the US-67 Express route.
- **Future Downtown Cedar Hill Rail Station:** future-proof pedestrian accessibility by assessing potential sidewalk gaps crossing the rail tracks, with particular focus on the southside of West Belt Line Road.

2.3.6. Phase 3 (11 – 20 Years)

Phase 3 is a long-range service plan that includes targeted zones for future transit service between years 11 and 20 of the plan. The goal of Phase 3 is to further improve the system by extending service to new growth markets including planned passenger rail stations in Cedar Hill and Duncanville. In addition, Phase 3 includes new transit service to future employment growth in the Inland Port area in the cities of Lancaster and DeSoto. **Figure 2-29** shows the areas of focus for new transit in Phase 3.

Figure 2-29: **Phase 3 Focus Areas** *Source: ATG*

2.3.7. Connections to Future High Capacity Transit

Recent transit studies by NCTCOG and DART have included plans for two new commuter rail lines that would extend through the study area. The Midlothian Corridor includes planned stations in Cedar Hill and Duncanville and the Waxahachie Corridor includes a station in Lancaster. Phase 3 will build on the services implemented during previous phases with a focus on improving connections and transit service to the future station areas. The transit service from previous phases will also need to be reassessed as routes may no longer need to travel to UNT Dallas Station for connections into the regional transit system.

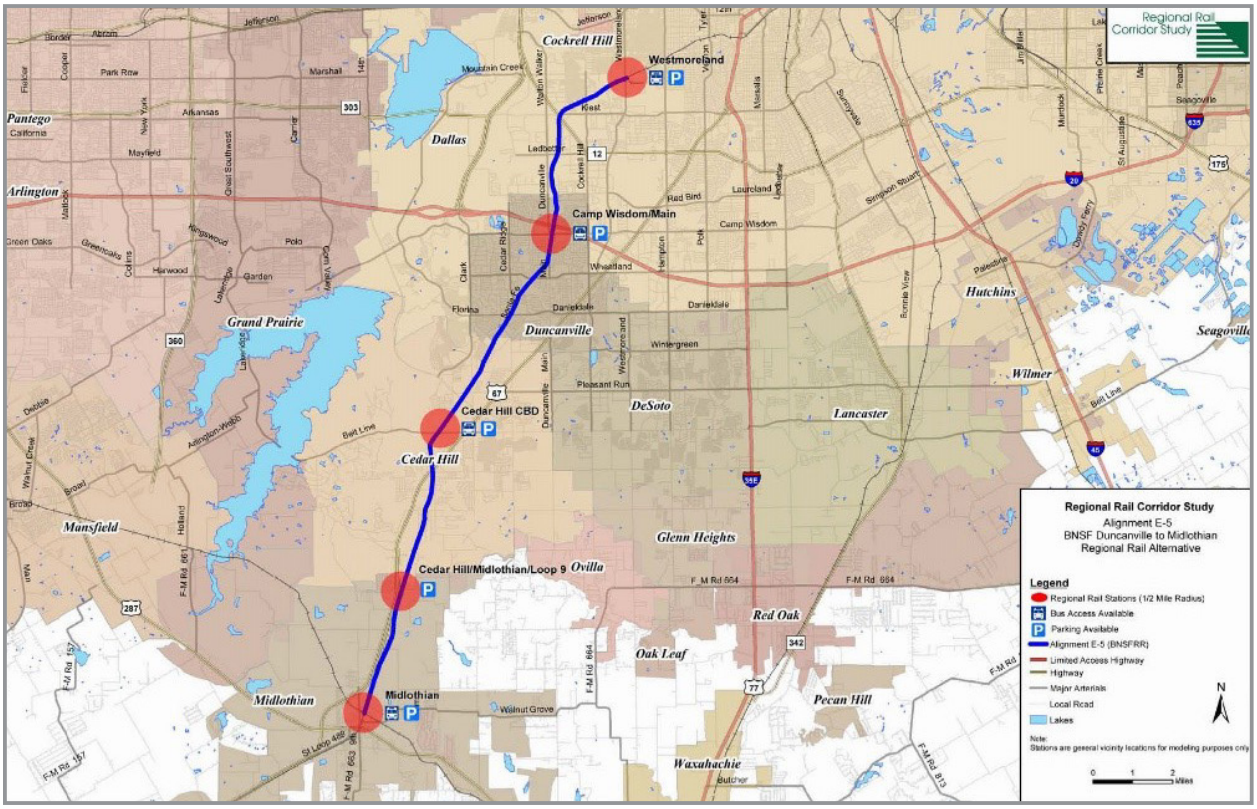


Figure 2-30: **NCTCOG Midlothian Regional Rail Alternative** *Source: NCTCOG, Regional Rail Corridor Study*

Midlothian Corridor

The Midlothian corridor would connect to the end of DART's Red Line at Westmoreland Station and travel south to Midlothian along an existing freight rail corridor. The 18.8-mile corridor is owned by BNSF, and DART has light rail operating rights between Westmoreland Station and Duncanville. NCTCOG included the corridor in their long-range plans (Mobility 2045) as a recommended transit rail corridor in June 2018; however, NCTCOG started evaluating regional transit rail corridors through the Regional Rail Corridor Study completed in July 2005. DART summarized the opportunity as part of their 2040 Transit System Plan in July 2017.

NCTCOG evaluated the potential for three types of transit technology: regional rail, light rail, and bus-rapid transit. The corridor added five stations along the corridor including stations in Duncanville and Cedar Hill (see **Figure 2-30**). Ultimately, NCTCOG recommended regional rail.

NCTCOG projected ridership for the corridor based on the following schedules. Regional rail would operate with 20-minute peak headways and 60-minute off-peak headways. Light rail would operate with 10-minute peak headways and 20-minute off-peak headways, which was similar to existing DART light rail service at the time of the study. Regional rail ridership forecasted to 2030 was expected to be 4,200 weekday passengers and light rail was 8,000 weekday passengers.

Station Area Plans

Cedar Hill has started to plan for potential station areas and included plans in their City Center Development Plan (2010). The future Cedar Hill CBD station is located near City Hall, as shown in **Figure 2-31**. Their plans also included a phased plan for a transit circulator to help feed the station. The circulator would connect the Cedar Hill Uptown Village to Old Town.

Duncanville's Main Street Plan identifies the area as a potential site for the regional rail corridor. An image illustrating the master plan, and including a potential station location, is shown in **Figure 2-32**. The station would be located west of the Main Street and Center Street intersection.

Both the Cedar Hill and Duncanville stations are planned in the downtown areas of the cities with existing pedestrian infrastucture and commercial uses.

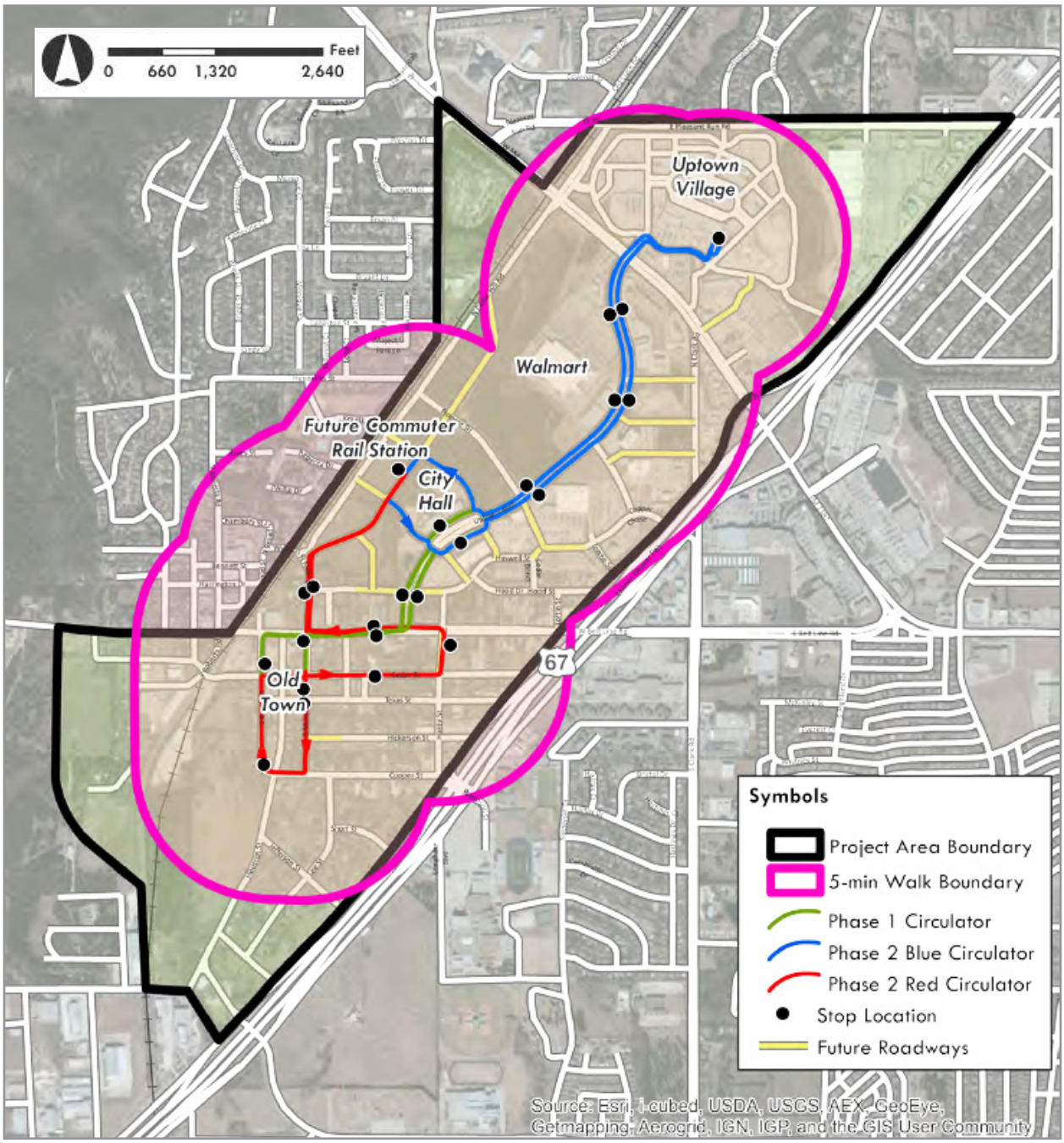


Figure 2-31: **City Center Circulator and Walkability** *Source: Cedar Hill City Center Development Plan, 2010*

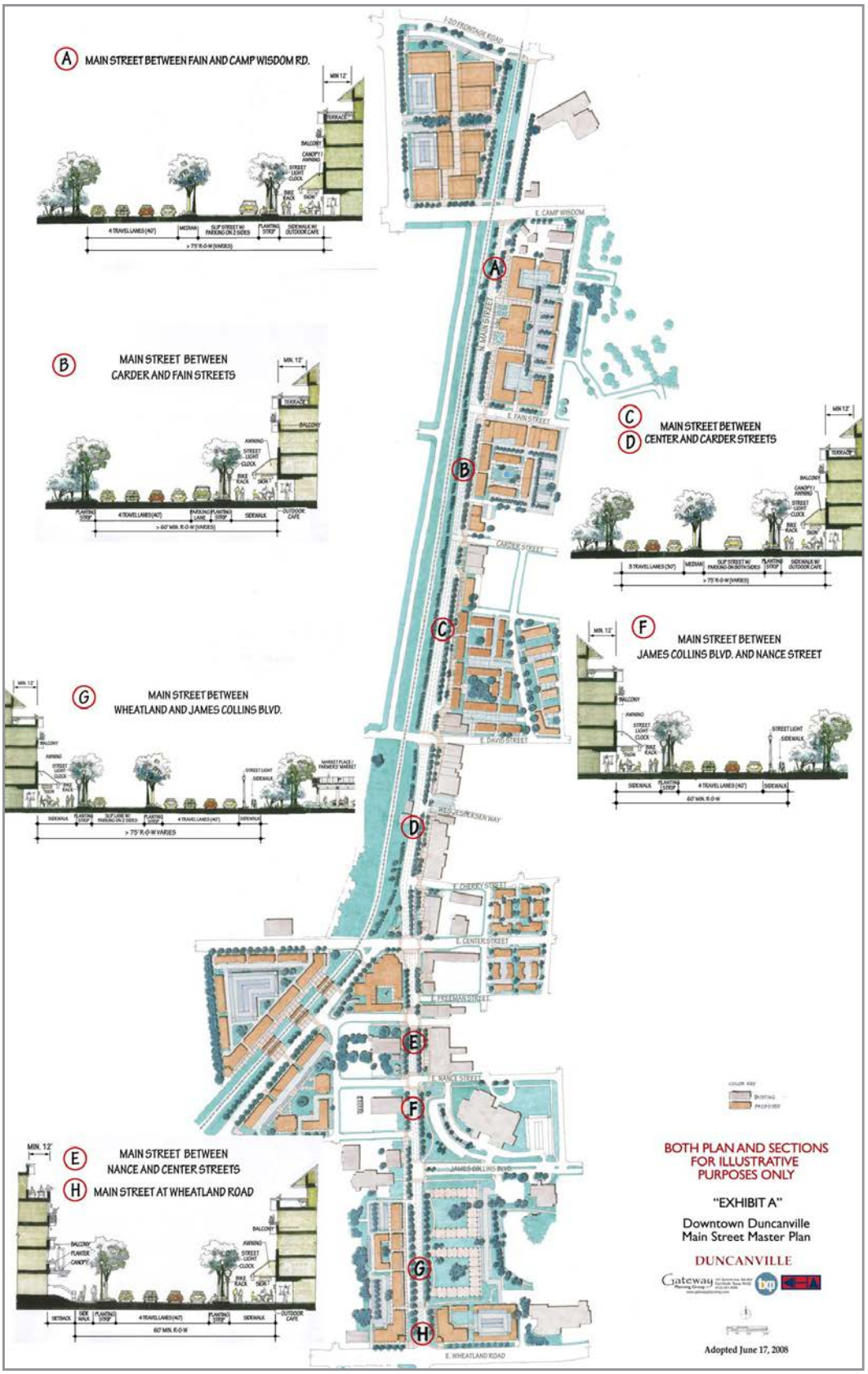


Figure 2-32: **Duncanville Main Street Master Plan** *Source: city of Duncanville*

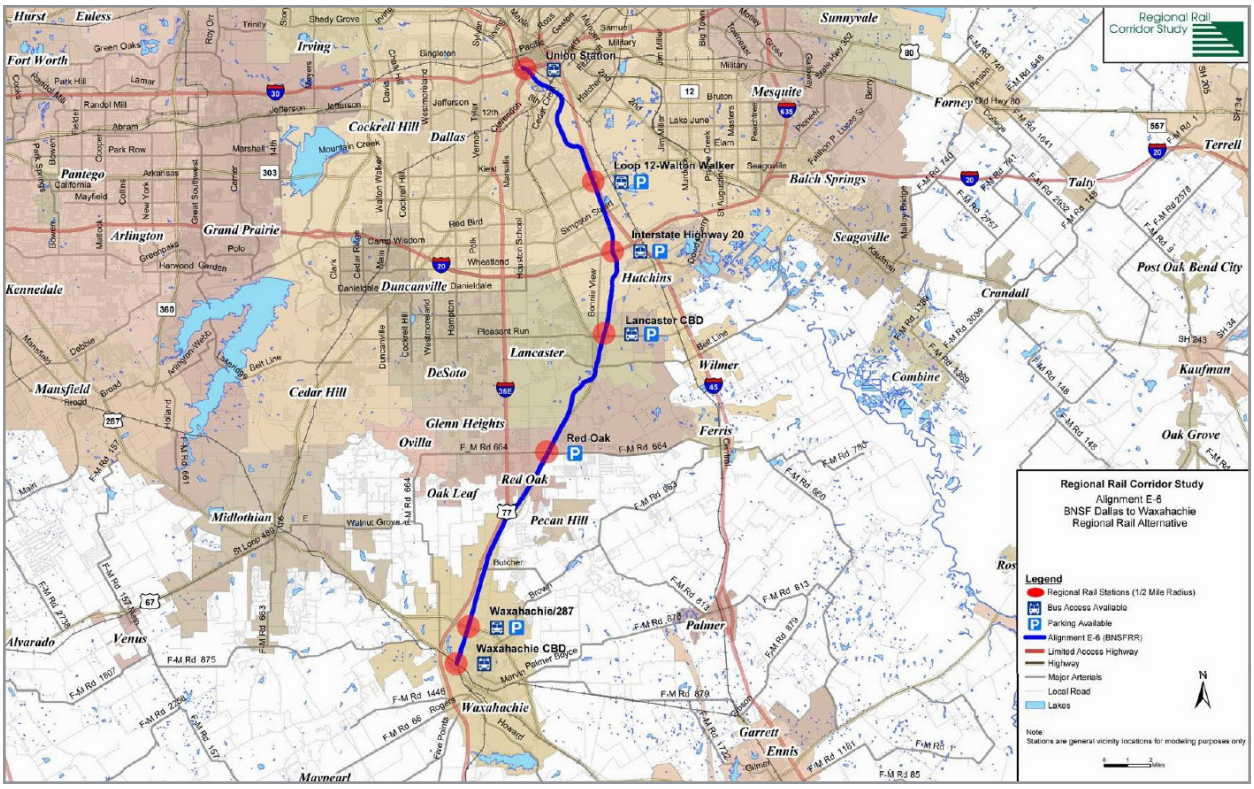


Figure 2-33: **NCTCOG Waxahachie Regional Rail Alternative** *Source: NCTCOG, Regional Rail Corridor Study, 2005*

Waxahachie Corridor

The Waxahachie corridor connects to Union Station in downtown Dallas and travels south to Waxahachie with a station near downtown Lancaster. The approximately 30.7-mile corridor is primarily owned by BNSF. UP owns 2.4 miles between Dallas Union Station and Forest Avenue in the city of Dallas. NCTCOG included the corridor in their long-range plans (Mobility 2045) as a recommended transit rail corridor in June 2018; however, NCTCOG started evaluating regional transit rail corridors through the Regional Rail Corridor Study completed in July 2005.

This corridor has not been evaluated since the NCTCOG's RRCS completed in July 2005.

NCTCOG evaluated the potential for three types of transit technology: regional rail, light rail, and bus-rapid transit. Bus-rapid transit was determined to be not feasible because of the lack of parallel roadway system and the presence of freight rail traffic. The corridor could add six to nine stations along the corridor depending on the technology (see **Figure 2-33**). Ultimately, NCTCOG recommended regional rail.

NCTCOG projected ridership for the corridor based on the following schedules. Regional rail would operate with 20-minute peak headways and 60-minute off-peak headways. Light rail would operate with 10-minute peak headways and 20-minute off-peak headways, which was similar to existing DART LRT service at the time of the study. Regional rail weekday ridership was expected to be 6,100 with 780 boardings in Lancaster in 2035.

Although the city of Lancaster does not have specific station area plans, the city's 2016 Comprehensive Plan discusses the need for transit related development near the station in the downtown area.

2.3.8. Future Growth Areas

With the Inland Port expected to double its employment growth over the next 10 years, the cities of DeSoto and Lancaster may experience rapid new development of industrial, commercial, and manufacturing uses. In DeSoto growth may occur in the area west of I-35 and north of Wintergreen and in Lancaster the growth will most likely occur in the eastern part of the city near the airport. For Phase 3 the cities should focus on improving transit connections to the new growth area and reassessing transit services implemented through Phases 1 and 2. This could mean shifting service from UNT Dallas Station to a new station in downtown Lancaster if the Waxahachie rail line is built out.

3. Financial Plan

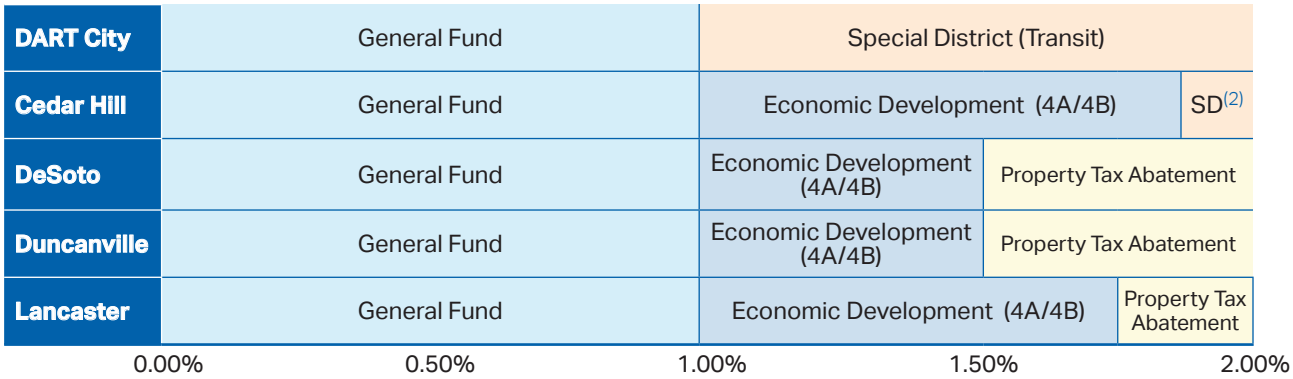
This section presents the estimated operating and capital costs associated with transit service recommendations in Southern Dallas County. The 10-year financial plan (see **Section 3.3**) presents these costs alongside typically available revenue sources and identifies additional revenue needed to fund the project. A variety of non-traditional revenue options were assessed to determine their potential for generating additional revenue for transportation and infrastructure projects.

The recommended service area includes the cities of Cedar Hill, DeSoto, Duncanville, and Lancaster and is located within the Dallas-Fort Worth-Arlington Urbanized Area, and just outside of the DART service area, which impacts available service delivery options. O&M costs, capital costs, and revenue estimates are tied to assumptions about how services are delivered. **Table 3-1** documents the service delivery assumptions and cost implications that were considered.

Formation of a new municipal transit district is not recommended due to potential legal complexities surrounding Chapter 453 of the Texas Transportation Code, as well as this option having higher potential costs compared to available contracting options in the area. To join DART as a member city, a 1% transit sales tax would need to be collected in each jurisdiction. However, each city currently collects the maximum allowable 2% local sales tax rate, as shown in **Figure 3-1**. This revenue is dedicated towards other purposes, including the cities' general funds, property tax abatement, economic development programs, parks and recreation, and crime prevention programs. As a result, it is not likely that these jurisdictions could levy an additional sales tax for transit without diverting revenue from another designation or advocating significant changes to Texas local government code. Therefore, costs for this financial plan reflect service delivery option 3.

Service Delivery Option	Cost and Revenue Implications	Recommended
1. Directly operated municipal transit district	Peer-based operating costs, vehicle purchase and ability to collect fares	No
2. Through DART (member city)	N/A – dedicated sales tax contribution	No
3. Service and management contract	Service costs based on STAR Transit, fully allocated including vehicle needs, fares collected by service provider	Yes

Table 3-1: **Financial Implications of Service Delivery**[1]



Source: Texas Comptroller of Public Accounts, City Sales and Use Tax. https://comptroller.texas.gov/taxes/sales/city.php. Texas Comptroller of Public Accounts, Cities with Additional Sales and Use Tax, https://comptroller.texas.gov/taxes/sales/city-additional-tax.php. Accessed September 2020.

Figure 3-1: **Local Sales Tax Designations**

(1) *The Collin County Transit Study identifies transit-formed Local Government Corporations (LGCs) as a feasible alternative to a municipal transit district. An LGC may be created under Texas Transportation Code §431.101 to act on behalf of one or more local governments to accomplish a governmental purpose. The LGC would have the powers of a transportation corporation authorized for creation by the Texas Transportation including the power to issue bonds. Given the lower estimated costs available through local 3rd party transportation providers, LGCs were not studied further as a potential governing structure for South Dallas County.*

(2) *Special District (Crime Prevention)*

The service plans described in Chapter 2 reflect a pattern of local microtransit zones feeding into intercity fixed routes, allowing residents connections to more regional transit services. Capital costs, operating costs and project-level revenue sources have been developed for the full 4-city plan, bearing in mind these regional connections. Revenue estimates for individual cities are based on the following cost allocation assumptions and shown by route in Table 3-2:

- Fixed route and express service costs allocated by the number of stops within each jurisdiction (excluding Dallas)
- Costs for microtransit zones within a single jurisdiction allocated to that jurisdiction
- Costs for microtransit zones spanning multiple jurisdictions are distributed evenly between those jurisdictions

City-specific financial plans are presented in Appendix B to assist cities with budgeting for new transit services; however, all cost allocation formulas will be subject to negotiation through execution of a service contact or through MOU between jurisdictions. Implementation plans are available in Chapter 6. By working collectively to fund intercity routes, each city will gain access to a more robust network of transit choices than would be available through a city-specific closed-door service of a similar cost.

Route/Service	Route Total	Cedar Hill	DeSoto	Duncanville	Lancaster
US-67 Express	100%	50%	0%	50%	0%
Wheatland I-20	100%	0%	0%	75%	25%
Hampton East	100%	0%	86%	0%	14%
Lancaster-Cedar Hill*	100%	25%	58%	0%	17%
Cedar Hill Microtransit	100%	100%	0%	0%	0%
DeSoto Industrial Microtransit	100%	0%	100%	0%	0%
Duncanville Microtransit	100%	0%	0%	100%	0%
Lancaster Industrial Microtransit	100%	0%	0%	0%	100%
DeSoto-Lancaster Microtransit	100%	0%	50%	0%	50%
Lancaster Airport Microtransit*	100%	0%	0%	0%	100%

Table 3-2: **Cost Allocation Assumptions**

** Phase 2 Service Only*

3.1. Capital Costs

Phase 1 capital costs, shown in Table 3-3, are estimated based on a total of 26 physical stop locations divided among four tiers of potential infrastructure needs. For connecting stops inside the DART service area, a minimal cost is included to support any signage needs for the new routes utilizing existing DART infrastructure. DART does charge an additional connection fee for high ridership routes utilizing DART infrastructure; however, preliminary estimates for southern Dallas County transit services do not indicate ridership would be high enough to trigger these fees. DART's ILA for 3rd party shuttle access to facilities does require that the shuttle operator maintain liability coverage and provide ADA paratransit services, as well as coordinating with DART regarding timepoints and bay designation. Costs associated with insurance and ADA fulfillment are assumed to be included in the O&M cost per hour estimates for contracted services.

The majority of stops inside the Southern Dallas County service area would be low-infrastructure stops consisting of signage indicating the bus schedule affixed to a pole in concrete. Additional costs for a bench stop (including seating, concrete pad, waste receptacle, and signage) are included for three inbound stops where a larger volume of riders is expected to wait for a bus. The US-67 Express route is expected to generate some park and ride commuters. The two stops associated with this service have a higher infrastructure cost to accommodate bus shelters, including bench, concrete pad, waste receptacle, bike rack and signage. Capital cost allocation to each city is based on the stop's location and is presented in Appendix B. Adopt-a-stop programs, as described in Section 3.5, could be used to fund additional stop amenities or offset some of the costs associated with the assumed amenities listed in Table 3-3.

Stop Treatment Assumptions	Unit Cost	Number	Total Cost (2021 $)
DART Signage Modification [1]	$100	6	$600
Pole and Sign Stop	$200	15	$3,000
Bench Stop [2]	$6,300	3	$18,900
Express Stop with Shelter and Bench	$12,000	2	$24,000
ADA Approaches [3]	$2,000	4	$8,000
Total Infrastructure Cost [4]			$54,500
Federal Share			**$(43,600)**
Transportation Development Credits			**$(8,720)**
Required Local Match			**$2,180**

Table 3-3: **Phase 1 Capital Cost Estimates**

[1] *Costs associated with added signage at existing DART infrastructure.*
[2] *Assumes Bench stops at select inbound locations only: EB at Wexford Townhomes, EB at The Beacon, and NB at Pleasant Run.*
[3] *Assumes that approximately 20% of stop locations may need some ADA curb rehabilitation. For budgeting purposes only, specific ADA improvements should be determined on a stop by stop basis*
[4] *Unit costs reflect general estimates for labor and materials. Assumes in-house capacity for design and CM within city transportation/streets department.*

Annual service costs are assumed to be fully allocated including vehicle costs. Therefore, the capital cost estimates above do not include any costs associated with vehicle purchase.

Federal assistance is assumed to cover up to 80% of capital costs. Another significant portion of the project start-up costs could be supported by Transportation Development Credits (TDCs) . NCTCOG's next TDC cycle will begin in the fall of 2021 with awards in Summer of 2023. In addition to the application, use of TDCs requires cities to adopt 50% of NCTCOG's policy bundle, which includes initiatives in categories such as air quality, safety and security, sustainable development and transportation . One policy aimed at dedicating funds to transit would be met as part of implementation of the recommended financial plan. The amount of TDCs available for any particular city are based on each cities participation in NCTCOG's Policy Bundle. The financial plan assumes that all four jurisdictions collaborate to achieve the maximum award, 20% of the federal revenue share with amounts distributed proportionally to each city's cost share.

Table 3-4 summarizes capital costs for Phase 2 recommendations, including an additional 17 stop locations along the Lancaster-Cedar Hill corridor. This does not include seven stop locations that would be shared with Phase 1 services. Bench stop amenities are assumed for travel in both directions from three higher density locations in Cedar Hill's midtown, Pecan Crossing Apartments in DeSoto, and Crestview Medical Center in Lancaster.

Stop Treatment Assumptions	Unit Cost	Number	Total Cost (2021 $)
Pole and Sign Stop	$200	11	$2,200
Bench Stop [1]	$6,300	6	$37,800
ADA Approaches [2]	$2,000	4	$8,000
Total Infrastructure Cost [3]			**$48,000**
Federal Share			$(38,400)
Transportation Development Credits			$(7,680)
Required Local Match			**$1,920**

Table 3-4: **Phase 2 Capital Cost Estimates**

[1] *Assumes Bench stops at select locations only: EB & WB at Cedar Hill Midtown, EB & WB at Pecan Crossing Apartments, and EB and WB Crestview Medical Center*
[2] *Assumes that approximately 20% of stop locations may need some ADA curb rehabilitation. For budgeting purposes only, specific ADA improvements should be determined on a stop by stop basis*
[3] *Unit costs reflect general estimates for labor and materials. Assumes in-house capacity for design and CM within city transportation/streets department*

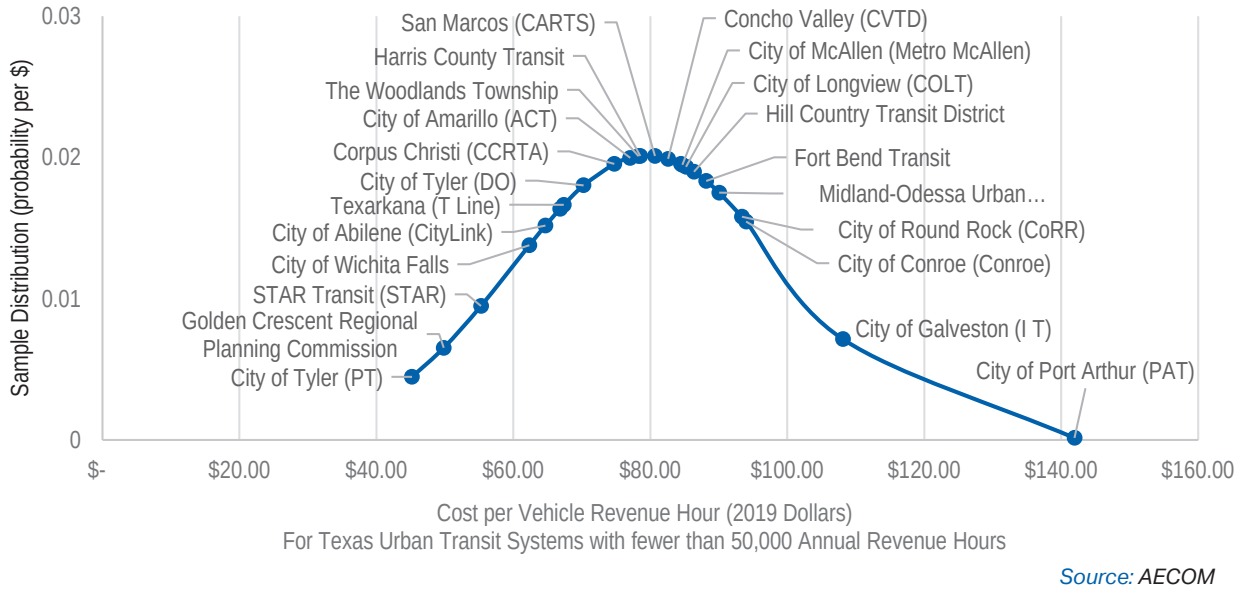
3.2. Annual Service Costs

Table 3-5 presents the estimated service levels (in terms of vehicle revenue hours) and costs for each Phase 1 recommended fixed route and microtransit zone. A vehicle revenue hour is the total amount of time a vehicle is in service (including end of line recovery), and total service levels are summed across all vehicles needed to maintain the expected schedules. All routes except the US-67 Express are expected to operate for 12 hours per weekday with one vehicle dedicated to each route. The US-67 Express would operate six hours per day during the AM and PM peaks only. A total of 260 weekdays per year are used to derive annual service levels.

Service costs represent the expected amount to be paid per revenue hour for service delivery through a 3rd party service and management contract. These differ somewhat from traditional O&M cost estimates in the sense that these are the fully allocated costs inclusive of a third party providers overhead, incentives and fare revenue offsets. The service costs shown in Table 3-5 reflect a $49.50 (2021) unit cost per revenue hour based on rates from local provider STAR Transit. This cost is significantly lower than directly operated peers (see Figure 3-2), and, given current statutory and taxing challenges around operating service directly or becoming a DART member city, represents the most realistic service delivery option. Costs for contracted service and transit management through an alternate transit provider were not solicited but are assumed to be competitive with these rates.

Route/Service	Daily (M-F) Revenue Hours of Service	Annual Revenue Hours of Service	Total Cost (2021 $)
US-67 Express	6	1,560	$77,220
Wheatland I-20	12	3,120	$154,440
Hampton East	12	3,120	$154,440
Cedar Hill Microtransit	12	3,120	$154,440
DeSoto Industrial Microtransit	12	3,120	$154,440
Duncanville Microtransit	12	3,120	$154,440
Lancaster Industrial Microtransit	12	3,120	$154,440
DeSoto-Lancaster Microtransit	12	3,120	$154,440
Southern Dallas County Service Total	**90**	**23,400**	**$1,158,300**

Table 3-5: **Phase 1 Annual Service Cost Estimates**



Source: AECOM

Figure 3-2: **2019 Operating and Maintenance Costs for select Peers**

Service cost allocation for each city, subject to executed service agreement, is presented in Appendix A.

Phase 2 service levels and costs are shown in Table 3-6. These costs are inclusive of all Phase 1 services as well as frequency improvements on the Wheatland I-20 corridor, new service on the Lancaster-Cedar Hill corridor, and two additional microtransit vehicles. This represents a 50% increase over Phase 1.

Route/Service	Daily (M-F) Revenue Hours of Service	Annual Revenue Hours of Service	Total Cost (2021 $)
US-67 Express	6	1,560	$77,220
Wheatland I-20	24	6,240	$154,440
Hampton East	12	3,120	$154,440
Lancaster-Cedar Hill	12	3,120	$154,440
Cedar Hill Microtransit	12	3,120	$154,440
DeSoto Industrial Microtransit	12	3,120	$154,440
Duncanville Microtransit	12	3,120	$154,440
Lancaster Industrial Microtransit	24	6,240	$308,880
DeSoto-Lancaster Microtransit	12	3,120	$154,440
Lancaster Airport Microtransit	12	3,120	$154,440
Southern Dallas County Service Total	**138**	**35,880**	**$1,776,060**

Table 3-6: **Phase 2 Annual Service Cost Estimates**

3.3. 10-year Financial Plan

Table 3-7 presents a 10-year financial plan for the recommended Phase 1 and Phase 2 transit services. It is assumed that Phase 1 capital improvements and service costs would start in 2023. Capital improvements for Phase 2 could occur in 2026 with additional service costs starting in 2027. Capital improvements are traditionally planned for the year prior to launching a new service; however, given the award schedule for TDCs, it is recommended that capital improvements be pursued alongside Phase 1 service implementation. All costs and revenues include a 3% annual escalation compared to the 2021 estimates described in Sections 3.1 and 3.2 and are rounded to the nearest $1,000 (YOE).

It is anticipated that Federal revenues could support approximately 50% of annual costs. Advertising revenue is based on an assumption of ad sales at the two shelters identified along the US-67 Express route and are expected to offset costs in Cedar Hill and Duncanville, where those shelters would be located. Revenue estimates are based on 12 months of ad sales at approximately $500 per month, with 20% of revenues supporting maintenance and marketing of the ad program. Ad revenue is prorated in the first year of operation, to account for approximately six months of operation prior to having the shelter infrastructure, marketing support, and ad sponsors in place.

The remaining revenue needed to fully fund the recommended transit service is allocated to each jurisdiction, based on each jurisdiction's share of costs (see Appendix B). As shown in Table 3-7, the city of DeSoto already supports approximately $139,000 (2021) in current transit service, which is shown separately to help identify additional budget needed to support the transit recommendations.

Year	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Existing Service Costs	$(139)	$(143)	$-	$-	$-	$-	$-	$-	$-	$-
Infrastructure Costs	$-	$-	$(58)	$-	$-	$(56)	$-	$-	$-	$-
New Service Costs	$-	$-	$(1,229)	$(1,266)	$(1,304)	$(1,343)	$(2,121)	$(2,184)	$(2,250)	$(2,317)
Total Cost of Service	**$(139)**	**$(143)**	**$(1,287)**	**$(1,266)**	**$(1,304)**	**$(1,398)**	**$(2,121)**	**$(2,184)**	**$(2,250)**	**$(2,317)**
Federal Revenue [1]	$-	$-	$661	$633	$652	$716	$1,060	$1,092	$1,125	$1,159
Advertising Revenue [2]	$-	$-	$5	$11	$11	$12	$12	$12	$13	$13
Transportation Dev. Credits [3]	$-	$-	$9	$-	$-	$9	$-	$-	$-	$-
Cedar Hill Local Share	$-	$-	$100	$100	$103	$107	$132	$136	$140	$145
DeSoto Existing Budget [4]	$139	$143	$147	$152	$156	$161	$166	$171	$176	$181
DeSoto Additional Share	$-	$-	$46	$46	$47	$50	$104	$107	$110	$114
Duncanville Local Share	$-	$-	$159	$160	$165	$170	$241	$248	$256	$263
Lancaster Local Share	$-	$-	$159	$164	$169	$174	$405	$417	$430	$443
Total Revenue	**$139**	**$143**	**$1,287**	**$1,266**	**$1,304**	**$1,398**	**$2,121**	**$2,184**	**$2,250**	**$2,317**

Table 3-7: **10-Year Financial Plan** (Thousands $)

[1] *Assumes 80% federal match for capital and 50% match for service costs*
[2] *Assumes $500 ad sales per month less 20% marketing and maintenance, x 6 months in 2023 and x 12 months thereafter*
[3] *Pending Confirmation of available amounts, assumes 20% of Federal share*
[4] *Assumes city of DeSoto's current budget for existing transit services would be reallocated for proposed services*

3.3.1. Alternative Revenue Sources Considered

The Texas Local Option Transportation Act (TLOTA), formerly known as Rail North Texas, is the regional transportation initiative to identify funding for passenger rail roadway projects that address residents' transportation needs as well as the region's air quality goals. TLOTA was introduced during the 51st Texas Legislature, and includes a menu of local option fees and taxes including:

- New Resident Impact Fee
- Mobility Improvement Fee
- Drivers License
- Local Option Gas Tax
- Parking Fee
- Emissions Fee

TLOTA would allow counties in Texas to raise funding for use on transportation projects within the county, and would not create additional layers of government. Implementation would require legislative authority, detailed service and funding plans advanced for each county, voter approval of projects and funding sources, and service delivery agreements with existing transportation providers.

Table 3-8 summarizes an analysis of a variety of potential sources of transit revenue. For each revenue source considered, the analysis considered 1) existing statutory authority, 2) restrictions that may limit the use of the tax, and 3) whether legislative changes would be required. The easiest to implement alternative revenue sources fall within the category of value capture. Value capture strategies could allow cities to leverage existing zones (or in some cases create new zones) in which infrastructure improvement costs can be offset by tax revenues associated with the added value in those zones. The most common use of value capture in transit finance is applied towards stop treatments and ADA sidewalk access improvements, but transit services are not precluded where they provide a tangible benefit to the zone. Individual jurisdictions may consider using these strategies to offset their identified local share of costs. Other revenue sources have more significant legislative barriers or may require voter approval. If a large, more stable source of transit funding is desired for long term transit improvements , property tax and local option gas tax strategies were identified as having a larger potential impact on funding, after clearing political hurdles. These strategies are recommended for further study as part of a cohesive regional approach to transit funding that could increase options for multiple communities, but are not considered feasible as part of short term financial plan for Phase 1 transit services in Southern Dallas County.

Funding Source	Statutory Authority	Legislative Action	Restrictions / Barriers	Potential Revenue	Recommended for Further Study
Value Capture					
Tax Increment Financing	Texas Tax Code Ch. 311	Possibly [1]	Low	Medium	Yes
Transportation Reinvestment Zones	Texas Transportation Code Ch. 222	No	Low	Medium	Yes
Public Improvement Districts	Texas Local Government Code Ch. 372	No	Low	Medium	Yes
Management Districts	Texas Local Government Code Ch. 375, 395	No	Low	Medium	Yes
Taxes					
Property Tax	Texas Tax Code Ch. 302	No	Low	High	Yes
(Local Option) Gas Tax	Texas Tax Code Ch. 162	Yes	High	High	Yes
Motor Vehicle Tax	Article 8, section 1 of the Texas Constitution	Possibly [2]	Medium	Low	No
Rental Car Tax	Texas Tax Code Ch. 152	No	Medium	Medium	No
TNC Tax	Texas Transportation Code Ch. 2402	Yes [3]	High	Medium	No
Tax on alcohol, tobacco, or lottery proceeds	Texas Tax Code Ch. 302	Yes	High	Medium	No
Fees					
VMT Fee	N/A [4]	Yes	High	Medium	No
License and Title Fees	Texas Transportation Code Ch. 502	Yes	High	Low	No
Local Vehicle Registration Fees	Texas Transportation Code Ch. 502	Yes [5]	High	Low	No

Table 3-8: **Summary of Alternative Funding Options**

[1] *Current law places restrictions on how value capture districts can be established*
[2] *No action for collection on business use vehicles, but personal-use vehicles are currently exempt. Legislation would be required to expand revenue potential*
[3] *HB 100 restricts local ability to tax TNCs*
[4] *Most research on the implementation of VMT fees has occurred at the state level. Only Oregon has a functional (voluntary) VMT fee in place*
[5] *Dallas County already collects the maximum permissible local vehicle registration fee*

3.4. Phase 3 Costs

Mobility 2045 has identified a potential capital cost of $1.8 Billion for the 18-mile Midlothian Regional Rail line. The 33-mile Waxahachie Regional Line is estimated to cost an additional $1.8 Billion. Revenue for projects of this magnitude would need to rely on a variety of regional cost sharing, but some local contribution should be expected for cities with station access. Local costs would be subject to detailed engineering and design estimates as well as partnership agreements which should be coordinated through NCTCOG.

To the extent that additional local services may be needed to supplement Phase 1 and 2 recommendations or to better connect to rail expansion, local costs can be estimated as approximately $154,000 (2021) annually per vehicle in service. Transitioning a microtransit zone to a fixed route service can be relatively cost neutral, assuming the fixed route service schedule can be accommodated with a similar number of vehicles as the microtransit service.

3.5. Public Private Partnerships

Given current and projected public funding constraints for transportation improvements, partnerships with the private sector will be pivotal to the implementation of the preferred scenario; policies that accommodate potential public-private partnerships would facilitate agreements between local transit agencies, cities, employers, and other private interests. To help off-set the cost of implementing recommended transit and goods movement projects, the following implementation options and suggestions are identified for each Phase of service implementation:

3.5.1. Phase 1

- **Shuttle for Higher-Demand Destinations:** consider developing shuttles connecting higher-demand locations, such as job sites, residential complexes, schools, and hospitals, to proposed mobility hub locations, subsidized by those locations that will benefit from the "enhanced" shuttles. Subsidies coming from this form of partnerships may be used to bring higher frequency and/or capacity to higher-demand locations, bridging the gap between on-demand microtransit service and fixed-route transit service while the transit demand and usage pattern mature over time.
- **Transit Pass Subscription Program:** consider encouraging or mandating large employers, large residential developments, and schools to offer transit passes to employees, residents, and students, to further encourage transit demands and ridership in the area. This may be implemented in coordination with existing transit pass schemes including GoPass by DART, further encouraging integrated regional transit usage. Privately subsidized transit passes can also be encouraged in conjunction with public incentives, such as additional zoning or development cost incentives (e.g. higher floor-area-ratio limits, or reduced permit fee) for new developments. Development incentives may also be formalized as a separate public-partnership initiative in later phases.
- **"Adopt-a-Stop" Program:** consider implementing an "Adopt-a-Stop" program to offset initial capital and ongoing maintenance cost for transit facilities (e.g. shelters, benches and signages) at proposed mobility hub locations and transit destinations with higher-demand. Privately sponsored transit stops and facilities may feature signage acknowledging the sponsor as a part of the program. As a part of the implementation of this program, consider developing a "menu-item" of sponsorships with a list of facilities that could be added or sponsored with associated cost and benefit attached to each item so that it is easier for potential sponsors to participate in the program.

3.5.2. Phase 2

- **Service/Vehicle Subsidy:** as transit ridership in the area matures, especially around destinations with higher transit demand, consider soliciting subsidy for additional service hours and/or vehicle procurement cost in exchange for even higher service level for microtransit services, shuttles, and local fixed-route buses. This may also facilitate the process of identifying areas where the initial Phase 1 service implementation was most successful, offsetting the cost of transitioning into next phases including additional transit facilities and vehicles. This program would require carefully coordinated purchase agreement between private sponsors and transit service providers, to strike the balance between providing additional services privately sponsored and ensuring equitably distributing transit service resources.
- **Advertisement for Directly-Operated Bus:** in conjunction with the "Adopt-a-Stop" program described above, consider adding advertisement on bus vehicles that are directly operated by agencies or at transit facilities as a source of additional revenue that could offset operating and maintenance cost. It should be noted, however, that developing robust transit service and reliable ridership demands ahead of incorporating advertisement scheme is critical as advertisements are more effective on locations with high visibility.

3.5.3. Phase 3

- **Mobility Hub/Transit Station Land Use Incentives:** Consider implementing land use incentives for new developments at or near mobility hub and future high-capacity transit stations, encouraging higher land use intensity (i.e. density) along the transit corridor and expanding the focus of the common scope of transit-oriented development (TOD) outside the immediate transit station areas and tax increment financing (TIF).
- **Transit Oriented Development:** There may be opportunities to take advantage of TODs or joint development for the areas near future rail stations along the planned Waxahachie and Midlothian rail lines.

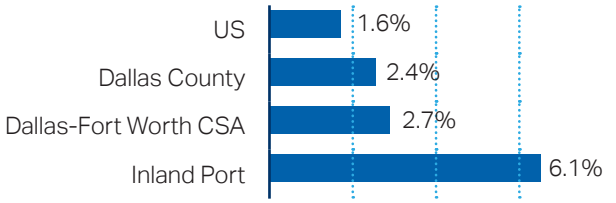
These opportunities could be used to leverage existing designations to incentivize TODs. TIF is a tool available that local governments can use to finance infrastructure improvements or improvements to the buildings in a designated, contiguous geographic area. In Texas, these are commonly referred to as Tax Increment Reinvestment Zones (TIRZ) because the purpose of the TIF is to promote development or redevelopment of an area as long as the governing body deems that the development or redevelopment would not occur otherwise. As such, TIF acts as a mechanism to encourage reinvestment in a designated zone. The improvements made in the zone are subsidized by the value added to existing property values in the form of increased property taxes. The incremental increase in tax revenue resulting from the increased property value is diverted to cover project costs instead of going into general revenue for the governing agency. Each taxing unit can agree upon the amount of tax revenue gained through the reinvestment zone; this can be all, a portion, or none of the revenue. These reinvestment zones can be initiated by the property owners themselves, via a petition, or by a municipality.

An example of how a TIRZ can be used for transit-related construction can be found in Dallas, TX. In December 2008, the Dallas City Council approved the creation of a 560-acre transit-oriented development TIF district around eight Dallas Area Rapid Transit (DART) light-rail stations (Dallas Reinvestment Zone Number Seventeen). As development occurs around some stations in the TIF, the incremental value of that development is captured and directed to improving infrastructure of those not experiencing new development. The TIF has budgeted over $185 million (in 2009 dollars) worth of new infrastructure projects to be completed in the zone to be reimbursed though increment revenue. The goal of this TIF is to create unique locations along the DART system and foster regional growth and connectivity.

4. Freight and Goods Movement Plan

4.1. Growth and Development

The Inland Port has seen rapid and significant growth - gaining jobs at a faster rate than that of Dallas County, the Dallas-Fort Worth Metro Area, and the US. Over the past decade, 17% of all job growth in the Dallas-Fort Worth Metro Area occurred in the Inland Port. As of 2019 (pre-COVID), the Inland Port supported 33,900 total jobs, with more than 15,200 jobs across the manufacturing, transportation and warehousing, wholesale, and e-commerce sectors.



Source: EMSI, US Census OnTheMap

Figure 4-1: **Inland Port Job Growth, 2010-2019**

While the Inland Port has seen significant job growth, it has also been adding industrial space at an even faster rate (6.1% job growth vs. 11.5% real estate growth). The area currently hosts nearly 50 million square feet – over 1,000 acres – of occupied industrial space. Inland Port growth aligns with several factors:

- E-commerce has rapidly created demand for new warehouse and distribution space, pulling jobs out of traditional brick and mortar retail locations.
- The increasing significance Dallas-Fort Worth in anchoring the Texas Megaregion, which is growing faster than any other US Megaregion and already makes up 8% of all US jobs.
- As inland ports accelerate in size beyond 50 million square feet, they become more attractive for manufacturing development, with corresponding jobs that pay higher-than-average wages.

COVID-19 has dramatically accelerated the shift to e-commerce, with US online sales growing from about 10% to 16% of total retail sales within a few months; this has also made clear the dependence of US consumers on foreign manufacturing locations. As a result, more manufacturing activity is expected to return to the US and Mexico in coming years, and locations such as the Inland Port would expect to compete for this activity, leveraging both the existing Union Pacific intermodal ramp as well as proximity to the Port of Houston; both elements figures in notions of a more robust industrial / logistics future.

AECOM's initial review points to several, large-scale planned and proposed industrial projects that would increase system capacity to deal with increasing freight and truck volumes. Per the Comprehensive Goods Movement Needs Assessment, 545 acres of industrial development are already in the pipeline (proposed and under construction), in context with 27,000 acres of developable land (vacant industrial and agricultural).

If the historic pace of growth continues, the Inland Port activity is poised to more than double over the next 10 years, with the potential to see more than 100 million square feet of new industrial development. Two forecast scenarios confirm this growth trajectory:

- **Scenario A** assumes a gradual build-out over the next decade, in line with current (10-year vs. 1-year) rates of growth.
- **Scenario B** follows the same trajectory but incorporates the full realization of all currently proposed developments over the next three to four years.

Even with the most conservative estimates, which assume the current year COVID impacts on industrial real estate continue over the next decade, the Inland Port is still extremely well-poised to add at least 700 acres of new industrial development. Given this trajectory of future growth, there are direct implications of freight and truck movement on existing transportation and transit infrastructure in the Inland Port, particularly on interstate and arterial roads.

Trajectory	Growth Rate	Basis	Scenario A (Million sq ft)	Total Cost (Million sq ft)
Slow Growth	5.3%	1-year (2019-2020) growth rate (long-term COVID-19 impacts)	+32	+101
Baseline Growth	12.4%	10-year (2010-2020) growth rate (continue along existing trajectory)	+104	+113

Table 4-1: **Future Inland Port Growth Scenarios** *Source: CoStar, AECOM*

4.2. Infrastructure Considerations

Analysis of existing truck traffic over the past five years shows a handful of key Inland Port intersections are approaching thresholds where capacity concerns would become apparent. Experience suggests that intersections where more than 10-15% of all existing traffic comes from trucks, begin to warrant significant increases in congestion, and drive improvements to support growing truck volumes.

While some of the locations where annual average daily traffic (AADT) is collected at the axle-level have changed over the 4-to-5-year period, we know that truck traffic is growing. While 19% of Inland port intersections in 2015 had more than 10% of all traffic coming from trucks, 24% of all intersections in 2019 saw the same truck volumes. Trip generation data from the Institute of Transportation Engineers (ITE) Trip Generation Simulator reinforces that there is generally a significant linear relationship between industrial building size and truck counts – indicating that industrial buildings grow beyond 250,000 square feet to approaching 1 million square feet, on average, truck traffic grows in parallel. Considering that the Inland Port's share of total regional industrial space has doubled over the past decade (from 3% to 6%), we can see clear and direct impacts of a nearly identical doubling of freight tonnage.

Knowing that intersections where truck volumes are already at 15%, and where proposed development is already in the pipeline, are poised to potentially double in truck volume over the next decade, it raises crucial concerns about local transportation and transit capacity. Roads and intersections currently fielding maximum truck traffic must be sized to deal with growing demand for the movement of goods and workers in and out of the area.

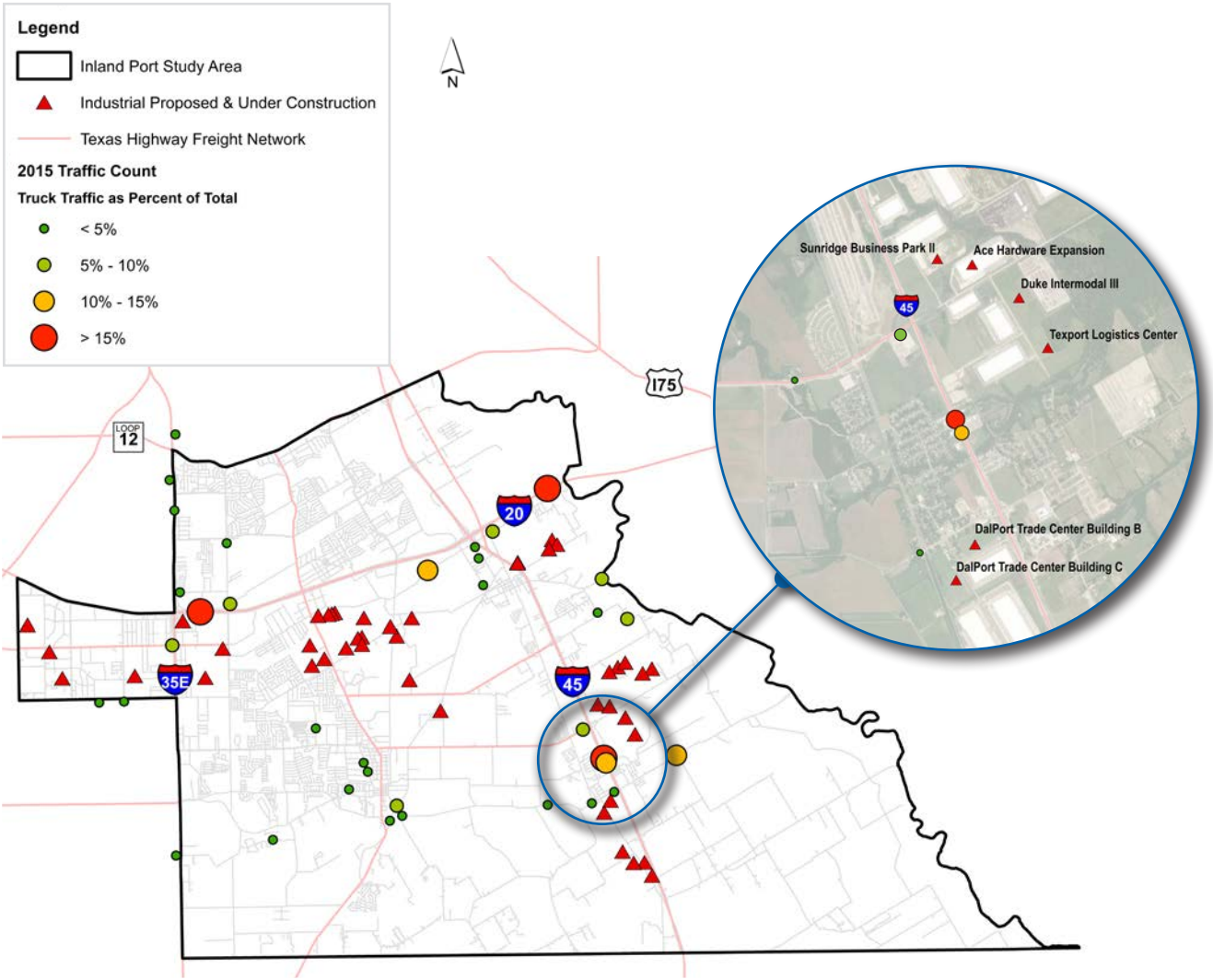


Figure 4-2: **Inland Port Truck Traffic, 2015**

Source: CoStar, TxDOT

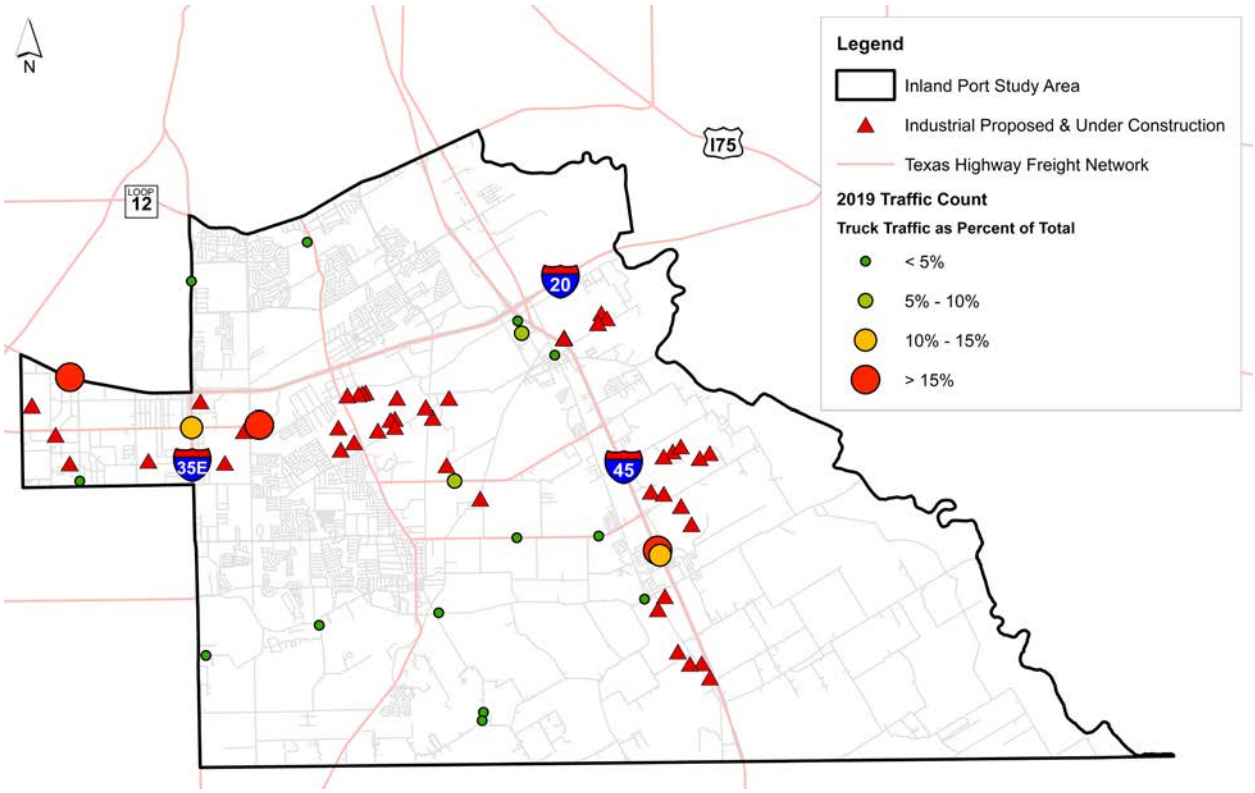


Figure 4-3: **Inland Port Truck Traffic, 2019**

Source: CoStar, TxDOT

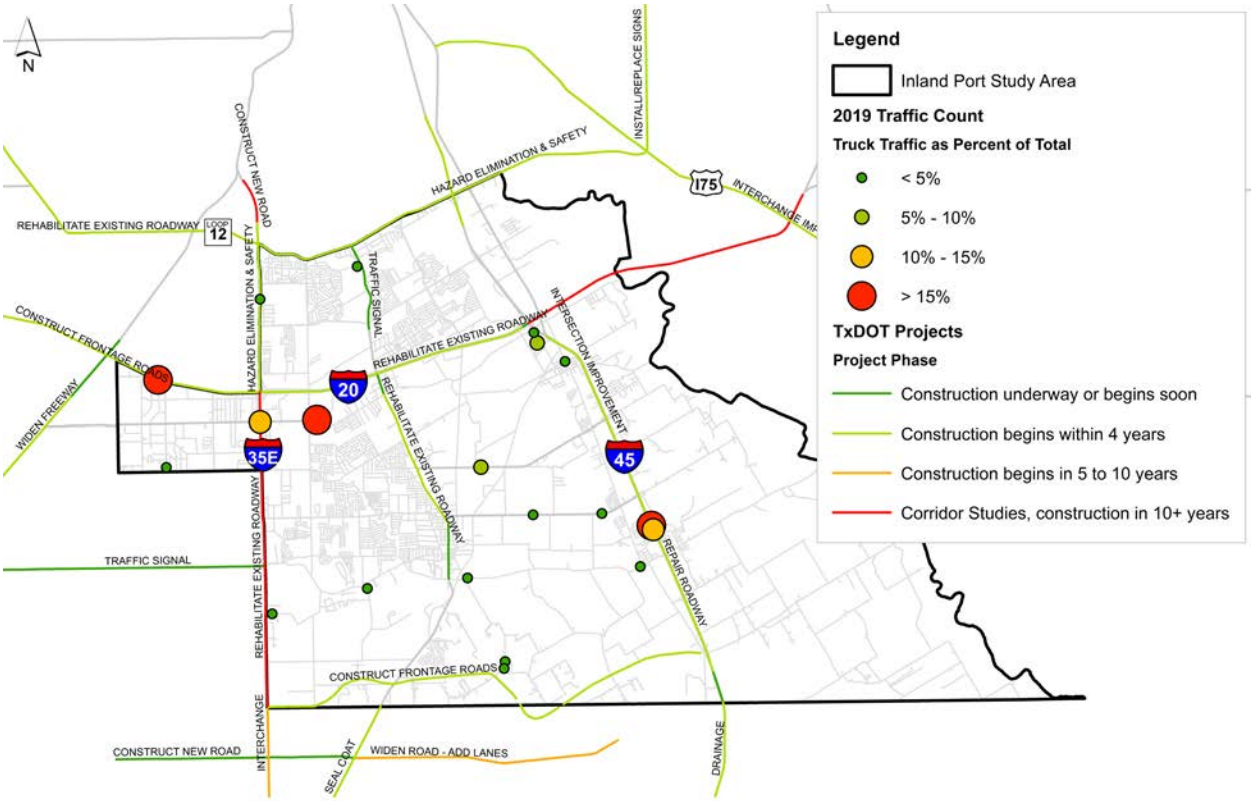


Figure 4-4: **TxDOT Planned Roadway Projects**

Source: TxDOT

4.3. Capital Planning

TxDOT has identified several future projects to add local street grid capacity across the Inland Port:

- 1.8 miles of road rehabilitation on I-20 from State US-342 to Bonnie View Lane (construction underway)
- 4.5 miles of road rehabilitation on State US-342 from Beltline Road to I-20 (construction underway)
- 8.4 miles seal coat and pavement markings on frontage roads on I-45 from Ellis C/L to State US-310 (construction underway)
- Signal improvements at the Camp Wisdom Road intersection (construction beginning soon)
- 6 miles of road rehabilitation on I-20 from I-35E to I-45 (construction beginning in 4 years)
- 5.6 miles of frontage road construction in Southern Dallas County from I-35E to the Dallas/Ellis County Line (construction beginning in 4 years)
- 6.5 miles of road rehabilitation on I-35E from I-20 to Ann Arbor Ave (construction beginning in 10 years)

Review of TxDOT projects shows that while improvements are planned, funding is often concentrated on interstates, and there are clear locations across the Inland Port where existing roads have not been upgraded to support increasing truck volumes. Many frontage/service roads around large distribution and warehouse centers appear again and in need of repairs. In addition to heavily accessed frontage roads, growth in truck volumes tends to create additional challenges at intersections, given that trucks take longer to accelerate and can cause increased congestion.

Figure 4-5: **Inland Port Roadways** *Source: Google Earth*

4.4. Infrastructure Recommendations

Broadly, recommendations for Inland Port road infrastructure are intended to ensure that the area is prepared to accommodate continued growth in truck volumes. Identified improvements have been focused on three types of facilities:

- Upgraded interstate interchanges, both to better manage flow, and to prepare for eventual emergence of autonomous trucks.
- Improvements to arterials (primarily traffic flow, installation of signalized intersections, turn lane improvements), and consideration of heavy truck routes.
- Improved side streets (2-lane to 3-lane / 4-lane), with larger intersections, shoulders

Side street improvements will be particularly important in areas where planned developments are already in the pipeline. The types of infrastructure projects to ensure the Inland Port remains competitive, and estimated costs,[1] include:

Focus Area	Details	Est. Cost	Priority
Local Roads	Tactical improvements to aging, outdated local roads near warehousing/distribution centers	$120-200 per linear foot	Near-Term
Stoplights / Signal Timing	Signal timing in response to changing truck volumes along primary arterials (i.e. ITS)	$600,000 per full inter-section	Medium-Term
Interstate Interchanges	New and updated interchanges and reevaluation of the condition, status and capacity of frontage roads on either side	$3-4 million for full interchange (including exits, bridges, signals)	Long-Term

Table 4-2: **Future Inland Port Focus Areas** *Source: CoStar, AECOM*

Beyond these primary concerns, other areas of focus for the Inland Port should be:

- Evaluation of all overweight truck roads
- East-west connections and service road entrances into the Inland Port
- Evaluation of truck parking challenges and opportunities
- Evaluation of alternative fuels, electrification, and implications for autonomous trucking
- Growing partnerships with local TMAs to support employee access to new job sites
- Support for transit-friendly design improvements to facilitate safe and convenient passage for transit users (pedestrian and bike route, etc.)
- Given that large portions of the Inland Port are also in unincorporated Dallas County, it will be important to ensure that improvements in the unincorporated areas happen at pace with improvements within adjacent municipalities.

In line with the above, the continued coordination—across policy, planning, data sharing, and more—among the Inland Port, TMAs, neighboring municipalities, economic development agencies, private sector employers, developers, and other stakeholders will be critical to ensuring sustainable growth.

Overall, the scale of future growth in and around the Inland Port presents clear benefits in terms of business growth, new job opportunities, and regional economic activity. Local leaders should be cognizant of the potential equity impacts of truck traffic on adjacent neighborhoods; as activities increase, trucks will seek the path of least resistance and may increasingly travel via residential roads. Southern Dallas is one of a small number of places in the US where trucking volumes are more likely to grow than decline. As such, there is a need for policies to ensure that both workers and residents can benefit from new economic growth, while mitigating the environmental impacts of increased emissions. The types of improvements noted above—enforcement of designated truck routes, transit-friendly design, alternative fueling and electrification initiatives—can help the area better position for continued growth, while ensuring industrial activity doesn't infringe on nearby residential communities.

[1] *Cost estimates provided by AECOM. Estimates are for materials only and do not include anticipated labor costs*

5. Future Mobility Enhancements

This section focuses on providing a comprehensive overview of future mobility enhancement projects which could be implemented on an as-needed basis. Emerging technology solutions explored in this section include connected and autonomous vehicles (CV/AV). Future mobility concepts are also summarized in this section, including Mobility as a Service (MaaS) and mobility hubs.

5.1. Emerging Technology

While the CV/AV industry is developing rapidly, the future is far from certain. If you were to read articles approximately five to seven years ago, many predicted we would have fully autonomous vehicles on the road by 2021; however, several companies are still invested in researching and developing their technology in order to increase safety and performance records. A promising market within the CV/AV industry appears to be along the freight truck pathway, especially within the State of Texas and the North Texas region. As shown further in this section, several companies are actively testing CV/AV freight vehicles, including within the study area.

As the vehicle and infrastructure technology continues to develop, communities and regulatory agencies are wrestling with how the technology could, or should, impact land use, transportation, equity, and environmental decisions. This subsection will provide a brief summary of the current state of technology, describe the existing or potential regulatory policy and planning context, illustrate potential scenarios for implementation, and identify any possible funding sources.

ADS	Automated Driving Systems
CV / AV	Connected and Autonomous Vehicles
C-___	Cellular Technology
V2I	Vehicle-to-Infrastructure
V2V	Vehicle-to-Vehicle
V2X	Vehicle-to-Everything
V2P	Vehicle-to-Pedestrians
V2G	Vehicle-to-Grid
V2D	Vehicle-to-Devices
DSRC	Dedicated Short-Range Communications
FLM	First/Last Mile Vehicle
ITS	Intelligent Transportation Systems
MaaS	Mobility as a Service

5.1.1. Technology Summary

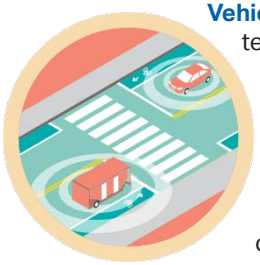
It is important to understand the two separate, but related, connected vehicle and automated vehicle technologies. A vehicle can be connected, or automated, or both at the same time.

Connected vehicles communicate with other vehicles, infrastructure, and other devices through wireless network technology (radio frequencies, Wi-Fi, or Bluetooth). According to the United States Department of Transportation (USDOT), "*connected vehicle technology will enable vehicles, roads and other infrastructure, and our smartphones to all communicate and share vital transportation information through advanced wireless communication technology.*"[1] Currently, there are two main technology solutions competing to enable communication and sharing information between vehicles and infrastructure: dedicated short-range communications (DSRC) and cellular technology (LTE/5G). While both use wireless communication methods, the two technologies are not interoperable.

DSRC: similar to Wi-Fi, DSRC is a wireless form of communication technology which allows devices within vehicles and infrastructure to communicate without using cellular infrastructure. DSRC technology has been used by intelligent transportation systems (ITS) for approximately 20 years. The technology can be used for short- and medium-range communication.

Cellular Technology (C-V2X): this wireless technology uses 4G long-term evolution (LTE) or 5G cellular connectivity to communicate between vehicles, infrastructure, but also adds the ability to connect to pedestrians and other cellular-connected devices. Research testing has shown C-V2X can operate at ranges 20% to 30% greater than DSRC.

Vehicle-to-Infrastructure (V2I): V2I technology describes communication between vehicles and devices within infrastructure, such as traffic signals or street light poles. V2I communication provides vehicles and traffic management centers with real-time information on road and traffic conditions, roadway signage, and the status of traffic signals located downstream.



Vehicle-to-Vehicle (V2V): V2V technology allows vehicles to communicate with each other in order to share information on vehicle speed, intended direction, braking status, and other vehicle information. This communication helps avoid conflict by sharing information on the vehicle's intended path.

[1] *USDOT, "How Does Connected Vehicle Technology Work?", https://www.its.dot.gov/cv_basics/cv_basics_how.htm. Accessed June 2021*

Vehicle-to-Everything (V2X): V2X technology includes V2I and V2V, but adds additional capabilities to connect with pedestrians (V2P), devices (V2D), and grids (V2G). The additional connections can help improve safety by providing vehicles, pedestrians, and/or traffic management centers with a better understanding of the environment. For example, a pedestrian may receive a notification when it is safe to cross the road, or a vehicle may be alerted when a bicyclist or pedestrians has entered the roadway.

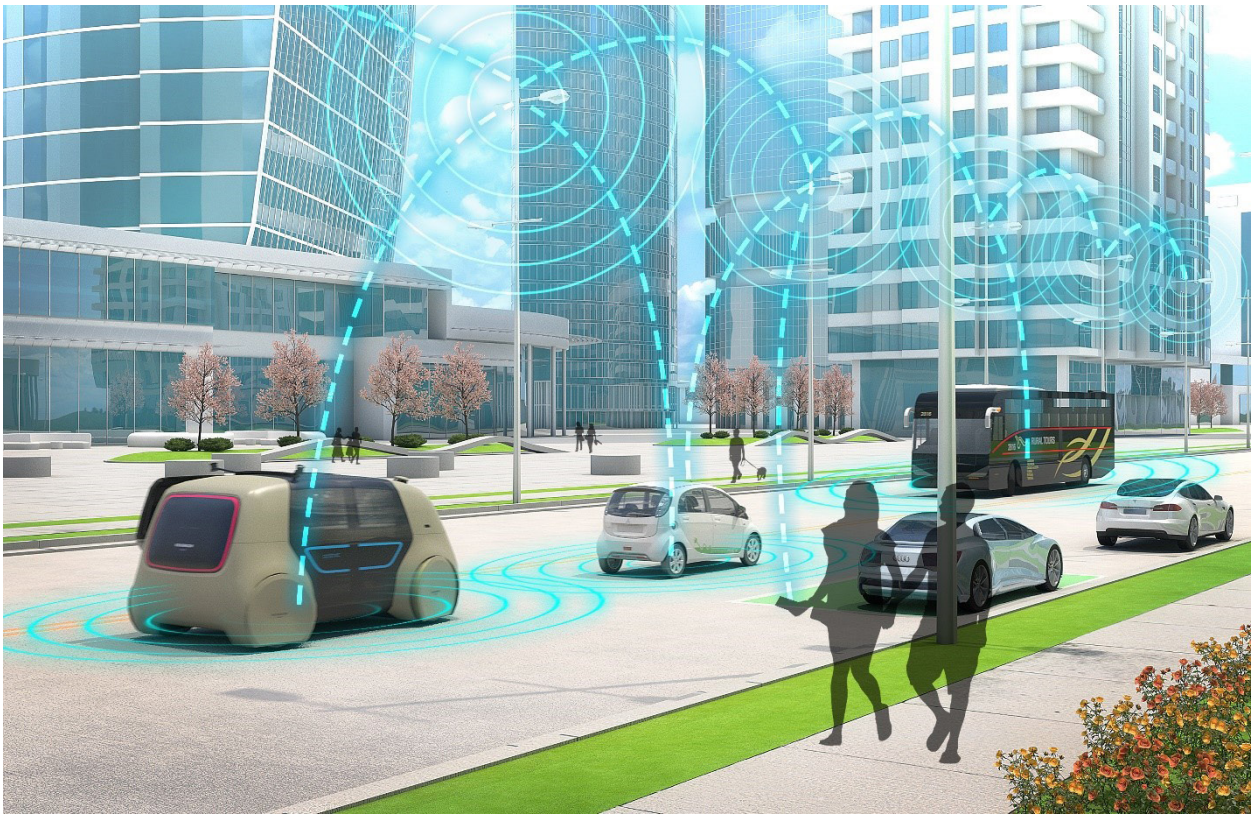


Figure 5-1: **Connected Vehicle Technology Illustration** *Source: AECOM*

The concept of connected vehicles communications are illustrated in in **Figure 5-1**. To summarize the general CV process as shown in **Figure 5-2**, vehicles communicate with other vehicles, traffic signals and other infrastructure, as well as pedestrian devices. The data communicated between vehicles and infrastructure is then sent to a type of traffic management center to collect and process the data. These traffic management centers could be operated by local or state agencies, or private operator. The illustration shows how DSRC (blue circles) and C-V2X technology (blue dashes) could be used together.

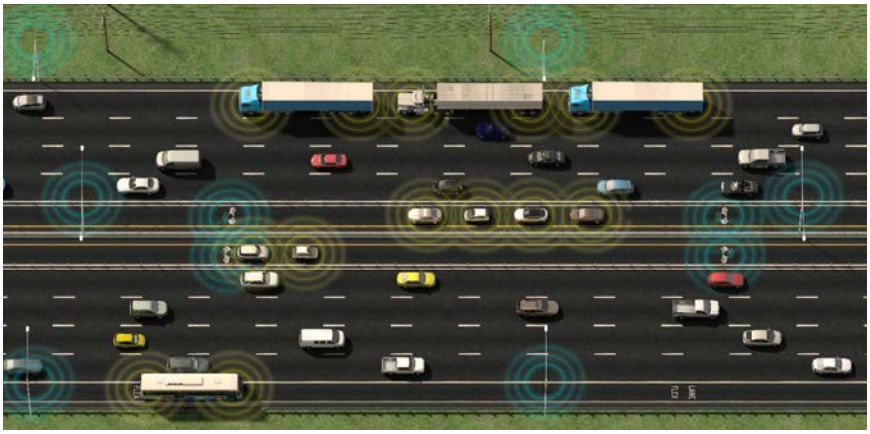


Figure 5-2: **CV Process**
Source: AECOM

Automated vehicle technology uses sensor technology (cameras, lidar, radar), GPS, or computer technology to quickly scan and illustrate surroundings and allow the vehicle to operate with few to no human interaction. The technology allows the vehicle to react to changing surroundings by controlling steering, acceleration, and braking. Some technologies can detect, and react to, sudden changes to the environment, such as a pedestrian entering the roadway suddenly.

SAE International has defined six levels of vehicle automation, shown in **Figure 5-3**. While there are no fully automated vehicles offered in the market, several vehicles have been tested to operate on a limited autonomous basis, with active human observation and involvement.

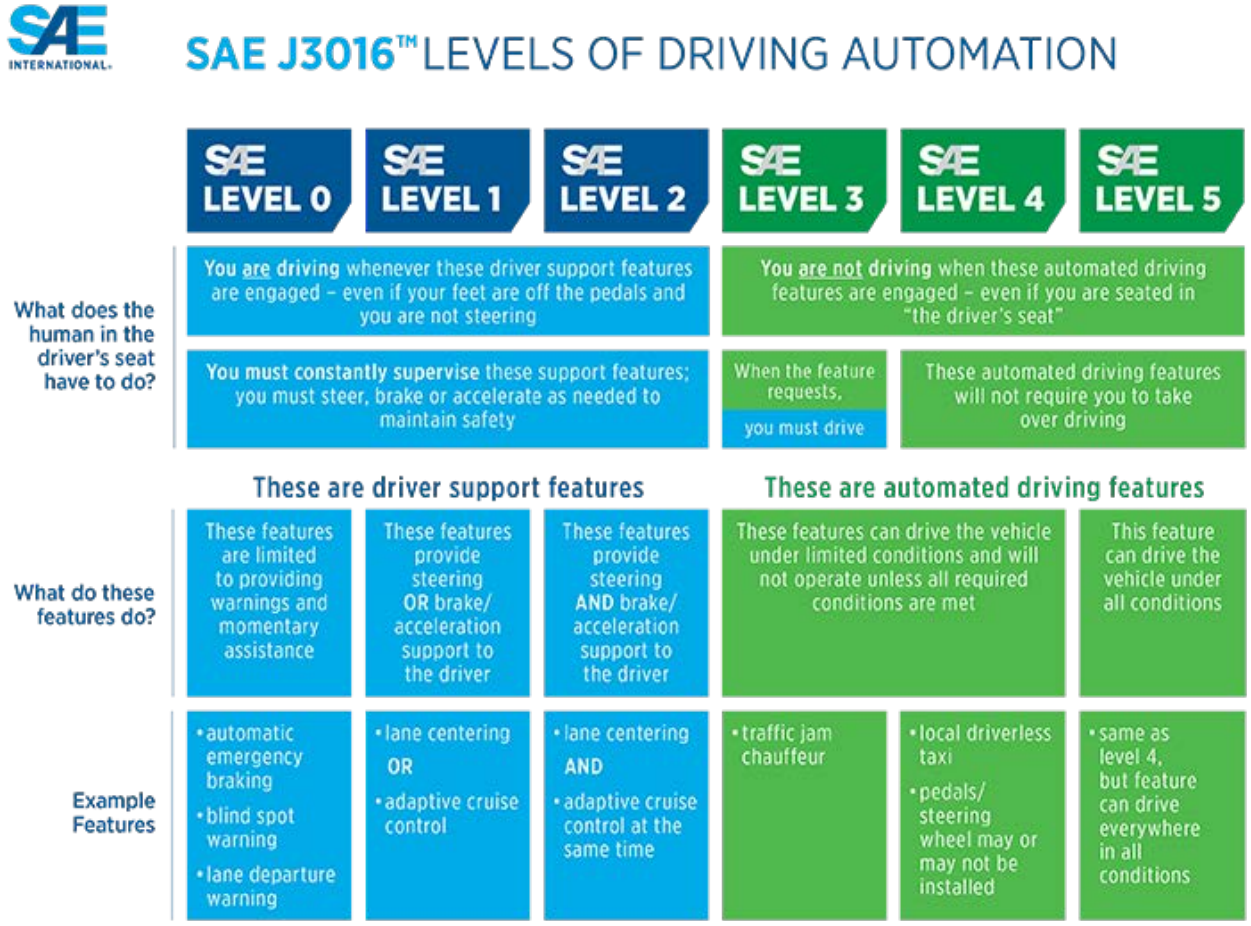


Figure 5-3: **SAE International Levels of Driving Automation** *Source: SAE International*

5.1.2. Regulatory, Policy, Planning Context

The most recent federal regulation, policy, and planning guidance comes from the USDOT's *Automated Vehicles Comprehensive Plan*, released in January 2021. This plan defines three goals for advancing automated driving systems (ADS). As detailed in the plan, the three goals are[(2)]:

- Promote Collaboration and Transparency – USDOT will promote access to clear and reliable information to its partners and stakeholders, including the public, regarding the capabilities and limitations of ADS.
- Modernize the Regulatory Environment – USDOT will modernize regulations to remove unintended and unnecessary barriers to innovative vehicle designs, features, and operational models, and will develop safety-focused frameworks and tools to assess the safe performance of ADS technologies.
- Prepare the Transportation System – USDOT will conduct, in partnership with stakeholders, the foundational research and demonstration activities needed to safely evaluate and integrate ADS, while working to improve the safety, efficiency, and accessibility of the transportation system.

[(2)] *USDOT, "Automated Vehicles Comprehensive Plan", January 2021.*

Goals also include objectives and actions the department intends to undertake. One key action item is to create a safety framework for *"defining, assessing, and providing for the safety of ADS."*[3] The safety framework is intended to enable safety innovations to be introduced to the market more efficiently. Further guidance can be found in the USDOT's *Ensuring American Leadership in Automated Vehicle Technologies: Automated Vehicles 4.0*.

State regulations in Texas allow for the operation of an automated vehicle without a human driver under certain requirements. The state has provided for local municipalities and agencies to create additional regulations to serve their communities. Within the region, NCTCOG is leading the AV 2.0 program which helps local agencies prepare and plan for CV/AV transportation solutions and provides funding through a competitive grant program. Current local planning efforts have been led or fostered by several communities along the I-20, I-30, and I-45 corridors.

Due to the state and local communities' openness to CV/AV technology, the Dallas/Fort-Worth region has a growing contingent of automated technology companies performing tests. From August 2017 to August 2018, the city of Arlington tested EasyMile's Milo vehicle, the first self-driving shuttle program in the United States. Building on this effort, the city tested an on-street pilot program in partnership with the company drive.ai (now Apple Inc.) The city now operates an autonomous fixed-route shuttle around Downtown and the university campus. Additionally, at least four automated freight vehicle companies are conducting Level 4 autonomous tests in the region, Waymo, TuSimple, Kodiak Robotics, and Aurora. Many of these freight vehicles are being tested within the Southern Dallas County study area.


AECOM

City of Arlington, TX


City of Arlington, TX

5.1.3. Potential Scenarios

This section summarizes how CV/AV technology could impact the municipalities within the study area. Case studies of previous, or current studies, are presented as insets and highlight key lessons learned. A high-level action plan for implementation is provided for communities interested in exploring CV/AV technology.

5.1.4. Applications

- **Automated transit vehicle.** An automated transit vehicle could be used to operate the commuter route from Cedar Hill to downtown Dallas. Currently, an association of transit agencies across the United States have started testing automated transit vehicle technology under a program known as The Automated Bus Consortium. The goal of the Consortium is to develop an autonomous transit vehicle and then deploy and test the vehicle in live service environments. As mentioned previously, the city of Arlington has on-street automated vehicles in service. The vehicles operate in mixed-traffic and with speeds up to 35 miles per hour.
- **First/Last Mile (FLM) vehicle.** FLM vehicles would serve as connectors to key origins and destinations, from trunk services offered by transit providers. These vehicles could be a variety of passenger sizes depending on the need. Pilot projects for these types of mobility service have been conducted locally by the city of Arlington, as well as across the United States. FLM vehicles could also carry types of freight, such as smaller groups of packages. These vehicles could be used as circulators within the study area cities that connect to transit hubs such as the UNT Dallas LRT Station.

[3] *USDOT, "Automated Vehicles Comprehensive Plan", January 2021.*

NCTCOG is providing funds for pilot testing of passenger and freight services in the Southern Dallas County area through the AV 2.2 and 2.3 Program. One project that is being considered through this program is at the Dallas College Cedar Valley Campus in the project study area. The college would use automated vehicles to provide on-campus service, in addition to service connecting Lancaster High School, community centers, and adjacent neighborhoods. Dallas College Cedar Valley Campus also received funding to provide workforce development related to the CV/AV industry. Education and training will provide skills for three industries: transportation technology, trucking, and goods delivery. Projects are expected to begin in 2022.

CV/AV Freight Port: a CV/AV Freight Port would provide a centralized location for CV/AV freight vehicles to load and unload. A human-operated freight vehicle would be used to carry freight to and from the port along corridors where CV/AV technology might be discouraged. Due to the amount of freight activity in the Inland Port, a CV/AV Freight Port may be useful. NCTCOG is providing funds for deployment and testing of an AV Freight Port in Tarrant County through the AV 2.2 and 2.3 Program. Projects are expected to begin in 2022.

Action Plan

The following table describes actions municipalities could consider when exploring CV/AV technology.

Action Type	Action Summary
Vision Plan	Establish vision for CV/AV technology. Consider departmental issues and solutions, and seek input from key stakeholders and the general public.
First/Last Mile Study	Evaluate FLM travel patterns to determine the optimal CV/AV solution. The FLM study will help communities identify barriers and solutions for improving shorter trips. Improvements could include evaluating the condition of infrastructure (e.g. travel lanes, bike lanes, sidewalks, intersections)
Infrastructure Plan	Focus on developing the infrastructure requirements for CV/AV technology to operate within the municipalities district. Parts of the plan should address intersection signal technology, CV/AV communications technology infrastructure requirement, and maintenance of CV/AV technology. This plan could also explore the potential and conceptual design for a CV/AV Freight Port.
Workforce Development Plan	Explore the education and training requirements for future workers in the CV/AV technology industry. Communities should prepare their workforce for the unique challenges and opportunities presented by adapting the built environment to emerging technology.

Table 5-1: **Possible CV/AV Technology Actions**

5.2. Potential Funding Sources

At the federal level, the most recent USDOT AV Comprehensive Plan identified an objective to continue funding demonstrations, pilots, and deployments. The department has funded projects through several grant programs: the Automated Driving System Demonstration, Integrated Mobility Innovation (IMI), Accelerating Innovative Mobility (AIM) Initiative, and the Inclusive Design Challenge. The most recent projects were awarded in August 2020 through the AIM initiative. Other funding programs under the USDOT include the Advanced Transportation and Congestion Management Technologies Deployment (ATCMTD) program. Through a competitive grant process, the program funds deployment and operation of technology to improve safety, efficiency, system performance, and increase the return on infrastructure investment.

Additionally, the most recent Infrastructure for Rebuilding America (INFRA) grant program does not call out CV/AV technology specifically, though the program would allow funds to be used to explore CV/AV technology project support for freight infrastructure. Once the newest federal transportation bill is passed, it is expected funding for emerging technologies will increase.

As mentioned previously, NCTCOG is providing funds through a competitive grant process as part of the AV 2.2 and 2.3 Program.

5.3. Mobility Concepts

This section describes two types of emerging mobility concepts, Mobility as a Service (MaaS) and mobility hubs.

5.3.1. Mobility as a Service

MaaS is designed to provide on-demand service using a variety of transportation services offered in an area. Technology helps link the different transportation providers and provides the passenger with a seamless experience from origin to destination. The following sections summarize the technology required for MaaS operators, current industry efforts in the region, and potential scenarios for MaaS in the study area.

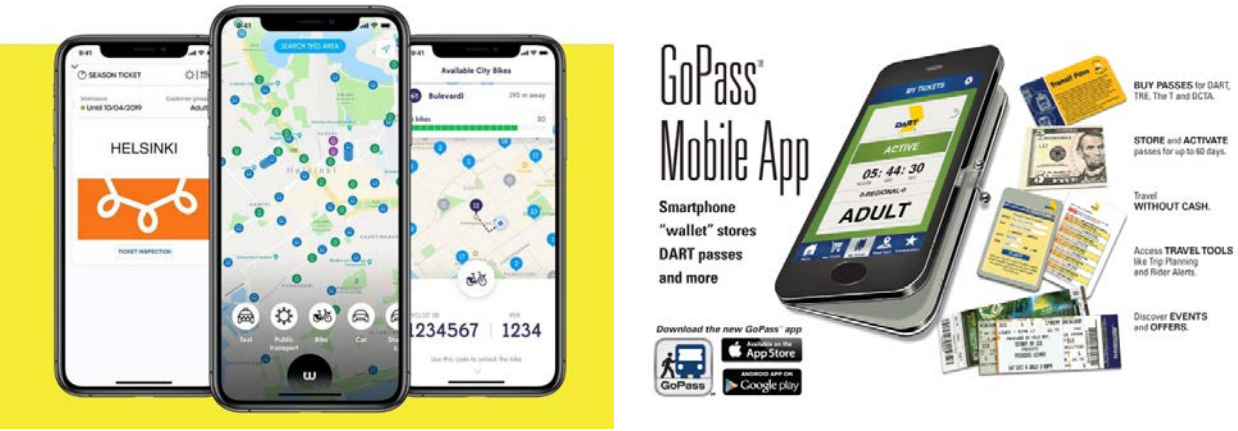


Figure 5-4: **Whim's MaaS Platform and DART GoPass App**

Source: Whim.com and DART.org

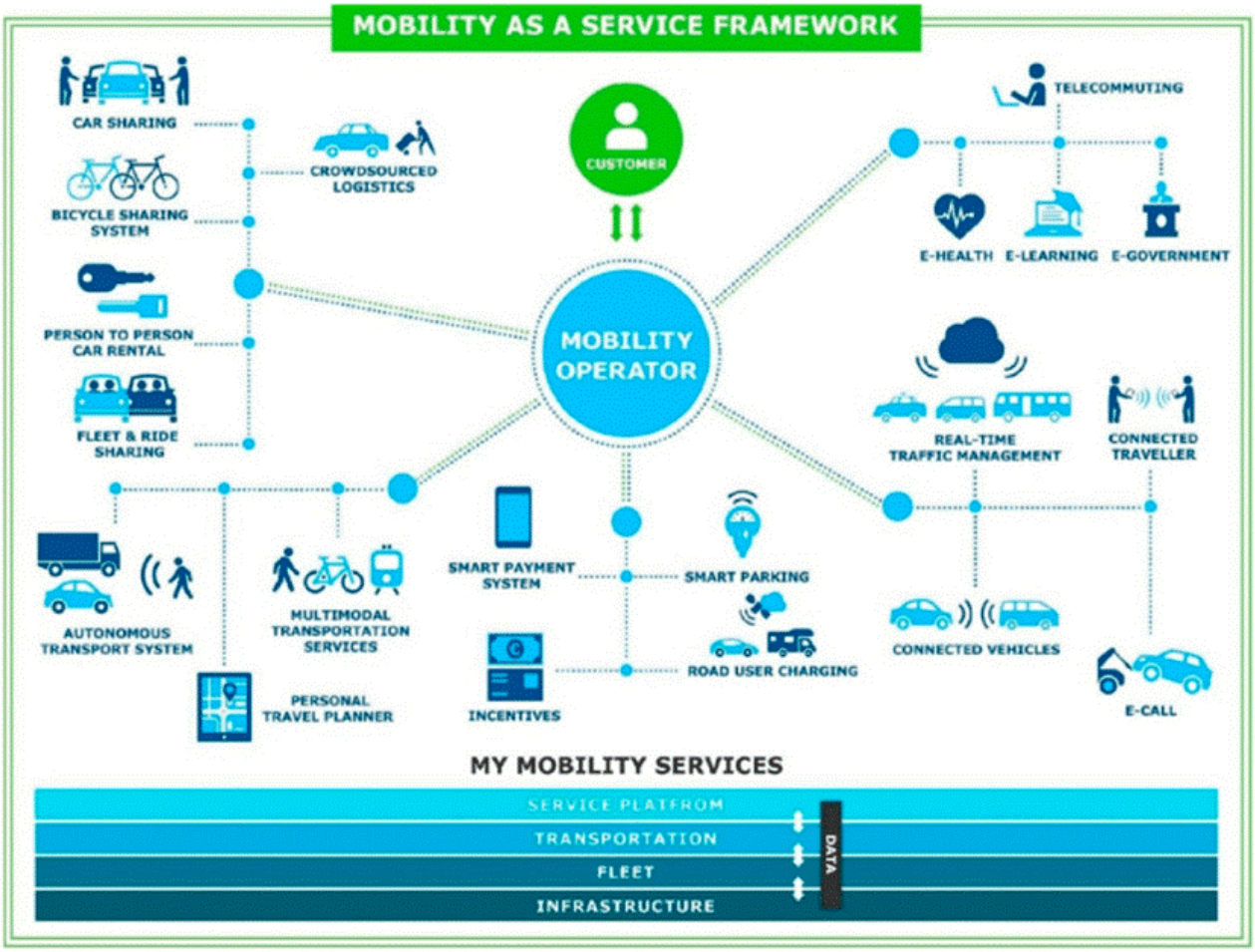
Technology summary

Using technology to link a variety of transportation services into one accessible service, or platform, is the key for MaaS to work effectively. The service should provide the passenger with a simple way to plan their trip, even if transfers between different types of vehicles are required. An effective MaaS platform will provide the ability to choose different mobility solutions based on time, cost, and travel preferences. This means a MaaS platform must be able to communicate with several different types of transportation providers, including taxis, transit providers, transportation network companies (Uber, Lyft, etc.), and bike, electric vehicle, and car share services.

Due to linking with several different transportation providers, the platform should also provide real-time scheduling tools for passengers to simplify trip planning. The platform should also provide multiple payment options, including bank and credit cards, NFC (Apple Pay, Google Pay, etc.), "cash to mobile" options, and other emerging payment technologies. Platforms are primarily accessed by the public through smartphones utilizing downloaded applications. The following image illustrates the various components and linkages which could potentially be integrated into a MaaS system (Figure 5-4).

Regional MaaS Operators

Because MaaS systems require linking several different regional transportation providers, regional transit agencies have started to lead efforts in setting up MaaS operations. Locally, DART is one of the industry leaders through its GoPass app. DART began testing and developing the platform in 2013 and has expanded transportation offerings each year, linking service to all of the regional transit agencies (DART, DCTA, Star Transit, and Trinity Metro), connecting TNCs, car and bike share companies to the app, and expanding payment options to provide a cashless payment system. GoPass has been successful in the Dallas area and now other transit agencies across the United States are interested in using the GoPass technology to provide MaaS in their region.



Source: Reyes Garcia, Lenz, Haveman, Bonnema. State of the Art of Mobility as a Service (MaaS) Ecosystems and Architectures—An Overview of, and a Definition, Ecosystem and System Architecture for Electric Mobility as a Service (eMaaS). October 2019

Figure 5-5: **MaaS Framework**

5.3.2. Mobility Hubs

The last emerging mobility concept which could impact the study area are mobility hubs. Similar to MaaS, mobility hubs integrate transportation choices; however, instead of a digital platform, mobility hubs physically locate transportation choices in a specific area. The following sections describe the different scales of mobility hubs, summarizes the FLM benefits of mobility hubs, and presents deployment strategies.

Scales of Mobility Hubs

No matter the scale of a mobility hub, all mobility hubs should have the following characteristics in common:

- Co-locating public and shared mobility modes. This can be as simple as placing shared electric vehicle stands near a bus stop, to providing food and covered resting places for high-traffic areas.
- Improves the public realm. Mobility hubs could improve the public realm by creating shared vehicle space which could reduce the amount of parking required at a station. This enables more land to be devoted for higher-use development within station areas. Creating lockers for mail and packages can reduce freight trips for operators by bundling deliveries to the mobility hub. Convenience is also passed on to the public by providing a place to ship and receive packages.
- Signage designating an area as a mobility hub. Digital technology would be located at the mobility hub to provide wayfinding assistance, public service announcements, and could also integrate MaaS platforms.

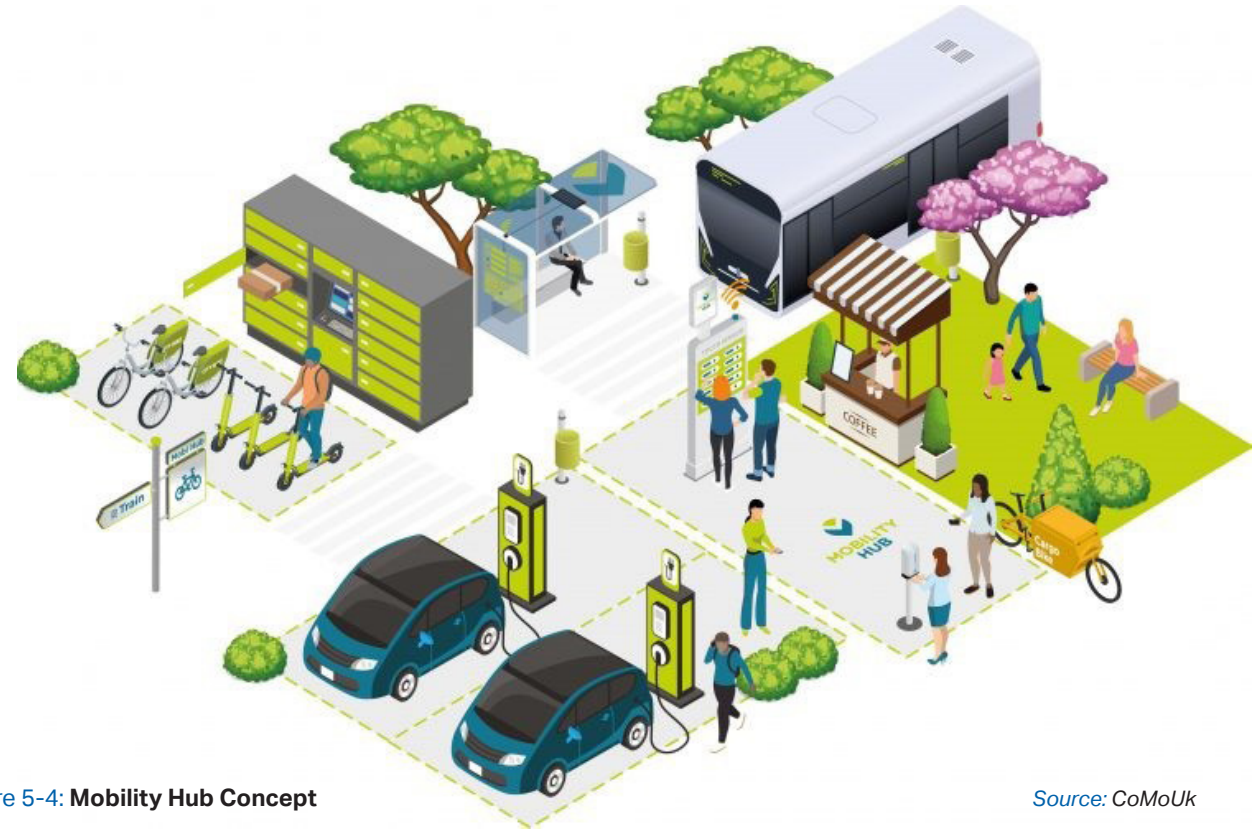


Figure 5-4: **Mobility Hub Concept** *Source: CoMoUk*

First/Last Mile Benefits

Mobility hubs can be located almost anywhere in the built environment. The FLM benefits of mobility hubs include the following:

- **Enhances the transit experience** by providing new mobility options to connect to key transit stations and services. Making FLM trips faster with electric vehicle sharing options, such as bikes or scooters, may expand the transportation experience.
- Provides wayfinding and trip planning services to **simplify trip planning**. A centralized location to plan and pay for transfers would be useful at an active mobility hub, such as a rail to bus station.
- **Built environment improvements**, including upgrading pedestrian facilities, space for small electric vehicles and bicycles, and lighting enhancements, all help contribute to improving safety and the overall transit experience.
- **Creates opportunities** for those who do not own a vehicle to have different mobility choices to make short and medium trips. A bicycle or electric scooter may be used one day to connect to the next rail or bus station, and the next day a car share rental might be required during a rainy day or to run multiple errands.

Deployment Strategies

The following action plan offers strategies for exploring mobility hubs. These actions are meant to guide decision-makers towards implementing scalable solutions.

5.3.3. Mobility Hubs in Southern Dallas County

Incorporating mobility hubs within the new transit service in Southern Dallas County will be key in providing greater access to transit. The first-last mile connections through micromobility, carshare and TNC service will extend the reach of the transit service. As the Phase 1 service matures over the first year it is important to track the service trends to better understand the ridership activity. Key nodes should be identified where improved connections are needed. Through this study's initial analysis prior to the introduction of service, three areas may be strong candidates for mobility hubs: Cedar Hill City Hall, the Walmart on Belt Line in DeSoto and the Duncanville City Hall. All three locations serve multiple routes and microtransit zones and serve as activity centers for the surrounding communities. Improved access to the locations will not only benefit the transit riders but the general community as well.

Action Type	Action Summary
Vision Plan	Establish vision for Mobility Hubs. Define objectives and methods to evaluate performance. Identify performance measures.
First/Last Mile Study	Evaluate FLM travel patterns to determine the optimal mobility hub solutions to be offered at a particular location. The FLM study will help communities identify barriers and solutions for improving shorter trips. Improvements could include evaluating the condition of infrastructure (e.g. travel lanes, bike lanes, sidewalks, intersections), design of supporting facilities, signage and wayfinding, and travel preferences.
Service and Operating Plan	Create the process to locate and scale each mobility hub. Building on the FLM study, this plan would identify the types of services offered at each mobility hub, create high-level conceptual designs, develop pricing structures, and identify revenue sources. The plan should also consider how customer service should be provided. Finally, performance measures should be created in order to evaluate each mobility hub.
Design and Infrastructure Plan	Focus on the design and development of each mobility hub. The plan would refine conceptual designs, establish branding themes, and establish architectural, color, material, and signage requirements to provide a recognizable environment.

Table 5-2: **Possible Mobility Hub Strategies**

6. Implementation Plan

This section discusses the steps that cities should take to implement the recommendations of the plan and the sequence in which they need to be done. Since implementation dates have not been selected, this section generally describes key tasks through years and phases of the project.

6.1. Coordination

The first step in the implementation process is organizing the effort through coordination. This includes coordination between the four cities and working directly with representatives from NCTCOG, DART, STAR Transit and the Inland Port TMA. A steering committee may be needed at the early stages to plan the implementation process. Each city should designate a representative who will take the lead for transit planning for the first two years of the process and also monitoring the service after implementation.

6.2. Implementation Planning

Through the coordinated effort of the steering committee there are key areas of focus that need to be planned by the four cities.

- **City Council approval:** in order to move ahead with implementation it is important for each City Council to review and approve the transit recommendations.
- **Regional connections:** the recommendations include connections to existing STAR Transit, Inland Port TMA and DART routes and stations. This could include timed transfers and permissions/contracts to use their facilities.
- **Operating characteristics:** plan operating characteristics for transit including service hours, frequency of service, days of the week and vehicle type.
- **Fares:** develop a fare structure including transfers, day passes and monthly passes. A reduced fare category should also be considered to accommodate seniors, students, ADA riders and potentially low income populations. Fare plans may also include coordinating with DART's GoPass app. Establish locations where fares can be sold to the public.
- **Contracting:** since it is most likely the service will be contracted, the cities will need to work together to select a contractor to operate the service.
- **Bus stops:** it is important to plan the general bus stop areas including the potential need for amenities such as benches and shelters and defining the distance between stops. This will only be needed for the fixed route services.
- **Marketing:** it is critical to market the service. This includes branding the service on buses and bus stop signs and also providing public information through signs, social media, transit service website and public outreach.
- **Monitoring the service after implementation:** once the new service is in place, performance should be monitored. Key metrics to monitor include running times and on-time performance, safety issues, pass-ups, productivity measures, ridership and passenger loads.
- **Future funding:** it is important to establish a sustainable funding source for transit in the future. The cities and NCTCOG should work together early on to establish a strategy for funding after the initial pilot period.

6.3. Other Implementation Considerations

6.3.1. Goals, Objectives, and Performance Measures

Transit system performance must be measured based on goals and standards that reflect the operating environment and values of the community it serves. The four cities should work together to define goals and strategies for the future transit service. Transit goals should reflect a community vision for the role of transit in supporting broader community goals such as unmet needs, safety, regional connectivity, ADA accessibility, economic development, equal access to goods, services and activities, etc. Objectives and performance standards should identify priority transit markets, service priorities, and design parameters.

Service Design and Performance Indicators and Standards

Performance measures must be developed to address standards within the following categories:

- Efficiency, effectiveness and productivity
- Service quality
- Service design

These standards will be used to guide future service evaluation; set standards for future service changes, and to ensure compliance with ADA, Title VI, and other local, state, and federal requirements.

Examples of service standards used to monitor efficiency, effectiveness, and productivity include:

- **Passengers per Revenue Hour:** the total number of passengers divided by the total number of revenue service hours provides a data point for monitoring ridership as it relates to total bus hours operated. This key productivity measurement works as an effective tool for future service planning. Improving ridership is often the goal of planning bus service, however it is just as important to plan for additional ridership with a "right sized" route or system.
- **Operating Cost per Revenue Hour:** this is calculated by dividing operating costs by the total number of revenue (in service) hours. Operating cost per revenue hour is one of the key cost effective performance measures to gauge the amount of service provided to the cost to operate that service. The standard should be tracked every six months for the system and by route to identify service areas that are less cost effective compared to other routes within the bus system.
- **Operating Cost per Passenger:** the total operating costs are divided by total passengers (unlinked trips) to calculate the cost for each passenger on the service. This is designed to track the cost effectiveness for the system as it relates to ridership over time.
- **Cost Recovery prior to Subsidy (Farebox Recovery):** this is calculated by dividing the revenue from the farebox by the total operating costs. Farebox recovery shows the amount of the total revenue that is generated by passenger fares. The goal for most small to medium sized systems should ultimately be 15 to 20 percent farebox recovery after the system has time to mature after one to two years in service.

Specific standards for the above-listed indicators will be agreed upon by the cities and contractor during contract negotiations before revenue service is implemented.

Service quality standards help staff evaluate system performance pertaining to reliable and high quality service which encourages ridership. The recommended service quality performance standards include the following:

- **On-time performance:** buses must arrive at the stop no later than five minutes from the scheduled timepoint 95 percent of the time. To be considered on-time, buses should also not depart a timepoint prior to the time in the schedule.

Service design standards help guide decisions for adding new service and making changes to the system. It identifies standards to design the service with a more consistent and uniform approach. The service design standards include the following:

- **Bus stop design:** all bus stops should be clearly marked with bus stop signs. It is preferable that the bus stop signs show the route(s) serving each stop. Route number decals can be added to signs or removed from signs during service changes. Bus stop amenities should be added to stops only when a minimum boarding threshold has been met. These thresholds can be defined after one year of fixed-route service.
- **New service:** ridership and productivity measures should be defined prior to introducing new service. Service should operate for at least one-year as a pilot program to allow for ridership to develop.

It is recommended that the service starts with several key efficiency and quality performance measures for fixed routes in the first three years of service. Additional measures should be added over time as the service matures. The performance measures that will be monitored during the implementation of the service should include the following:

- Passenger per revenue hour
- Fare recovery ratio
- Cost per passenger
- Cost per revenue hour
- On-time performance

6.3.2. Inland Port TMA

The Inland Port TMA currently operates the GoLink Inland Port Connect microtransit service within the entire Inland Port area including the city of Lancaster and portions of DeSoto. The service operates from 5:00 AM to 8:00 PM Monday through Friday and provides connections to the UNT Dallas Station and the Methodist Charlton Medical Center. Riders can use the DART GoPass app to plan trips and pay fares for the TMA service. In addition, the TMA is planning to provide a late night rider assistance program to eligible employees of TMA business members.

In October 2021 the TMA is planning to update their service and potentially include new restrictions on rider eligibility. Coordination between the cities and the TMA is critical throughout the implementation process of Phase 1. There are opportunities to optimize mobility in the area by introducing complementary services and to reduce potential overlaps. NCTCOG staff has had ongoing coordination meetings with the TMA and these meetings should continue with the involvement of the cities in the study area.

6.4. Implementation Plan

Table 6-1 presents a summary of the key implementation milestones and a suggested schedule for implementation. The schedule is set up to provide detailed plans for the first five years and more general recommendations for outer years of the planning horizon. The schedule is flexible and can be implemented starting at a later date.

Time Period	Implementation Milestones	
Year 1 – August 2021- November 2021: Contracting and System Start-up	• Designate a staff representative from each city to coordinate transit planning • Develop a transit steering committee for the four cities to coordinate planning effort • Present Plan for adoption to city councils • Meet with potential bus operations contractors • Engage businesses for funding partnerships through public private partnerships • Coordinate funding for plan between cities and NCTCOG • Maintain existing STAR Transit service until new services begin • Set system start-up date and schedule	• Establish fare program for the service • Cities and bus contractor enter into an agreement • Develop Capital Plan • Procure bus stop amenities – stops, benches, and shelters • Initiate marketing campaign to promote new service. • Cities coordinate outreach to the public about service and implementation date • Road test all routes • Begin bus stop placement • Coordinate service with Inland Port TMA service • Begin service
Year 2 – 2022 – Implementation and Monitoring Service	• Develop method for collecting feedback from clients – customer comments should be documented by contractor for analysis by the cities • Assess microtransit zone ridership activity to determine if boundaries should be updated • Update service based on development of new transit generators including high density residential, large shopping centers, and new employers. Assess changes to fixed route service with relation to ADA and paratransit requirements	• If service changes are needed, prepare Title VI review to ensure that the level and quality of fixed-route and demand-response services are provided in a non-discriminatory manner • Update and establish regular procedures for maintaining system goals, objectives, and strategies based on first six months of service • Track service data for service standards • Begin to plan a mobility hub plan based ridership activity
Year 3 – 2023	• Conduct on-board counts and rider survey. Travel patterns and utilization by passengers should be established by then	• Assess service for potential service improvements or changes for implementation
Year 4 – 2024	• Continue to monitor service • Make adjustments to routes based on	demand including updates to frequency, service hours, routing and zones
Year 5 – 2025	• Assess Phase 2 implementation based on needs and budget	• Assess financial plan and funding opportunities to implement Phase 2
Years 6-10	• Continue to monitor service and make adjustments as needed • Coordinate implementation with service contractor	• Develop a schedule for implementation of Phase 2 • Develop a marketing plan • Implement Phase 2 recommendations • Market new service
Years 11-20	• Continue to monitor service and make adjustments as needed • Assess growth and development in the four cities and need for new services • Assess the expansion of high capacity transit in the study area	• If regional rail is extended to area, begin developing service plan to connect into stations. This can include new microtransit zones or fixed routes that feed into the rail service

Table 6-1: **Key Implementation Milestones**