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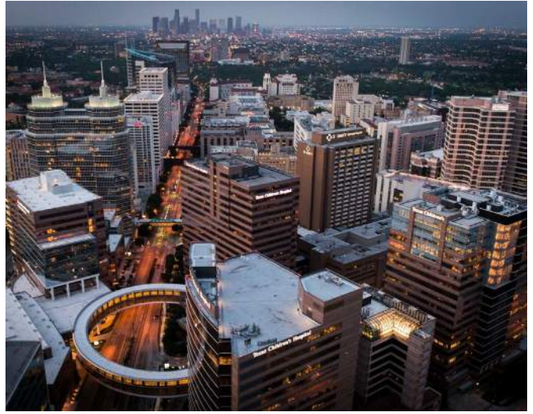
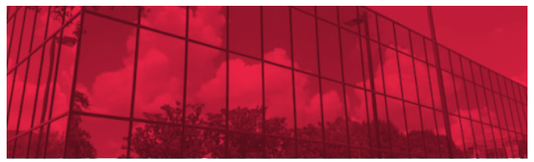
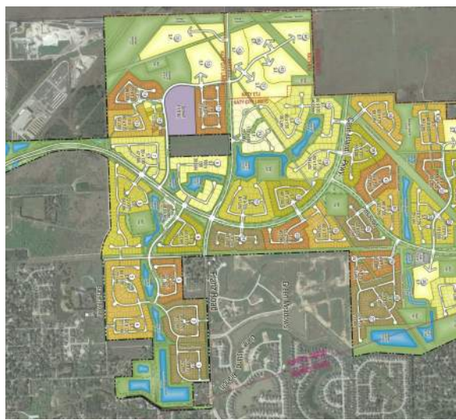


HARRIS COUNTY RDA & TIRZ 24 INFRASTRUCTURE & INVESTMENT STUDY

PREPARED BY EHRA ENGINEERING
NOVEMBER 2023





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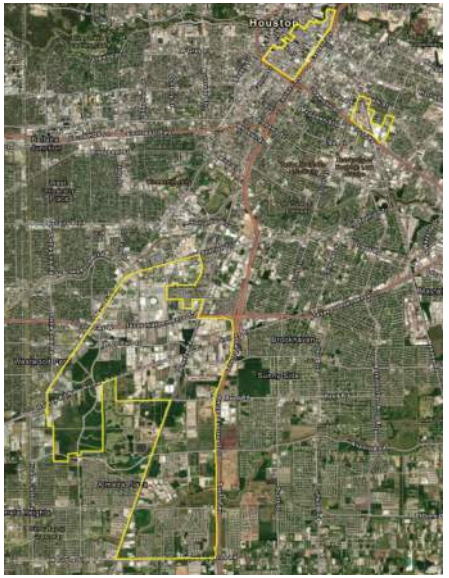


TIRZ 24 Three Sectors

Harris County RDA & TIRZ 24 Project Mission

The Harris County RDA and TIRZ 24 will make strategic community investments in real estate projects and capital improvements that will result in resilient, sustainable communities integrating transit access, innovative drainage solutions and incorporating an enduring urban design that promotes new real property housing values serving mixed-income and mixed land-use developments.

EXECUTIVE **SUMMARY**

The Harris County Redevelopment Authority (RDA) and Tax Increment Reinvestment Zone No. 24 ("TIRZ 24", the "RDA") are seeking to fund infrastructure improvement projects to spur development and future investment within the District's boundaries. TIRZ 24 consists of three separate areas, only two of which are part of this Infrastructure and Investment Study. The largest study area is known as the Southern Sector which resides within Harris County Precinct 1 and includes the entirety of NRG Park as well as being immediately adjacent to the Texas Medical Center (TMC). It is generally bounded by Old Spanish Trail, Almeda Genoa Road, SH 288, and South Main Street. In total, the **Southern Sector encompasses 7,145 acres**; however, **1,873-acres are vacant**, and another **1,872-acres are underdeveloped**. The second Infrastructure and Investment study area is located near the University of Houston Manin Campus and is known as the Cullen Annex, which is generally defined between Interstate 45 on the south, Milby Street to the west, Leeland and Polk Streets to the north, and South Lockwood Drive to the east. **The Cullen Annex totals 190.6-acres**, straddling Harris County precinct lines, with **56. 4-acres in Precinct 1** and **134.2-acres in Precinct 2**. The TIRZ 24/RDA can stimulate development of vacant tracts and redevelopment of underdeveloped tracts in both study areas by providing the public infrastructure needed to serve new development.

A tract-by-tract analysis of the current land uses was conducted within the study areas. In the Southern Sector, most vacant and underdeveloped tracts within the study area will require some measure of infrastructure improvement for development to occur since public infrastructure is practically nonexistent. Within the Cullen Annex, the current land uses are served by decades-old, undersized utilities which will need to be upgraded to foster redevelopment. The primary function of this Infrastructure and Investment Study is to identify how best to serve the future development needs of both study areas by programming the required infrastructure.

The Kinder Institute's "My Home is Here" report illustrates the need for new housing in the Greater Houston area, specifically affordable housing. TIRZ 24 is in a unique position to facilitate new housing at varying price levels to support healthy communities. Specifically in the Southern Sector, a significant portion of new development should be allocated to residential uses of varying densities. Land parcels in the southern portion of the study area could be developed as lower density residential similar to the densities of homes in the existing neighborhoods near Sims Bayou. Tracts close to Loop 610 are more likely to be developed as multi-family, or as a mixed-use. Based on acreages of available land for new development at customary population densities, the following would be possible: 112-acres of multi-family residential or 11,807 new residents; 540-acres of single-family residential or 15,600 new residents; and 143-acres of mixed-use projects or 22,882 new residents. In all, **50,289 new residents** are projected to call the Southern Sector of TIRZ 24 "home."

The potential addition of 50,000+ residents will create the need for various other land uses to support a healthy and vibrant community. Based the forecasted residential population and using National Recreation and Park Association (NRPA) recommendations, between 6-10 acres of parkland are needed for every 1,000 residents. This equates to a need for 300 to 500+ acres of new parkland. Enhancing the Southern Sector with this level of outdoor recreation availability would create not only one of the most well-served urban neighborhoods in the Houston area but would also have a positive effect on overall TIRZ value.

The predominantly light industrial and warehouse/distribution land uses currently within the Southern Sector of TIRZ 24 do not dictate a need for school sites. Accordingly, there are few school campuses within the study area. However, if the residential population should increase as anticipated, there may be **7,500 to 12,000 school age children within TIRZ 24.**

Using the forecasted land uses and their corresponding populations/densities, a high-level analysis of the wastewater and water systems was conducted to master plan the infrastructure required to serve future development of vacant and underdeveloped tracts. To properly anticipate water and sewer capacity needs the proposed land uses have been translated into five density categories: single family residential, townhomes, apartments, mid-rise residential, and high-rise. Based on these densities, an engineering standard known as an **"Equivalent Single-Family Connection" (ESFC)** was used to determine the capacities needed for water and sewer service and the corresponding sizes of water and sewer pipes. Approximately **46,520 linear feet of wastewater lines and associated manholes** are proposed for the Southern Sector at an **estimated cost of $150 million**; and approximately **48,850 linear feet of water lines and associated valves and fire hydrants** are proposed at an **estimated cost of $75 million**.

Also, from the density assumptions, new roadway needs can be forecasted. New collector streets have been planned for the Southern Sector study area to provide adequate traffic circulation for the forecasted population. **The estimated cost of new collector streets is $18.6 million.** Finally, Kirby Drive, a major thoroughfare planned in this area by the City of Houston, has been accommodated in the plan. Its **estimated cost is $124 million**.

While water and wastewater are City supplied services, gas, electric, cable, and telephone are supplied by private utility companies (also known as franchise utilities). Such utilities are located within street rights-of-way or in separate easements and are constructed as development occurs rather than before development happens as is the case with water and wastewater infrastructure. Within the study area, natural gas and electric transmission are supplied by CenterPoint Energy, telephone by AT&T, and cable by Comcast. **At this planning level, a $20 million budget for power upcharges serves as a placeholder for the TIRZ 24 preference of underground power instead of the standard overhead power lines.**

The TIRZ 24 Southern Sector falls within two watersheds. The area north of Holmes Road drains to Brays Bayou (D100-00-00), and the area south of Holmes Road drains to Sims Bayou (C100-00-00). As a consequence of Hurricane Harvey in 2017, FEMA maps are being revised and are expected to be released in early 2024. In the interim, Harris County and the City of Houston are treating property within the 500-year floodplain as needing to be regulated the same as if it were within the 100-year floodplain. Further, development and redevelopment within TIRZ 24 will require additional detention facilities. New basins will need to be constructed on a parcel-by-parcel basis or on a subregional basis. Ongoing efforts are being undertaken to understand the Harris County Flood Control District (HCFCD) regional plan for flood mitigation and how it might benefit the TIRZ 24 future developments. **A $25 million budget serves as a placeholder for detention purposes.**

The Railroad Commission of Texas (RRC) has primary regulatory jurisdiction over the oil and natural gas industry. However, the Texas Commission on Environmental Quality (TCEQ) also plays an important role in the areas of air quality, surface water management, water quality, and waste management. Within the TIRZ 24 boundaries, the Pierce Junction salt dome is one of the earliest oil fields in the Houston area. As Houston has grown, marginal wells in the field have been plugged and abandoned. Today, only remnants of oil production still exist in the area. Plugged wells and potential environmental hazards from previous oil and gas extraction may pose redevelopment issues. However, remediation and careful site planning can address such concerns. Open space, parks, and private parking areas can be placed over plugged wells. Also, pipeline corridors have the potential to become linear parks and bike trails which provide needed multi-modal transportation connectivity and recreation inside and outside the Zone.

"Superfund" is the common name derived from the federal Comprehensive Environmental Response, Compensation and Liability Act of 1980, (CERCLA) and funds the cleanup of polluted sites. Environmental studies are performed to determine whether hazardous waste is on a site and if so, what risk it poses to the environment. Superfund's ultimate goal is to return hazardous-waste sites back to productive use. **Within the Southern Sector, there are two superfund sites: Houston Lead and Sol Lynn Industrial Transformer.** The Houston Lead site does not require further environmental action and it has been developed as commercial and industrial land uses. The Sol Lynn Industrial Transformer site currently has ongoing operation and maintenance activities. The site is suitable for commercial and industrial redevelopment, but not residential development.

Adjacent to the north right-of-way of Holmes Road lies a Union Pacific Railroad (UPRR) right-of-way containing two parallel rail lines that are heavily traveled. There are a total of nine at-grade crossings and two grade separated crossings within the study area. Since at-grade crossings are potentially dangerous for train and automobile collisions, UPRR has been reducing the number of crossings by requiring closure of several existing crossings in exchange for any new crossings. **The extension of Kirby Drive is an opportunity to bridge over the railroad.**

Another UPRR ROW containing a single rail line exists along the east side of Almeda Road. This line has dozens of at-grade crossings- many of them private driveways, and one grade separated crossing. This line is not as heavily travelled. However, several spur lines serve pipe supply companies located near Pierce Junction where Holmes Road, Almeda Road, and Bellfort Avenue meet.

The UPRR ROW along Holmes Road will be in use for the foreseeable future since it provides a vital link to the Houston ship channel. Access for redevelopment of adjacent tracts of land is not hampered significantly since the existing local street network can be used. Since the rail line along Almeda Road is on the east side of the ROW and few east-west local streets exist between the major thoroughfares, the extension of Kirby Drive per the City of Houston Major Thoroughfare and Freeway Plan becomes even more important for local access.

Multiple METRO bus routes and transit centers are present in the Zone. The Almeda, Lyons, Bellfort, West Bellfort, and Sunnyside bus routes provide transit service in the study area. Just north of Brays Bayou and a half-mile north of the Southern Sector study area is the Texas Medical Center (TMC) Transit Center. The METRONext Plan proposes METRORail extensions of the light rail transit (LRT) at the Fannin South Transit Center. An extension of the current Red Line will require a partnership with entities in Fort Bend County to provide future service to Missouri City and Sugar Land. The Red Line could also be extended along Kirby Dr. to Pearland. The METRONext plan also proposes enhancements to the BOOST network, which according to METRO focuses on bus stop relocations, adding new shelters, upgrading accessibility, and prioritizing transit signals. Bus Routes #8 and #73 on West Bellfort Avenue through TIRZ 24 are identified as BOOST corridors. Future METRO augmentation within the Southern Sector should focus on three potential projects: transit service to Pearland via Kirby Drive, enhanced service to NRG Park, and expanded Bus Rapid Transit (BRT) on Buffalo Speedway.

On the western boundary of the Southern Sector, **over 800-acres of undeveloped land is accessible via Buffalo Speedway between West Bellfort Avenue and West Airport Boulevard.** There has been interest in this area becoming a medical research and product distribution facility (a "BioPort"). A METRO BRT line on Buffalo Speedway connecting to the TMC via the NRG Park Transit Center would be an excellent way to provide access between the medical campus, the new Helix Park on Old Spanish Trail (OST), and the potential BioPort.

Multiple major thoroughfares are present within the Southern Sector and the completion of Kirby Drive would form a very robust street network. However, redevelopment of land within the Southern Sector will require additional collector streets to distribute traffic effectively per City of Houston code. **An $18.6 million budget serves as a placeholder for road purposes.**

Kirby Drive has been designated by the City of Houston as a Principal Thoroughfare on the Major Thoroughfare & Freeway Plan (MTFP) since 1942. Within the study area, some portions of Kirby Drive have been constructed. Other portions have dedicated ROW, but no pavement has been constructed. In other areas, ROW needs to be acquired. The extension and completion of Kirby Drive from Holmes Road to Beltway 8 would facilitate the connection of the Houston Central Business District (CBD) to the City of Pearland. Additionally, Kirby Drive connects several employment centers, including the Texas Medical Center, Uptown, and Greenway Plaza to residential neighborhoods along the route. Kirby Dr. is proposed in three phases. **The cost of Kirby Drive is estimated at $124 million and additional $20 million is budgeted for landscaping.**

A wide range of infrastructure projects are required to activate the developable acreage in the TIRZ 24 Southern Sector. The summary of costs below totaling $671.8 million are investments recommended to develop 3,745-acres of vacant and underdeveloped land in this TIRZ 24 study area.

SUMMARY OF SOUTHERN SECTOR INFRASTRUCTURE COSTS

SUMMARY OF INFRASTRUCTURE COSTS (SOUTHERN SECTOR)

Projects	Cost Design & Construction	References
Kirby Drive Phase, I, II & III	$124,105,000	Appendix 3, 4, 5, 6
Kirby Drive Bus Rapid Transit (BRT)	$15,000,000	Budgeted Amount, no Cost Detail
Kirby Drive Major Landscape Package	$20,000,000	Budgeted Amount, no Cost Detail
Almeda/IH610/SH288 Connectors	$158,400,000	Budgeted Amount, no Cost Detail
Collector Streets	$18,631,000	Appendix 7
Bikeway/Trails	$9,159,413	Appendix 8
Sidewalk & Signs	$5,801,000	Appendix 9
Wastewater System	$150,455,000	Appendix 1
Water System	$75,249,000	Appendix 2
AT&T, CenterPoint Energy, Comcast	$20,000,000	Budgeted Amount, no Cost Detail
Redundancy for Water, Sewer, Power	$50,000,000	Budgeted Amount, no Cost Detail
Detention	$25,000,000	Budgeted Amount, no Cost Detail
TOTAL SOUTHERN SECTOR PROJECTS (CONSTRUCTION & DESIGN)	**$671,800,413**	

The TIRZ 24 Cullen Annex is already experiencing redevelopment of some of the decades-old warehouse tracts. Proximity to Houston's Central Business District, two major universities, and transformation of the nearby EADO District make the Cullen Annex an attractive redevelopment opportunity. It should be noted that it is possible to add new multi-family and single-family residential units without displacement of existing homes since redevelopment in the Annex can take place on former warehouse and light industrial properties. Additionally, the availability of sizable acreage tracts makes exciting mixed-use projects viable. These conditions indicate that the TIRZ 24 Cullen Annex is a wise location for public investment.

Rather than a lack of infrastructure as demonstrated in the Southern Sector, the Cullen Annex requires infrastructure upgrades to facilitate further redevelopment. Local streets within the TIRZ 24 Annex study area were analyzed for pavement conditions, right-of-way (ROW) width, pavement width, street classification, sidewalk conditions, and multi-modal mobility to determine what infrastructure improvements, if any, were justified. Based on the City of Houston's Pavement Condition Index (PCI), segments of Coyle, Hussion, Milby, Leeland, and Polk Streets were rated "Very Poor". These streets are therefore proposed for reconstruction or rehabilitation in conjunction with any needed water, wastewater, and drainage improvements already identified as necessary. Regardless of the observed PCI, streets within the Cullen Annex which need significant underground infrastructure replacement will require pavement reconstruction in combination with the utility work. Several roadways are served by open-ditch drainage and are proposed to be converted to underground storm sewers so as to match other existing conditions and provide space within the ROW for new sidewalks. In total, **over $16.7 million is budgeted to address street and drainage projects** and an **additional $4.8 million is proposed for utility upgrades and sidewalk improvements in the Cullen Annex**.

The Union Pacific rail line which runs through the Cullen Annex study area is an important north/south connection between Houston and the ports of Galveston and Freeport. The line is highly traveled at regular intervals. Within the Annex study area, at-grade intersections with the rail line occur at Cullen and Leeland Streets, and an underpass is located on Polk Street. The Gulf Coast Rail District (GCRD), which was created to enhance the economic benefits of rail and passenger transport while improving regional quality of life, has studied the Union Pacific line with the goal of eliminating conflicts between the rail and other modes of transportation as well as increasing the safety of all roadway users. The GCRD study proposes to upgrade the intersections with Leeland Street and Cullen Boulevard with quad gates which will prevent the ability to drive around the gates when closed. Just north of the Annex study area, the GCRD study proposes to close the at-grade crossing with Milby Street.

Further local street circulation can be enhanced by studying the opportunity for a new underpass at Leeland Street. Currently classified as a Major Collector, Leeland Street provides direct access through the EADO District to Houston's Central Business District to the west and becomes Telephone Road to the east, leading to Hobby Airport. The current at-grade crossing of the railroad is an impediment to timely traffic circulation. Since the GCRD study proposes multiple crossing closures, assessing if Leeland Street could include a future underpass would ensure adequate circulation at all times. Projects such as this are eligible for Federal funding with 20% local match via the Transportation Improvement Program which equates to a $10 million budget amount.

SUMMARY OF CULLEN ANNEX INFRASTRUCTURE COSTS

SUMMARY OF INFRASTRUCTURE COSTS TO SERVE 89-ACRES OF NEW DEVELOPMENT (CULLEN AREA)

Projects	Cost Design & Construction	References
Coyle Street Reconstruction - Milby to Cullen	$3,867,795	Appendix 10
Milby Street Rehabilitation - Gulf Freeway to Bell	$2,404,650	Appendix 11
Hussion Street & Drainage - Coyle to Leeland	$2,484,000	Appendix 12
Cullen Boulevard Utility Improvements - Gulf Freeway to Leeland	$2,145,348	Appendix 13
Leeland Street Utility Improvements - Miller to Milby	$820,410	Appendix 14
Keating Street & Drainage - Leeland to Clay	$1,656,000	Appendix 15
Polk Street Sidewalk Improvements - Milby to Cullen	$648,600	Appendix 16
Leeland Street Sidewalk Improvements - Milby to Sidney	$483,000	Appendix 17
Leeland Street Sidewalk Improvements - Ernestine to Lockwood	$641,700	Appendix 18
Leeland/UPRR Rail Grade Separation - 20% TIP Match	$10,000,000	Appendix 19
Ernestine & S. Lockwood Multimodal Project - Gulf Freeway to Leeland	$938,400	Appendix 20
Pease Street & Drainage - Hussion to Keating	$1,269,600	Appendix 21
Jefferson Street & Drainage - Milby to Keating	$1,407,600	Appendix 22
Tharp Street & Drainage - Milby to Hussion	$1,035,000	Appendix 23
Winchester Street & Drainage - Milby to Hussion	$1,035,000	Appendix 24
Harby Street Utility Improvements - Eastwood to Ernestine	$771,420	Appendix 25
Urban landscape & Streetscape	$7,000,000	Budgeted Amount, no Cost Detail
AT&T, CenterPoint Energy, Comcast	$4,000,000	Budgeted Amount, no Cost Detail
TOTAL CULLEN ANNEX PROJECTS (CONSTRUCTION & DESIGN)	**$42,608,523**	

The Priority Projects listed below are undertakings in both Harris County Precinct 1 and 2 that can be accomplished in a relatively short timeframe, benefiting both the Southern Sector and the Cullen Annex, and will create value in TIRZ 24.

TIRZ 24 PRIORITY INFRASTRUCTURE PROJECTS

PRIORITY PROJECTS COSTS					
No.	Project Name	Location	Description	Cost Estimate (Design & Construction) Pct 1	Cost Estimate (Design & Construction) Pct 2
PRECINCT 1 PROJECTS					
1	Pavement Panel Replacement and Lane Striping on Kirby Dr. and Murworth Dr.	Kirby Dr. from Main St. to IH610; Murworth from Kirby Dr. to Main St.	Replace concrete pavement and add lane striping	$4,000,000	
2	Sidewalk Replacement and New Digital Signs at NRG Park	NRG Park - Westridge, Murworth, Lantern	Replace w/ 10-foot-wide sidewalks, install digital directional signs	$5,800,000	
3	Buffalo Spwy Water & Wastewater	Buffalo Spwy b/t W Belfort and Holmes	Install water & wastewater lines on Buffalo Spwy	$10,700,000	
4	Kirby Dr Preliminary Engineering Report (NEPA process)	Kirby from Holmes to Beltway 8 (all 3 phases)	Study Kirby alignment, ROW & environmental impacts, costs, and information needed for HGAC TIP application	$2,000,000	
5	S. Main Street at H610 Intersection Redesign	S. Main & IH610 Intersection	Provide double right turn from SB Main St to WB 610 frontage road	$1,000,000	
6	Shared Use Path on Kirby Dr	Kirby (from IH610 to Main)	Construction of 10-foot Shared-Use Path for pedestrians	$4,200,000	
7	Water and Wastewater Lines east of Almeda and north of Reed Rd.	East of Almeda and north of Reed Rd.	Install water and wastewater lines	$3,400,000	
8	S. Main Street Digital Dynamic Signs	S. Main between IH610 and Kirby	Install dynamic digital message signs	$3,408,750	
9	Water and Wastewater Lines (Southern Sector)	Within TIRZ 24 boundary	Install water and wastewater lines to be determined by developer's request	$2,000,000	
			TOTAL PRECINCT 1 PROJECT COSTS	**$36,508,750**	
PRECINCT 2 PROJECTS					
10	Hussion Paving and Drainage (Cullen Annex)	Hussion from Coyle to Leeland	Street reconstruction and utility improvements		$2,484,000
11	Keating St. Paving and Drainage (Cullen Annex)	Keating from Leeland to Clay	Street reconstruction and drainage improvements		$1,656,000
12	Sidewalk Replacement for Polk and Leeland (Cullen Annex)	Polk from Milby to Cullen, Leeland from Milby to Sidney, Leeland from Earnestine to Lockwood	Replacement of sidewalk panels		$1,773,300
13	Leeland Underpass Proposed TIP 20% match	Leeland west of Cullen	Tunnel installation on Leeland at Railroad tracts west of Cullen		$10,000,000
			TOTAL PRECINCT 2 PROJECT COSTS		**$15,913,300**
PRECINCT 1 & 2 PROJECTS					
14	Coyle St. Reconstruction (Cullen Annex)	Coyle from Milby to Cullen	Street reconstruction and utility improvements	$1,933,897	$1,922,897
15	Milby Street Rehabilitation (Cullen Annex)	Milby from Gulf Freeway to Bell	Milling and asphalt overlay and utility improvements	$1,119,076	$1,285,573
16	Cullen Blvd. Utility Improvements (Cullen Annex)	Cullen from Gulf Freeway to Leeland	Installation of Water and Wastewater lines	$1,480,290	$665,057
			PRECINCTS 1 & 2 SPLIT COSTS	**$4,533,263**	**$3,873,527**
			TOTAL FOR PRECINCT 1 & 2	**$41,042,013**	**$19,786,827**
			COMBINED PRECINCT 1 & 2 PROJECT COSTS	**$60,828,840**	

Investment in infrastructure as proposed in this study will activate redevelopment of **a total of 3,822-acres of undeveloped and underdeveloped land in TIRZ 24** which is centrally located within the Greater Houston Area. The resulting new development will include opportunities to provide living accommodations for over 50,000 new residents in close proximity to multiple job centers and public transportation. Such large acreage assemblies so close to the city center are extremely rare, which further illustrates the excitement of transforming the Southern Sector and Cullen Annex of TIRZ 24.

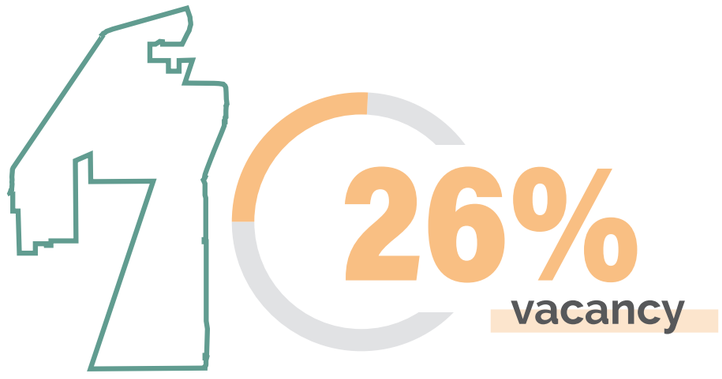
1

CHAPTER ONE: TIRZ 24 SOUTHERN SECTOR STUDY

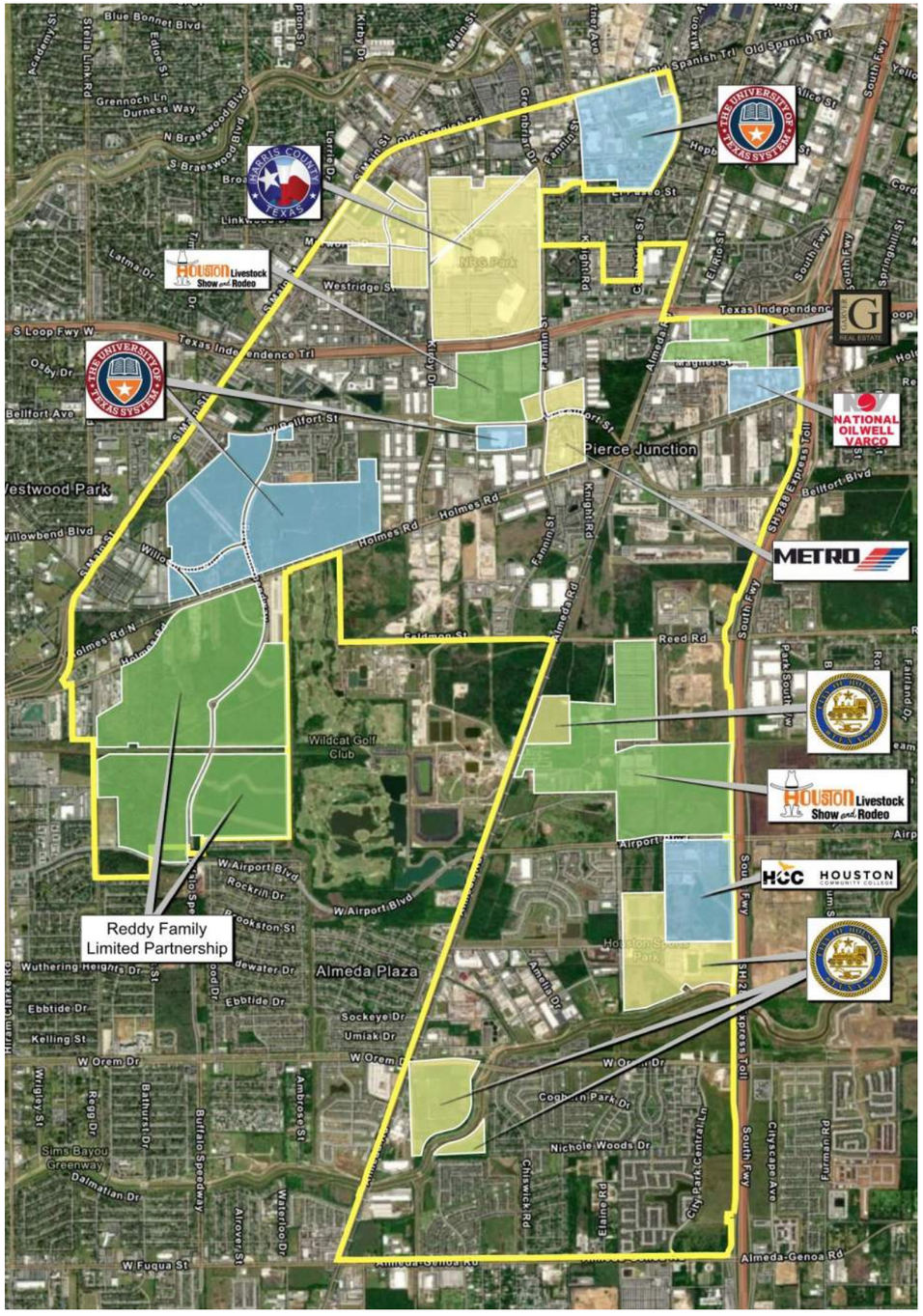
REDEVELOPING THE FUTURE OF TIRZ 24

The Harris County Redevelopment Authority (RDA) and Tax Increment Reinvestment Zone No. 24 ("TIRZ 24", the District) are seeking to fund infrastructure improvement projects within the District boundaries to spur potential redevelopment and future investment. Houston-based civil engineering firm Edminster, Hinshaw, Russ & Associates, Inc. (EHRA) is assisting the RDA and TIRZ 24 in determining where infrastructure investment should be made, the costs of such projects, when construction should occur, and what impacts or result can be foreseen.

The RDA/TIRZ 24 is composed of three parts. The Northern Sector adjacent the freeway side of the George R. Brown Convention Center is not part of the infrastructure study. The Cullen Annex is discussed in Chapter 2 of this study. The southernmost of the three TIRZ 24 areas is known as the Southern Sector and is generally bounded by Old Spanish Trail, Almeda Genoa Road, SH 288 and South Main Street. In total, the study area encompasses 7,145 acres. Developments within the TIRZ's boundary are diverse and include NRG Park, the METRO Fannin Red Line and Rail Operations Center, Houston Livestock Show & Rodeo (HLSR) event parking lots, New Hope Housing, Houston Community College-South Campus, AVEVA Stadium Complex, hotels, single-family and multi-family residential, and commercial and industrial businesses. However, approximately **26% of the southern sector study area remains vacant** due to a deficit of public infrastructure.



The RDA/TIRZ 24 can stimulate efforts to develop vacant tracts and revitalize underdeveloped areas by providing the public infrastructure needed to serve new development. Extensive investigation has occurred to determine where such investment is needed based on projected land use. Other physical and environmental factors have also been considered. In total, **over 3,745-acres of undeveloped or underdeveloped land** has been studied and proposed for redevelopment. These areas will need new streets, storm sewers, water and wastewater lines, and detention facilities in order for new development to occur. This planning document proposes and outlines how these objectives can be achieved.



RDA/TIRZ 24 Study Area with Major Landowners and/or Development Partners

3,745+ acres

Undeveloped | Underdeveloped Land

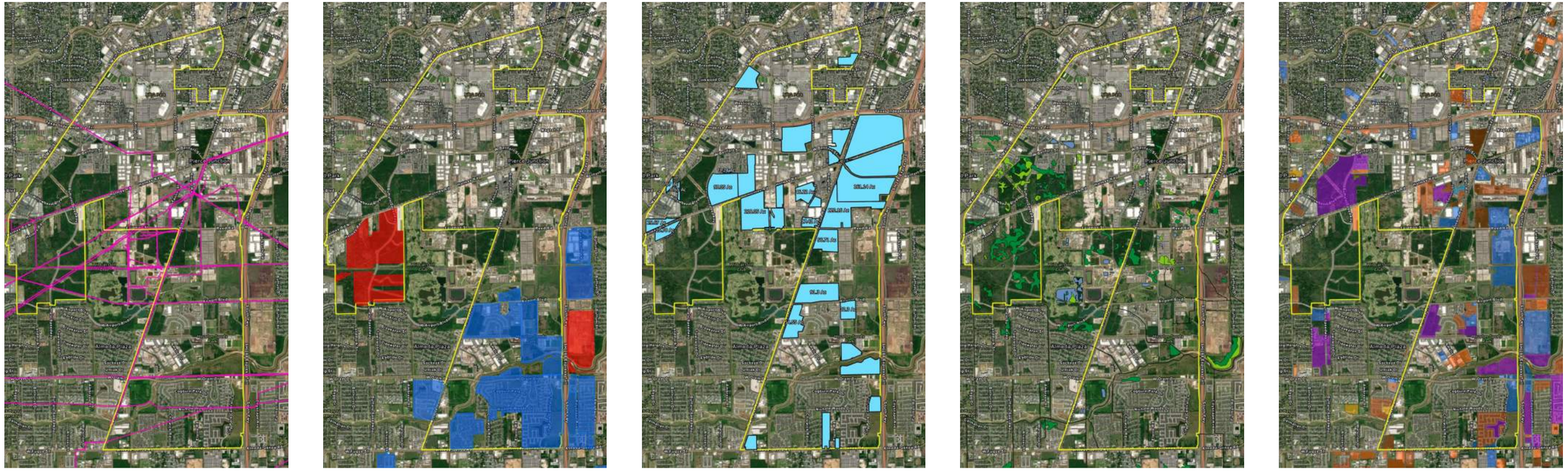
METHODOLOGY & GIS

The TIRZ 24 Infrastructure and Investment Study both proposes and predicts what infrastructure and dollar amounts are needed to support the future development of properties within the District boundaries. This study validates/confirms the lack of overall public infrastructure has thus far made new development difficult and financially infeasible within the study area. Development of properties requires that it be served by roads, water, wastewater, electrical, communication services, and other utilities before habitable structures can be built.

For any developer to succeed, they must understand all development costs for their project. A myriad of expenses is necessary to bring a project to fruition. But in simplistic terms, there is the cost of the land, the cost of public utilities to serve the land, and the cost of vertical structures to be built on the land. Land values are market driven and often based on what someone will pay for the land, while the cost to build structures is based on materials and labor cost at the time of construction. This study supplies the information needed to understand the infrastructure costs to provide road access and water and wastewater services to properties within the TIRZ boundary.

To arrive at dollar budgets for new infrastructure, the service requirements (i.e., water supply and wastewater capacity) for whatever may be built in the future must first be understood. Therefore, a number of factors are considered, for example, knowledge of current land use, the likely location and size of new developments, the timing of such new development, and the resulting population density of new development. To accomplish this, a Geographic Information Systems (GIS) platform was used to combine numerous layers of data from multiple sources. This included existing land use, topography, drainage, wetlands, railroads, public transportation routes, pipelines, franchise utility corridors, property data, and traffic counts, to name only a few. Before commencing analysis, the data sets were verified to assure accuracy.

From the many GIS data sets and by applying land planning principles and expertise, a proposed land use map was created. Subsequently, a new population or density for each developable (or redeveloped) tract of land was estimated. From the future population, the infrastructure required to serve the tracts could be generated. For example, forecasted traffic volumes could be generated to estimate the size of roadways. The forecasted populations are also used to estimate the size and location of water and wastewater lines in order to serve the new residents or businesses. Developing this information in a GIS database allows the RDA/TIRZ the ability to continually update the data as new development occurs. The tool can also be used to track current construction costs. Thus, the RDA/TIRZ can effectively predict the infrastructure investment needed for any piece of property at any time. This will allow the RDA/TIRZ to assist developers and partner with anyone wishing to bring new investment to the District.



These are examples of several of the 63 datasets available in EHRA's GIS database for TIRZ 24. The database is a collection from reliable government sources such as the City of Houston, Harris County Pollution Control, Harris Central Appraisal District (HCAD), Railroad Commission of Texas (RRC), Texas Commission on Environmental Quality (TCEQ), and the Houston-Galveston Area Council (HGAC), among many others. Several datasets were edited by EHRA for accuracy following site observation and cataloging so that the best possible data outcomes could be achieved.

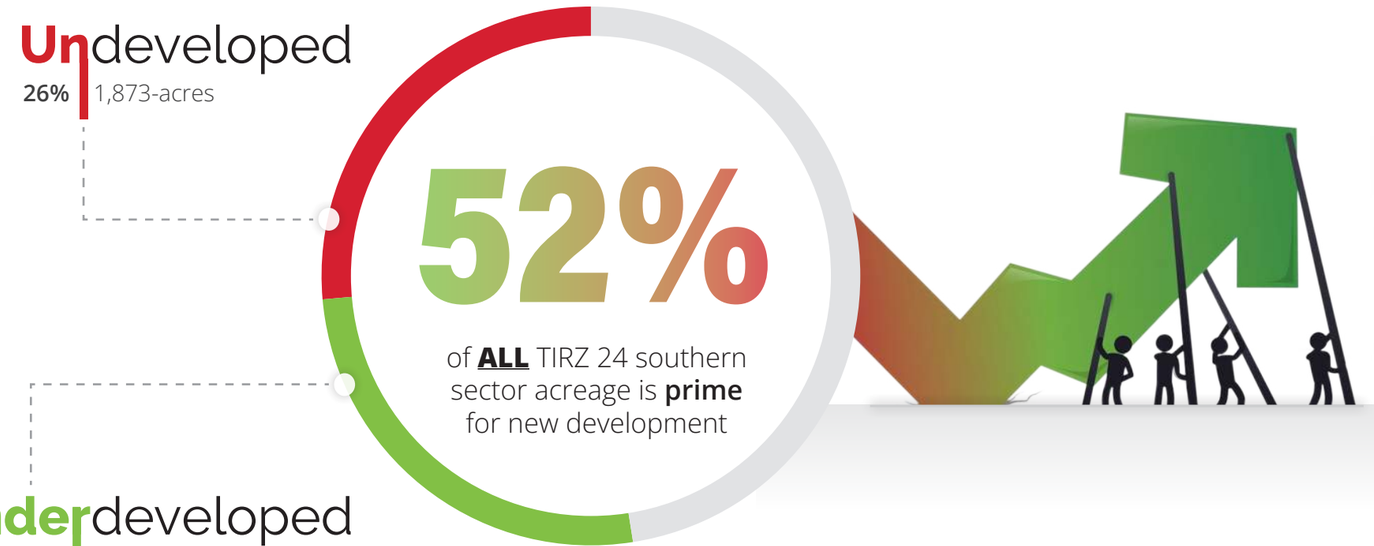
UNDEVELOPED AND UNDERDEVELOPED LAND

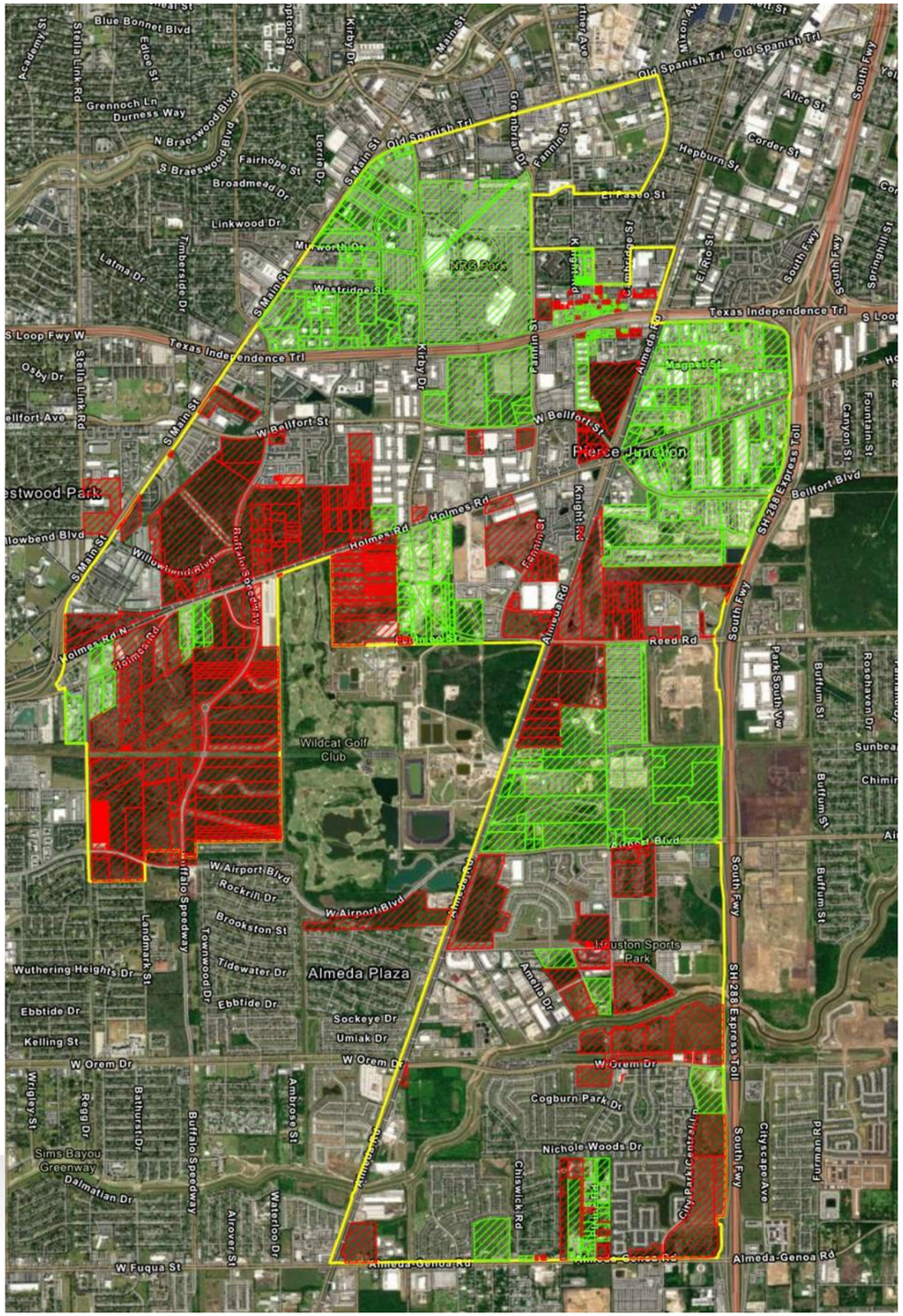
Within the 7,145-acre southern sector boundary, **1,873-acres** are vacant and considered **undeveloped**. Such areas are shown in **red** on the adjacent map. While many of those tracts are accessible by existing streets, new streets will be needed to fully access larger vacant tracts. Utilities located within new rights-of-way will provide the needed storm sewer, water and wastewater service to fully develop the vacant properties.

Another **1,872-acres** (nearly the same acreage as undeveloped) are deemed **underdeveloped**. This term means that the tract is currently underutilized. These tracts are shown in **green** on the map. Underdeveloped tracts in the District may contain older or unused warehouse structures and associated parking that can be easily demolished and redeveloped. Other sites may be in active use for storing oilfield equipment, which is essentially large storage areas that may contain small metal buildings. As the TIRZ redevelops it is easy to imagine that such sites can be demolished with minimal effort or cost so that new higher density projects can take their place.

The underdeveloped classification also includes the large parking area on the 350-acre NRG Park as well as the 101-acre HLSR property at the former Astrodome site. Other than the two stadiums and two exhibition buildings, these properties are essentially enormous parking lots, comprised of over 23,000 surface parking spaces, that are only used during events at the facility. Converting the surface parking to structured parking and improving public transportation to the site could recover many acres that may promote more intensive uses.

In all, over 52% of the area within the TIRZ 24 boundary can be considered ripe for redevelopment due to their vacant or underdeveloped condition. This fact illustrates the huge potential within the TIRZ to redefine land use and transform the character of the entire District area.





Current Undeveloped and Underdeveloped Land as of July 2023

CURRENT LAND USE

The TIRZ 24 Infrastructure and Investment Planning Study began with an analysis of the current land use within the District 7,145-acre southern sector boundary. While several sources are available for such data, none proved sufficiently accurate to rely upon fully. Therefore, EHRA performed a tract-by-tract reassessment and accurate accounting of the current land uses within the District. Standard accepted land use colors (denoted on the map) indicate the wide range of uses and percentages of each use. Compiling an accurate snapshot of all land uses currently within the District is a critical starting point for this study. Infrastructure improvements that will spark new development cannot be planned without understanding and projecting where the best locations for such improvements should occur.

Current major thoroughfares, rail corridors, and Sims Bayou are all physical features which create different land use characteristics due to street connectivity, or the lack thereof. Throughout the District land use is impacted by access to tracts of land. But in many cases the inability to cross railroads and waterways or to gain access from frontage roads is adversely affecting the development of numerous tracts.

North of Loop 610, the sprawling NRG Park complex and adjacent properties owned by Harris County dominates the developed acreage. Originally constructed in the 1960's, the Astrodome complex has grown to house a more modern sports stadium, exhibition and convention facilities, and acres of associated surface parking. The street network and freeway ramp system are configured to serve NRG Park which leaves adjacent land uses impaired due to frequent high traffic generating events. Commercial and medical center related uses are present along South Main Street and Old Spanish Trail near NRG Park. And many 1970's era apartment complexes reside east and west of the facility.

South of Loop 610 and north of Holmes Road, current land uses are characterized by car dealerships, undeveloped tracts, multiple vacant facilities, and many light industrial warehouse/distribution centers. Of note is the former Astroworld site on Loop 610 and the now vacant Sam's Club retail site. Both lie near to the METRO Fannin South Transit Center and METRO Rail Operations Center (ROC) which is the current terminus of the Red Line.

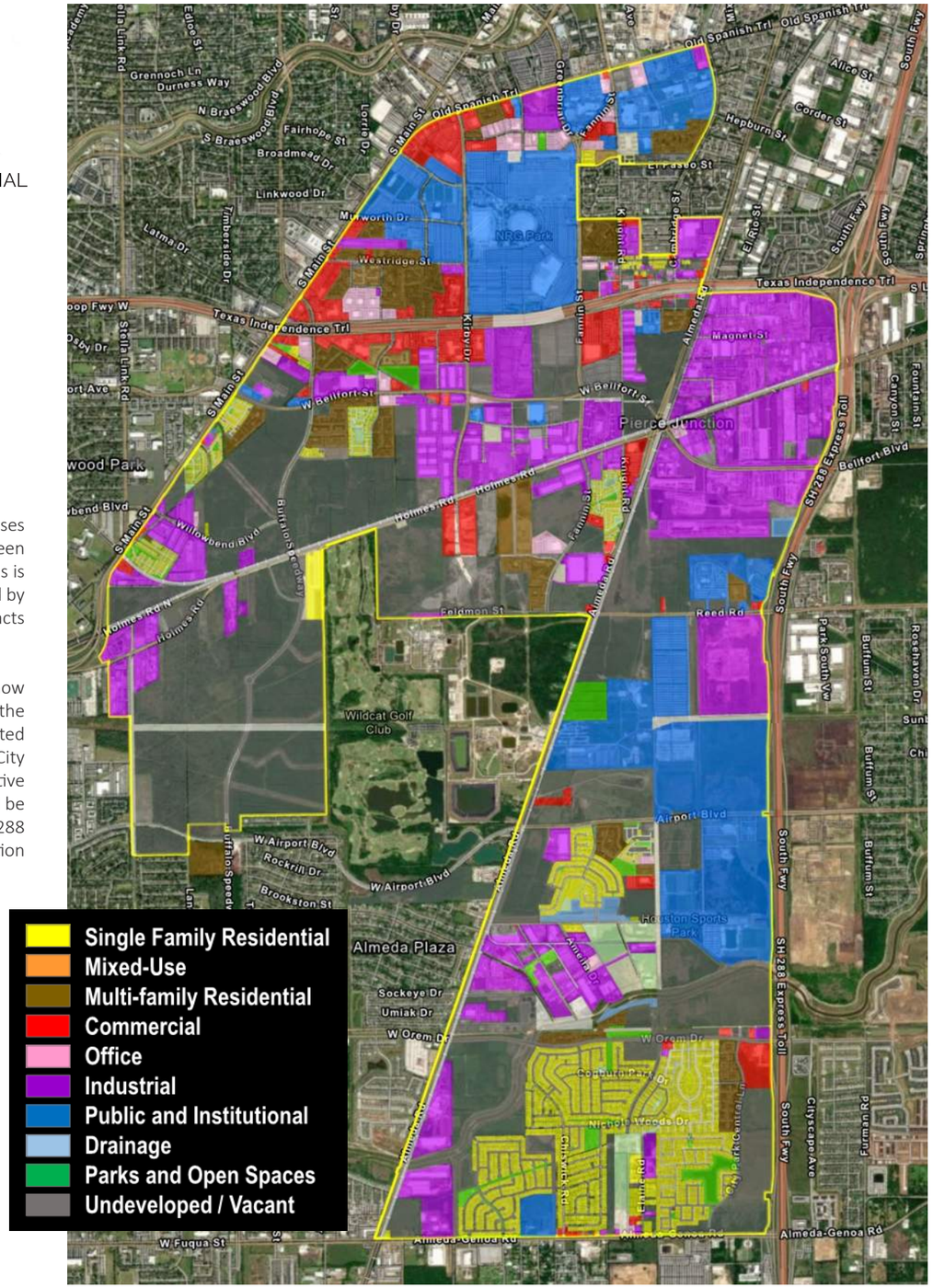
South of Holmes Road, the District boundary wraps around the Wildcat Golf Course and is characterized on the west side by vacant land accessible by Buffalo Speedway. This represents the largest portion of completely undeveloped acreage within TIRZ 24 at approximately 500 acres. Despite the good arterial street access, the area remains undeveloped due to the lack of utilities. East of the golf course, there are literally dozens of small, tightly grouped, undeveloped tracts. This presents a challenge to development due to the difficulty to assemble small tracts of land with multiple owners. However, centered within those parcels is the Orleans at Fannin Station apartment development, a new project which offers a range of apartment sizes and amenities. It is both a needed land use addition and a spark for other new residential development in the District.

At the intersection of Loop 610 and Highway 288, the predominant land uses are related to oil field equipment and pipe supply companies which have been operating in this area for decades. Rail service on Holmes and Almeda Roads is a necessity for such businesses. And while their current use is not hampered by the lack of vehicular access across the railroads, redevelopment of these tracts will require new solutions to access these properties.

Between Reed Road and Airport Boulevard, is the large Houston Livestock Show & Rodeo (HLSR) parking and staging facility which is highly utilized during the annual event. Between Almeda Road and the HLSR facility is the only dedicated park within the TIRZ 24 boundaries, E.R. and Ann Taylor Park. It is a 26-acre City of Houston open space focused on unspoiled walking trails laced within a native forest. As the area redevelops, additional and more intensive-use parks will be needed to serve new residents. Finally, the southwest corner of Highway 288 and Reed Road is under development as a new, large warehouse/distribution facility.

Sims Bayou runs east-west through the southernmost area of the District between Airport Boulevard and Almeda Genoa Road. This area is characterized by single-family residential not found anywhere else in the TIRZ boundaries. The master-planned City Park community as well as several smaller developments were created in the mid-2000's and are primarily built-out except for tracts which are likely planned for multi-family residential and commercial uses. The only other single-family found in the TIRZ are new townhome style developments on the far west side of the District.

Auxiliary land uses for residential development such as grocery stores, retail and professional centers, schools, and parks, are currently non-existent. The overriding take-away from the land use analysis is that **vacant and undeveloped land—1/2 of the District—is the largest land use.** The fact demonstrates the need for a variety of residential and commercial uses which is a tremendous opportunity for redevelopment.



Existing Land Use Map as of July 2023

POTENTIAL LAND USE

At this time, most candidate tracts within the TIRZ 24 boundary require some measure of infrastructure improvement in order for development to occur. Water or sewer connections are nonexistent, streets are not constructed, or stormwater drainage has not been accounted for. The primary function of this Infrastructure & Investment Study is to identify how best to serve the future development needs of the District by programming the required infrastructure. Thus, projecting what land uses may be best or appropriate in the future is a very necessary step. From the analysis of existing land uses within the District, a Potential Land Use map has been created to **guide the investment of infrastructure improvements** needed to support development and redevelopment.

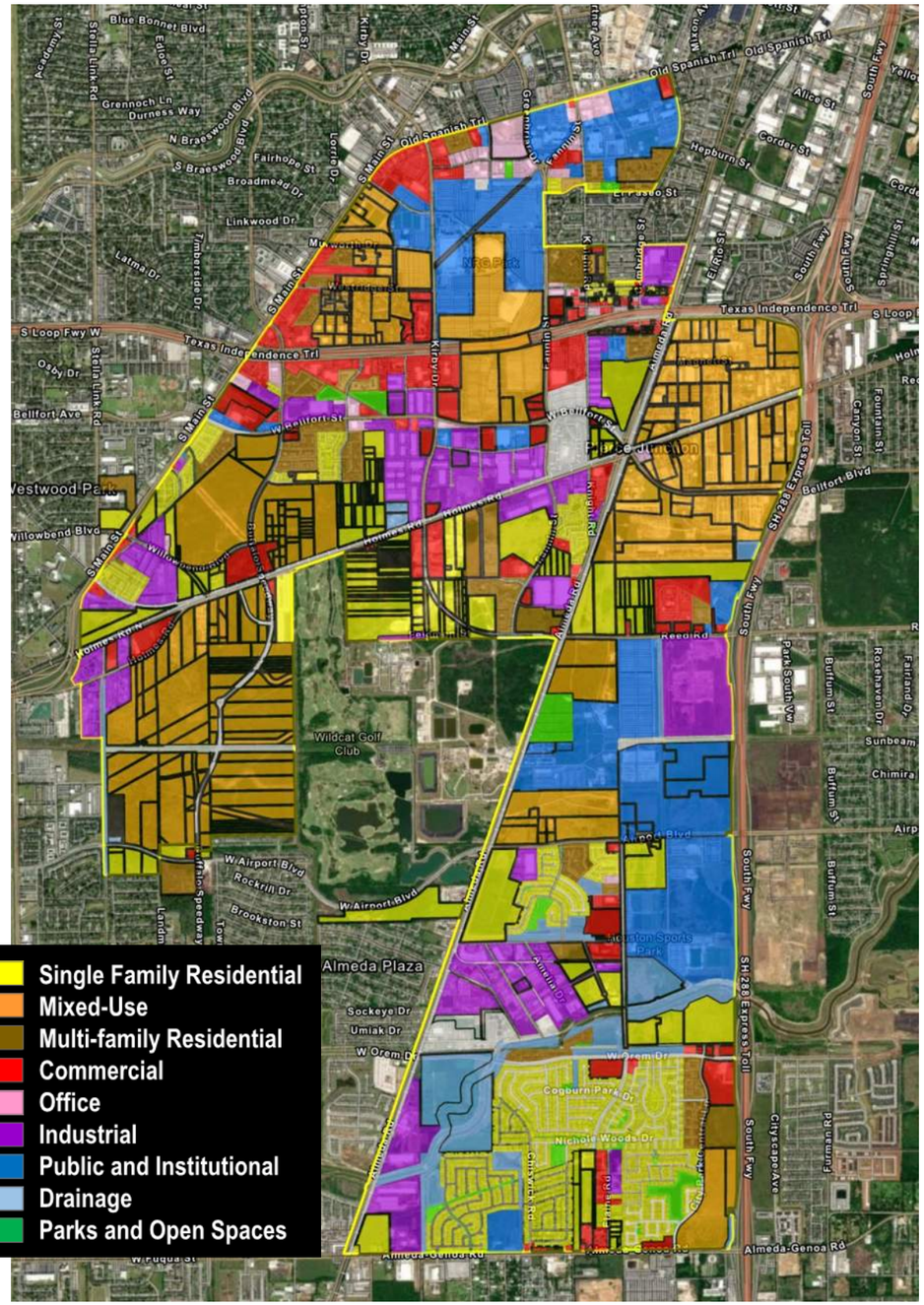
Though new development or redevelopment depends greatly on market based factors, this map illustrates potential land uses. These uses have been chosen based on intense study of many planning factors such as the need for specific land uses, vehicular access, adjacency to other land uses, and timeliness of new infrastructure and/or redevelopment. One of the most important factors in planning future land use is the **availability** and **cost** of land. Land values are constantly on the rise which requires developers to create value on tracts commensurate to land cost and development cost. This reality is easily observed in many near-town neighborhoods throughout Houston where smaller lots and denser townhomes are being built alongside mid-rise and high-rise multi-family buildings. Increasing density is one way to combat the higher cost of land in today's market. But, higher density also equates to a greater stress on all infrastructure. Thus, this Potential Land Use map puts an emphasis on identifying where higher density development is likely to occur so that the proposed infrastructure improvements (identified later in this plan) do not miss the mark. It is imperative to properly size the water, sewer, drainage, and transportation systems to support the proposed vertical improvements.

It is not difficult to imagine that mixed-use projects with medium to high density land uses will be common as new development occurs within TIRZ 24. The proximity of the tracts within the District to major thoroughfares and freeways makes transportation and connectivity issues an attractive sales point. With current median home prices above $300,000 and lying only 2.5 miles from the Texas Medical Center, the price of single-family lots will surely increase to a point which is not sustainable in this area. Thus, it is reasonable to assume that new single-family homes will be using the townhome model to keep lot prices within reach. The next increased level in density is the mixed-use model which is essentially to merging commercial/retail with multi-family residential. Such examples are now found throughout Houston and are experiencing good growth and high rental rates. In addition, the amenities offered by mixed-use projects create places to live, work, and play resulting in vibrant new communities.

There are multiple opportunities for redevelopment adjacent to NRG Park where older low-rise hotels, office buildings, and apartments could make more efficient use of land by building vertically. The resulting recovered land should be considered for mixed-use development so as to offer the ability to create street level restaurants and entertainment to complement offerings at NRG Park. As recently as the 2023 College Basketball Final Four event, comments were made by media that the area around NRG Park offered little in the realm of after-game interest. Several weeks after the basketball games, the owner of the Houston Astros announced a plan to develop a hotel and entertainment complex adjacent to Minute Maid Park in downtown Houston. Clearly, the idea of sports, exhibition, entertainment, and transportation complexes is viable. Not only do cities across the country redevelop using this model, but Houston has already proven this in the east downtown area

The Potential Land Use map relies heavily on new mixed-use areas in response to the need for dwelling units and results in appropriate utility demand assumptions. In all, **nearly 3,500 acres** within the TIRZ 24 boundary have been **proposed for new land uses** which is 49% of the total land area. As proposed, such development will be transformational for TIRZ 24 when the primary land uses evolve from pipe yards and vacant properties to mixed residential areas with vibrant retail and associated parks and recreation.

- **Create new land use for 3,500 acres within TIRZ 24**
- **Develop higher density**
- **Townhome model for new single family homes**
- **Merge commercial & retail with multi-family residential**
- **Transform pipe yards & vacant properties into residential areas**



Proposed Land Use Map

RESIDENTIAL

Studies such as the Kinder Institute's "My Home is Here" report illustrate the extreme need for new housing in the Greater Houston area, especially affordable housing. TIRZ 24 is in a unique position to facilitate new housing at varying price levels to support healthy communities. Proximity to the Texas Medical Center will likely be the driving factor for new residential dwelling units. The area itself, based on potential new light manufacturing and medical related industries, has the potential to generate thousands of new jobs which will require thousands of new homes and apartments.

As seen on the Proposed Land Use map, a significant portion of new development should be allocated to residential uses of varying densities. This map highlights the locations and density assumptions from which a projected population of new residents can be made. Certain tracts are ideal for townhome, single-family uses and are shown in yellow. Land parcels in the southern portion of the District could be developed as slightly lower density residential in concert with the existing densities of homes in the neighborhoods near Sims Bayou. The closer a tract is to Loop 610, the more likely that the tract will develop as multi-family, or as a mixed-use project. Based on acreages of available land for new development and historically observed population densities, the following assumptions can be made:

112-acres of multi-family residential have been identified which could yield 5,024 new apartment units. Assuming 2.3 persons per unit would result in

11,807
New residents

540-acres of single-family residential could yield 4,984 new home sites. 3.1 persons per household would equate to

15,600
New residents

143-acres of mixed-use projects are shown on the adjacent map- 15% of which are assumed to include high density multi-family residential. This equates to 11,441 new apartment units. With an expected 2.0 persons per unit occupancy this would result in

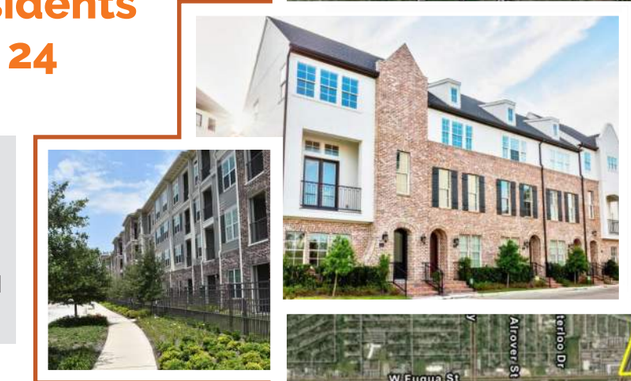
22,882
New residents

In all,

50,289

New residents could call TIRZ 24 "HOME"

When compared to new communities and mixed-use projects across the Houston area, this projected population is commensurate with observed development results.



Residential and Mixed Use Proposed Land Use Map

PARKS

The addition of over **50,000 residents** within TIRZ 24 as predicted in this study will create the need for various other land uses to support a healthy community. While commercial and retail land uses are already foreseen and accounted for in the future land use map, important recreational acreage is envisioned within new residential neighborhoods relative to the population density achieved as property redevelops.

In urban areas such as TIRZ 24, the concept of "live-work-play" asserts that housing, shopping, business, entertainment, and recreation exist in close proximity to each other to limit the reliance on automobiles and the allocation of land to single-use parking lots. Public and multi-modal transportation options, as well as vertical parking structures, can reduce surface parking needs and alternatively allow for necessary recreation facilities in redevelopment projects.

Based on the new forecasted residential population and using National Recreation and Park Association (NRPA) recommendations, between **6-10 acres of parkland are needed for every 1,000 residents.** This formula equates to a need for over

500 acres of new parkland

To predict where such park acreage could be placed, another valuable metric by NRPA recommends that parks located within a 10-minute walk from housing are most frequently utilized. Thus, an average walking speed of 10 minutes equates to a distance of 1/3-mile. The map on the right depicts a 1/3-mile radius covering each proposed residential land use within TIRZ 24 and demonstrates the need for

27 new park sites

Suburban master planned communities include small park sites throughout the neighborhood and are often connected via greenbelt trails. Pre-planning for parks in new neighborhoods is essential to their success and long-term viability. Data supports that properties located within a ¼-mile of a park increase in value by **10%**. Enhancing TIRZ 24 with this level of outdoor recreation availability would create not only one of the most well-served urban neighborhoods in the Houston area but would also have a positive effect on overall District value.

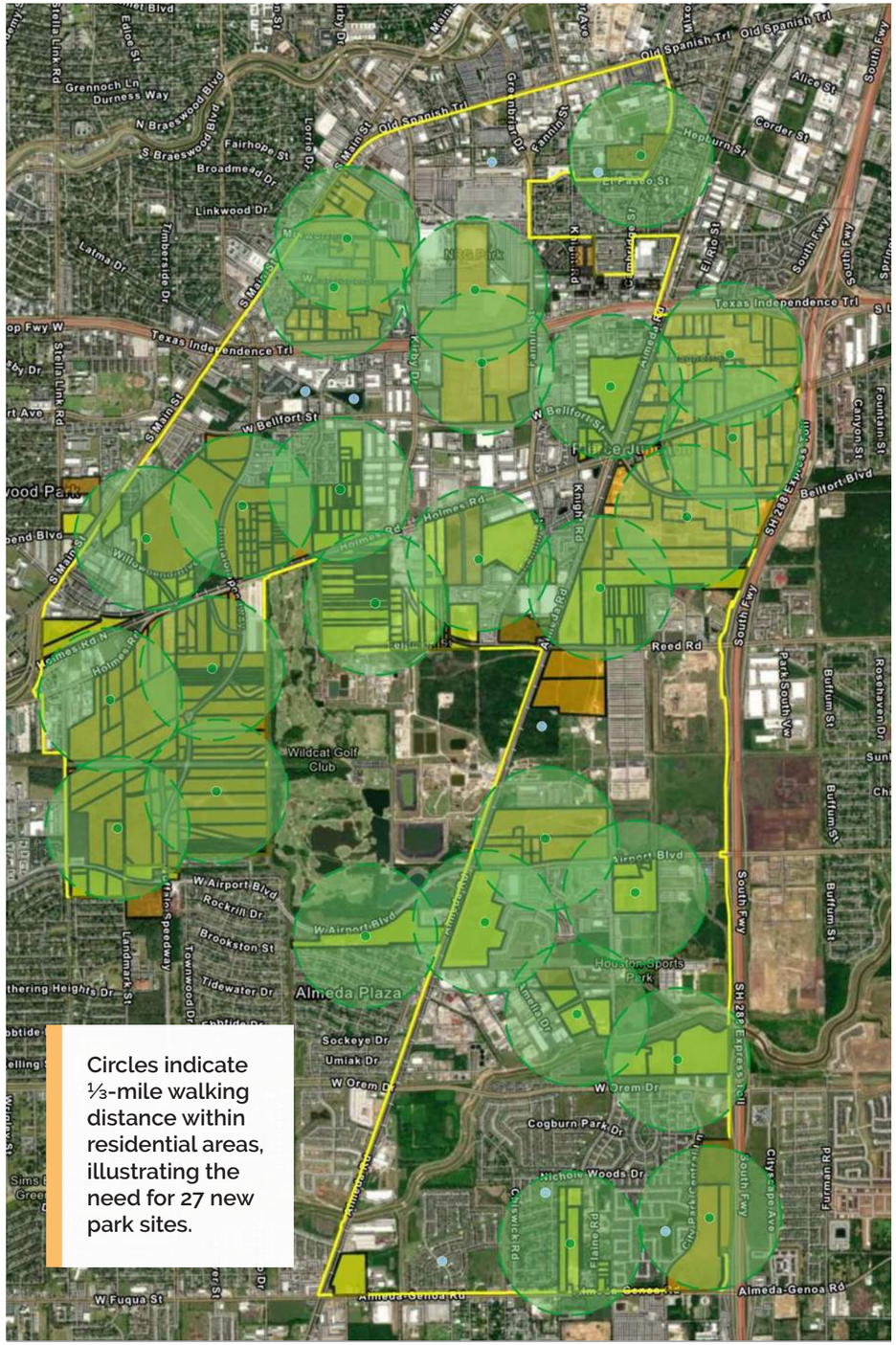
50,000 new residents

6-10 acres of parkland per 1,000 residents

500 acres of new parkland for TIRZ 24

27 new park sites

10% value increase per home within ¼ mile of park site



NRPA Recommended Park Coverage for Proposed Residential Land Use

SCHOOLS

The predominantly light industrial and warehouse/distribution land uses within TIRZ 24 do not dictate a need for school sites. Accordingly, there are few school campuses within the study area. But, if the residential population should increase within the District as anticipated, the school age population will increase as well. Census data shows that between 15% and 25% of urban populations are school aged, but these percentages can vary wildly between cities.

The land uses projected by this study cater to a workforce population. Therefore mixed-use, multi-story style buildings are recommended which may result in fewer family units. However, the market for residential units will ultimately drive all future commercial construction. So, estimating the upper range of population is always the best practice.

For forecast purposes, 7,500 to 12,000 students could call TIRZ 24 their home. The area is served by the Houston Independent School District (HISD) as well as three nearby private schools. HISD elementary schools vary in size, and school enrollments of over 800 students are common. Existing nearby schools could absorb some of this population growth, and HISD's School Choice Program allows a percentage of students to attend Magnet Schools or charter schools elsewhere in the school district. However, a large influx of residents would certainly require the construction of several new elementary schools in the zone. Reapportionment will likely need to be done so that existing elementary school service areas do not span across freeways which seriously hinders walkability to the schools. Future school locations throughout the TIRZ could be paired with park sites and nearby bike/pedestrian trails to encourage walkability and joint use of community acreage.

Elementary Schools zoned to TIRZ 24

1. **Longfellow**
2. **Whidby**
3. **Shearn**
4. **Young**
5. **Hobby**
6. **Reynolds**
- Almeda
- Red

Middle Schools zoned to TIRZ 24

- Pershing
- Cullen
- Lawson
- Attucks

High Schools zoned to TIRZ 24

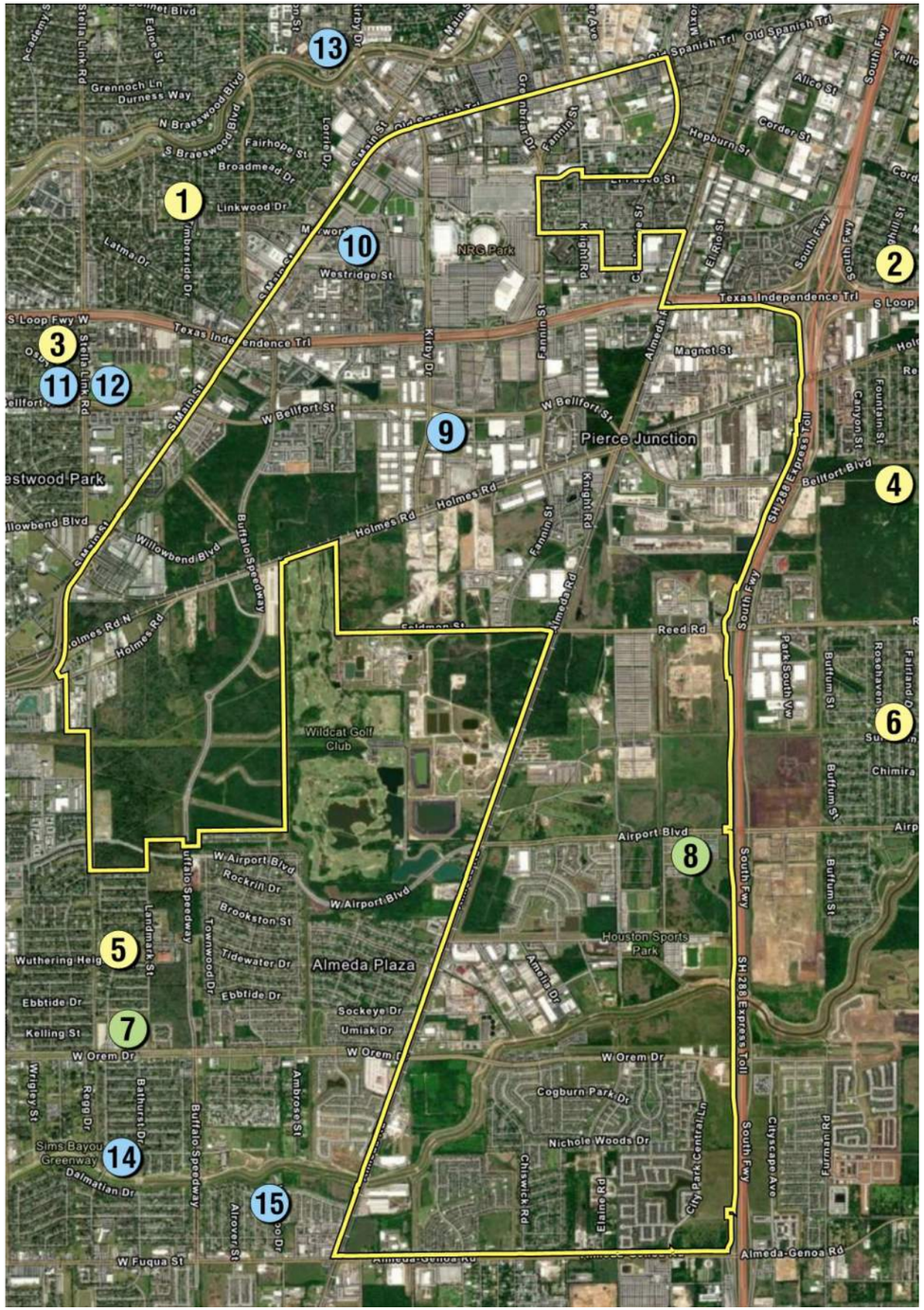
- Lamar
- Bellaire
7. **Madison**
- Worthing
8. **South Early College**

Specialty Schools within TIRZ boundary

9. **Harmony School of Fine Arts and Technology**
- Houston Community College South Campus
10. **Juvenile Justice Alternative Education Program**

Other Nearby Schools:

11. Corpus Christi Catholic Schools
12. The Emery/Weiner School
13. The Rice School
14. Montgomery Elementary
15. Peterson Elementary



DENSITY ASSUMPTIONS

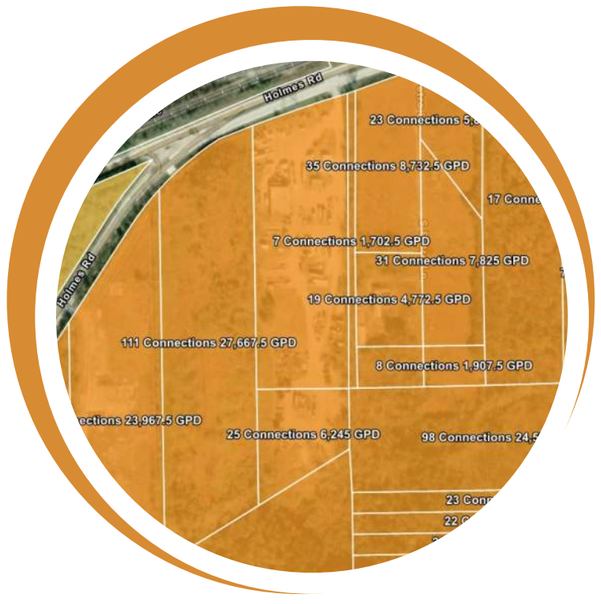
In order to properly anticipate water and sewer capacity needs as well as roadway capacity needs, the proposed land uses have been translated into a density map. Based on an assumed population for each land use, EHRA has taken these densities and translated them into an industry standard known as

"equivalent single-family connections" ("ESFC's" or "connections").

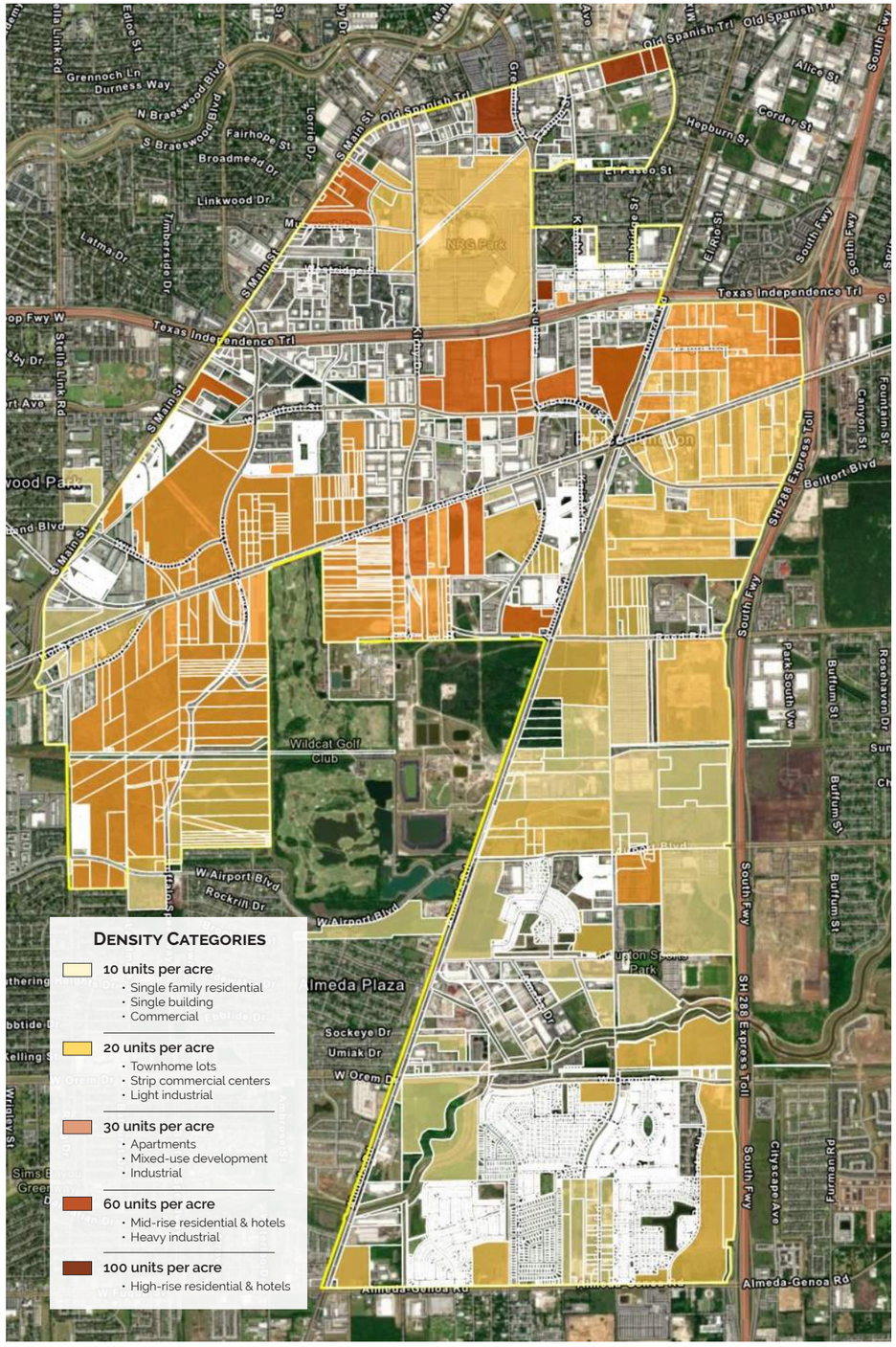
In this way, the expected increase in land use density and hence, population can be extrapolated into appropriately sized infrastructure. In other words, projecting a land use for a certain tract and adjacent tracts allow an estimate of how many persons will occupy residences and businesses in a given area. That estimated population translates to the number of connections needed for water and sewer service, and accordingly, the size of water and sewer pipes needed to deliver such services. Once pipe sizes are determined, a cost estimate can be prepared for an estimate of actual dollars for a project.

The density map at the right separates the study's land use projections into **five density categories** which are programmed into the GIS database.

Also, from the density assumptions, new roadway needs can be forecasted. Since densities relate to population, population is related to traffic. From the forecasted traffic, roadway capacities can be estimated. From this information, preliminary cost estimates can be prepared for water and sewer lines, street paving, and sidewalks. Total estimated project cost is key in understanding how much value needs to be generated within the District to offset the infrastructure investments that are needed. Knowing these costs will also allow the TIRZ to find funding programs and partners to invest in infrastructure improvements which will allow the District development/redevelopment to become a reality.



Using GIS, land use density is used to calculate equivalent single-family connections on a tract-by-tract basis. The labels in these graphics illustrate the data results when zoomed into the GIS map.



Expected Land Use Densities Map

WASTEWATER SYSTEM

From the forecasted land uses and their corresponding populations/densities, a high-level analysis of the wastewater system was conducted to estimate the wastewater infrastructure required to serve future development of vacant and underdeveloped tracts.

To streamline the planning process certain assumptions are made:

1. Proposed wastewater lines are installed within existing or future ROW/easements
2. Wastewater line installation is accomplished primarily by open cut construction with minimal trenchless construction for crossings at improved streets, driveways, and railroads

Two different City of Houston wastewater treatment plants (WWTP's) serve the NRG area. The existing wastewater trunk lines consist of a 21-inch line on Main Street, an 18-inch line on Kirby Drive, and a 72-inch line on Cambridge Street. Wastewater flow along Main Street is conveyed to the City of Houston Southwest WWTP at Beechnut Street near IH 610. The other wastewater lines around the NRG complex flow to the Almeda-Sims WWTP at Almeda Road and West Orem Drive.

In the area between IH 610 and Holmes Road, the sewer trunk lines consist of a 12-inch-diameter line on West Bellfort Avenue, a 48-inch line on Holmes Road, and an 84-inch on Almeda Road. Flow in this area discharges to the Almeda-Sims WWTP.

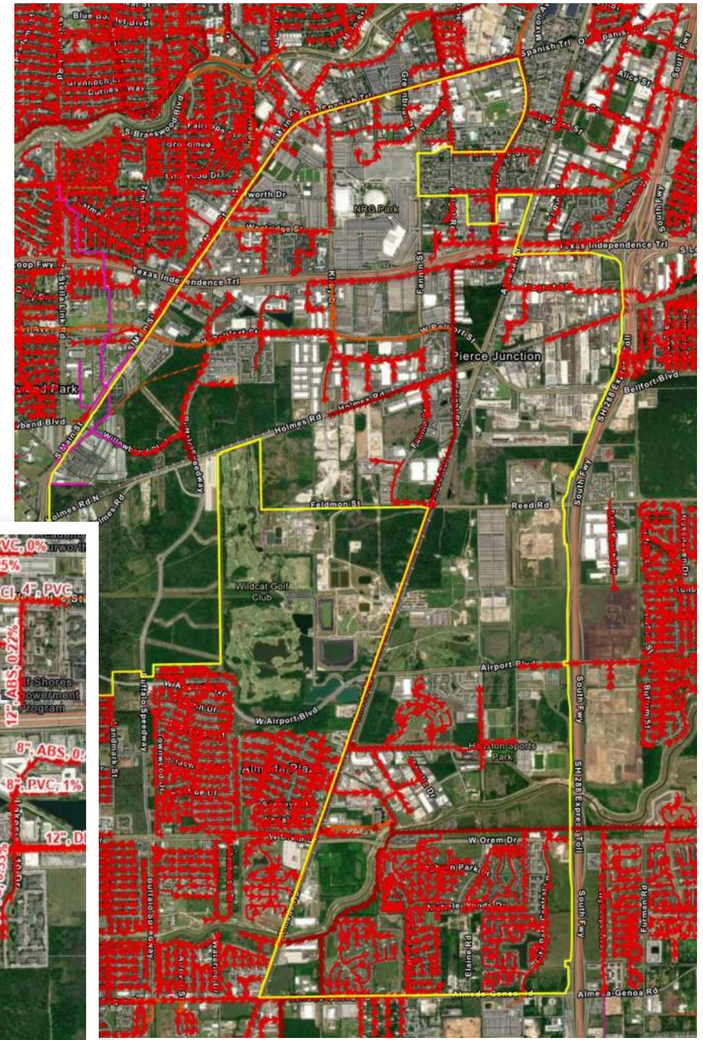
In the area south of Holmes Road, the sewer trunk lines consist of a 30-inch and 36-inch on Reed Road, a 36-inch and 42-inch along Sims Bayou, a 60-inch on West Orem Drive, and an 84-inch-diameter line on Almeda Road. Flow in this area discharges to the Almeda-Sims WWTP.

In addition, there are various lift stations and associated force mains within the TIRZ boundary.

The line sizing for the proposed wastewater system is based on the projected parcel population/density in the year 2045 and converted to the number of wastewater connections for each parcel. Using the City of Houston Infrastructure Design Manual (IDM) and the minimum grade for each diameter of wastewater line to maintain a velocity of 2.3 fps and the recommended Service Unit Equivalent (SUE) of 250 gpd per service unit, the capacity of each pipe size was calculated in terms of number of connections. For simplicity, the 250 gpd per SUE is used for wastewater calculations even though theoretically it may be less than 250 gpd. Moreover, a peaking factor of four (4.0) is generally applied to the calculated wastewater flow to account for wet weather inflow and infiltration and peak usage during the day.

The wastewater system will require additional wastewater treatment capacity to serve projected developments. In certain instances, some of the exiting wastewater lines may have to be upsized depending on the ultimate development. Approximately **46,520 linear feet** of 8-inch, 12-inch, 15-inch, 18-inch, 24-inch, 27-inch, and 30-inch are proposed including approximately 261 manholes based on the forecasted land uses. As depicted on the exhibits, the existing wastewater lines on McNee Road, Main Street, Kirby Drive, and IH 610 may require upsizing to serve future developments as forecasted in this study. Upsizing may be accomplished by the remove and replace or in some limited condition by the pipe bursting method. Field consideration on soil characteristics, groundwater levels, existing underground utilities, vehicle & pedestrian traffic, and access to businesses will determine the appropriate method for wastewater line installation at the time of design. Therefore, for simplicity and cost estimating purposes it was assumed that the wastewater lines will be installed by the **open cut method** with minimal trenchless construction for crossings at improved streets, driveways, and railroads. Moreover, estimated budgets were assigned for lift station & force main improvements and potential wastewater treatment plant expansions.

The estimated cost for wastewater system improvement is $150 Million, including the costs for design, construction, and contingencies. Planning level cost estimates were calculated for all recommended improvements and do not include individual service connections. Costs are further defined in Appendix 1.



Existing Wastewater Lines Per City of Houston Public Works

Example Zoomed-In View of GIS Map

WATER SYSTEM

From the forecasted land uses and their corresponding populations/densities, a high-level analysis of the water system was conducted to estimate the water infrastructure required to serve future development of vacant and underdeveloped tracts.

To streamline the planning process certain assumptions are made:

1. Proposed water lines are installed within existing or future ROW/ easements
2. Water line installation is accomplished primarily by open cut construction with minimal trenchless construction for crossings at improved streets, driveways, and railroads

Within the study area, the large diameter water mains consist of a 24-inch and 36-inch diameter lines on Kirby Drive, a 48-inch on West Bellfort Avenue, two 42-inch lines on Holmes Road, a 24-inch on Buffalo Speedway, and a 24-inch on West Orem Drive. There is no City of Houston water storage or water treatment facilities within the TIRZ boundary.

Large diameter water lines 24-inch and larger are often referred to as "**transmission** lines" that transport large quantities of water throughout the City system, but are not used to provide potable water service to a customer. Service for customers is provided by water **distribution** lines. Typically, these lines are 16" in diameter and smaller.

The proposed water line sizes are based on the projected parcel density in the year 2045 and converted to the number of water connections for each parcel. Adding the City of Houston Infrastructure Design Manual (IDM) criteria of 1.5 gpm per connection and a pipe velocity of 5-6 fps, these criteria are used to estimate the size of new or upgraded water lines.

The water system will require additional water treatment and storage capacity to serve all of the projected development in the zone. However, these upgrades will need to be coordinated with the City of Houston as to their timing. Furthermore, the upsizing of certain water lines may be delayed or cancelled depending on ultimate development patterns.

Upsizing may be accomplished by the remove and replace method, for example with a new 30-inch line or installation of a separate 16-inch to augment an existing 24-inch line. For simplicity and cost estimating purposes, it was assumed that this water line needs to be upsized to a 30-inch line by the open cut method. Field considerations such as soil characteristics, groundwater levels, existing underground utilities, vehicle & pedestrian traffic, and access to businesses will determine the appropriate method for water line installation at the time of design. As depicted on the exhibits, the existing water lines on Kirby Drive between La Concha Lane and Holmes Road may require upsizing from 24-inch to 30-inch to serve future developments.

Approximately 48,850 linear feet of 8-inch, 12-inch, 16-inch, and 30-inch water lines are proposed including about 130 fire hydrants based on the forecasted land uses. Moreover, budgets were assigned for potential water storage and water treatment plant expansions. The estimated total cost for the wastewater system is $75M, including the costs for design, construction, and contingencies. Planning level capital cost estimates were calculated for all recommended improvements and do not include individual service connections or subdivision lines. See Appendix 2 for more detail.

Example Zoomed-In View of GIS Map

Existing Water Lines Per City of Houston Public Works

FRANCHISE UTILITIES

While water and wastewater are City supplied services, gas, electric, cable, and telephone are supplied by private utility companies also known as franchise utilities. Such utilities are located within street right-of-way or in separate easements and are constructed as development occurs rather than pre-development as with water and wastewater infrastructure.

Franchise utilities are often constructed in overhead on power poles, or are buried underground. If buried, they are located much closer to the surface, thus requiring less earthwork. These utilities are also not constructed at the same time as new streets and city utilities. Franchise utilities are constructed when market demand demonstrates a need for them. These are definitely an “if you build it, they will come” outcome of residential and commercial new construction. TIRZ 24 should recommend to developers that new electrical service be located underground to improve aesthetics and reliability of service.

TIRZ 24 is served by multiple franchise utilities companies. Gas and electric transmission is supplied by CenterPoint Energy. Telephone and cable are provided by AT&T and Comcast, respectively. At this planning level, it is difficult to estimate the cost of franchise utilities, however a $20 Million budget serves as a placeholder for the TIRZ preferences such as underground power instead of overhead lines.

DRAINAGE & DETENTION

Due to the geography of Houston, area residents have contended with flooding for decades. It has been a major problem for residents in the Houston areas. The region has an average of 46 inches of rain per year. The relatively flat terrain, with moderately to highly impermeable soils, provides wide, natural floodplains for most of the major waterways that flow across the Houston region enroute to Galveston Bay.

Harris County contains **23 major watersheds.** Watershed boundaries are formed by nature and are largely determined by topography or the "lay of the land." These watersheds vary in shape and size, and each has its own independent flooding issues.

Two watersheds lie within the TIRZ 24. The area north of Holmes Road drains into Brays Bayou (D100-00-00), and the area south of Holmes Road drains into Sims Bayou (C100-00-00). Both Brays and Sims Bayous eventually drain into Galveston Bay.

Project Brays is a **$480 million** dollar project recently executed and completed jointly by the Harris County Flood District (HCFCD) and the U.S. Army Corps of Engineers (USACE). The goal of this project was to reduce flooding for residents and businesses within the Brays Bayou watershed.

Sims Bayou benefited from a **$344 million** dollar project also undertaken and completed (circa 2010) jointly by HCFCD and USACE. Recent major storm events did not cause Sims Bayou banks to overflow. This was attributed to the work previously performed to widen and deepen 19.3 miles of the bayou. The Sims Bayou improvements provide protection from a 25-year flood event and remove approximately 35,000 homes and 2,000 commercial structures from the 100-year floodplain.

HCFCD is responsible for buying land, easements, and rights-of-way in the floodplain. In fact, Sims Bayou did not flow out of its banks during Hurricane Harvey. They also relocate utilities, adjust bridges (except for railroads), and operate and maintain channels. As part of the HCFCD regional plan, the agency has purchased 700 acres of land to be used for three detention basins in the upper portion of the Sims Bayou watershed. These detention basins collect and store stormwater temporarily during severe storm events, which diminishes both the amount of water flowing through the channel. These basins also serve as multipurpose facilities. For example, portions of the 700 acres are subleased for equestrian facilities or park recreation amenities that can be utilized while the basin is not actively storing floodwater.

The Federal Emergency and Management Agency (FEMA) sponsors the National Flood Insurance Program. They issue maps known as Flood Insurance Rate Maps (FIRM's) to pictorially illustrate the potential for flooding along the nation's waterways. These maps are an easy way to determine whether a property lies within the 100-year floodplain. If so, mortgage lenders will require a property owners to carry national flood insurance. Fortunately, according to current FIRM's virtually all privately owned property in the District is outside of the 100-year floodplain, and only a very small portion of property inside TIRZ 24 is located within the 500-year floodplain. However, since Hurricane Harvey (2017), these maps are being revised and are expected to be released in early 2024. In the interim, Harris County and the City of Houston are treating property within the 500-year floodplain as needing to be regulated the same as if it were within the 100-year floodplain.

Further, development and redevelopment within TIRZ 24 will require additional detention facilities. New basins will need to be constructed on a parcel by parcel basis or on a subregional basis. Ongoing efforts are being undertaken to understand the HCFCD regional plan for flood mitigation and how it might benefit the District's future developments.

Typically, underground drainage pipes are constructed with new or upgraded roadways. Such costs have been included in the roadway cost estimates included in this study. Drainage pipes that are required within the development of a parcel will be constructed on a parcel-by-parcel basis as development occurs and paid for by each development.

DESIGN CRITERIA

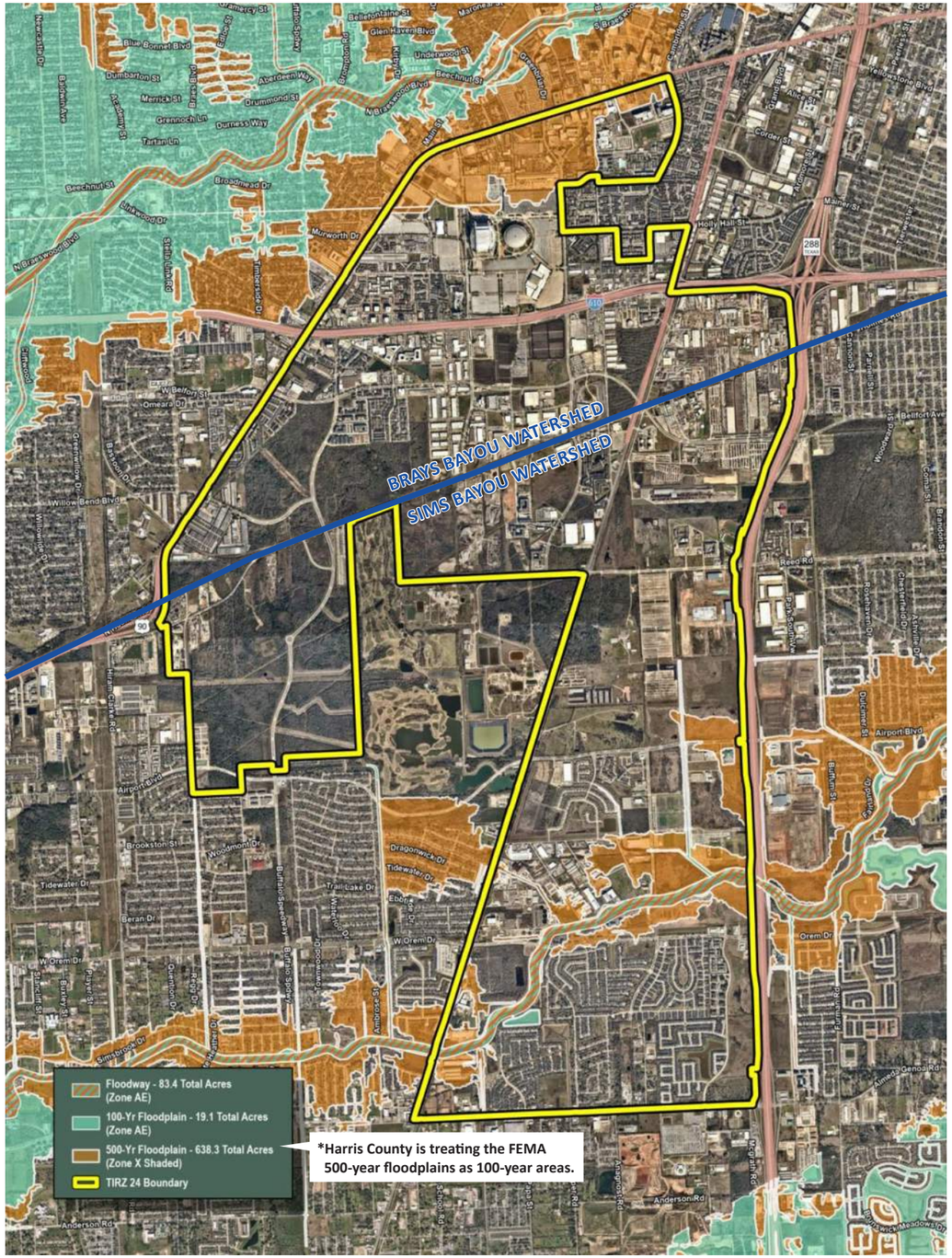
1. City of Houston IDM, Chapter 9 Stormwater Design and Water Quality Requirements
2. HCFCD Policy Criteria and Procedures Manual (PCPM)
3. FEMA Flood Insurance Rate Maps (FIRM) and Letter of Map Revision updates (LOMR)

DETENTION CRITERIA

City of Houston
0.75 acre-feet/acre up to 51% impervious, then an increasing scale to 0.98 acre-feet/acre at 100% impervious

Harris County
0.65 acre-feet/acre, if draining into a HCFCD facility
0.75 acre-feet/acre, if draining into a stormwater pipe

Harris County Flood Control District
Detailed engineering analysis



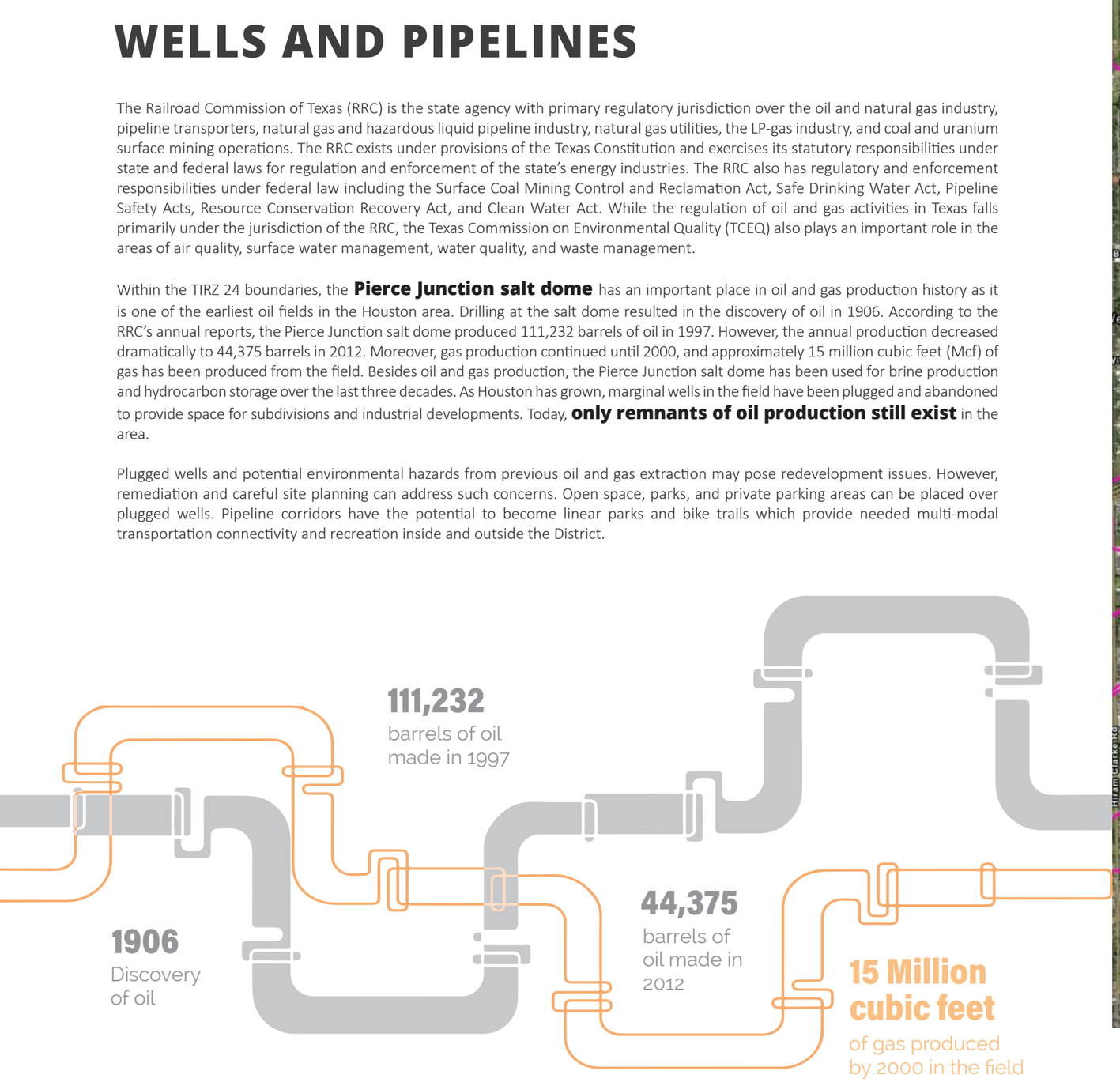
Brays and Sims Bayou Watershed Boundary Map Including FEMA Floodplains

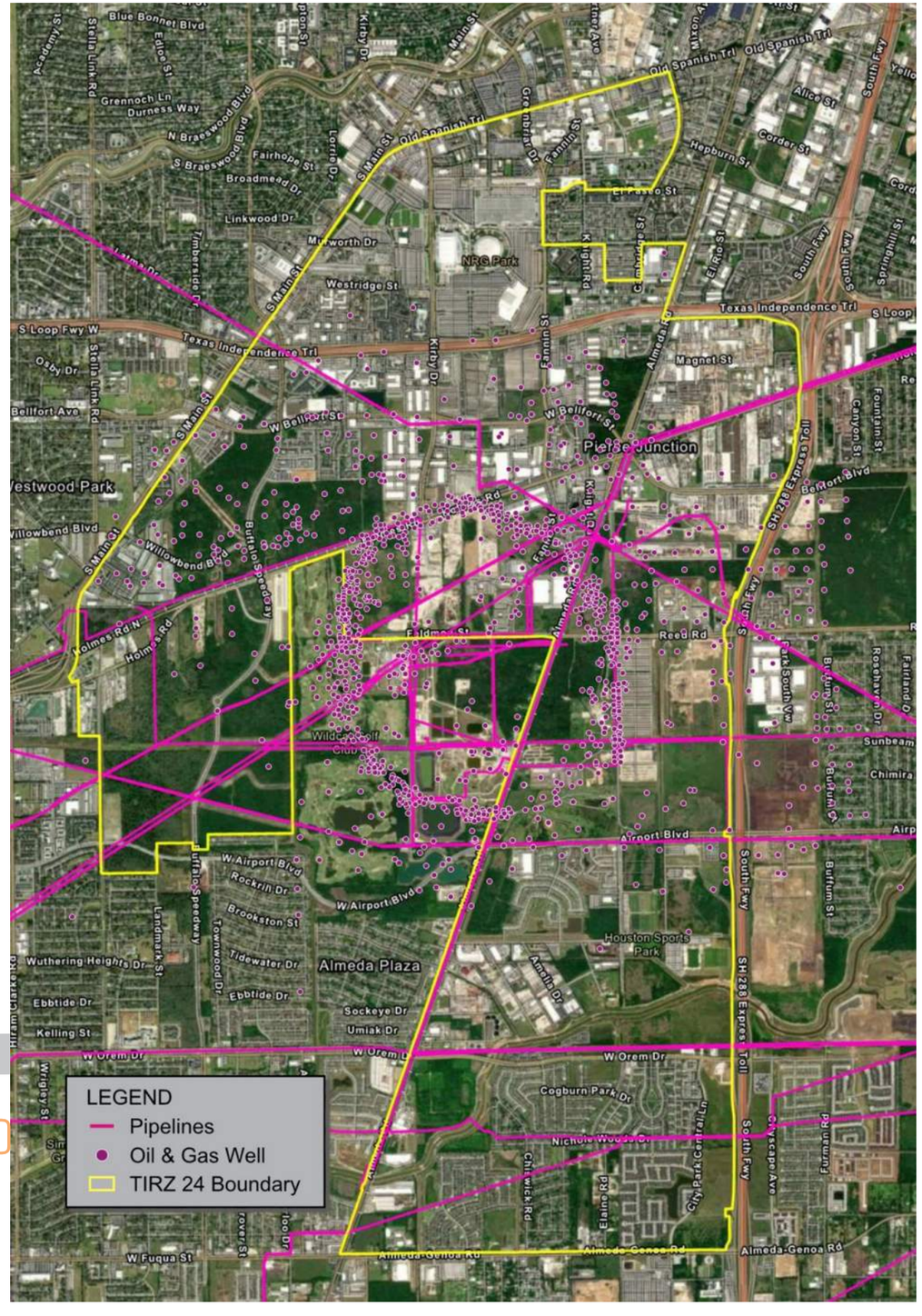
WELLS AND PIPELINES

The Railroad Commission of Texas (RRC) is the state agency with primary regulatory jurisdiction over the oil and natural gas industry, pipeline transporters, natural gas and hazardous liquid pipeline industry, natural gas utilities, the LP-gas industry, and coal and uranium surface mining operations. The RRC exists under provisions of the Texas Constitution and exercises its statutory responsibilities under state and federal laws for regulation and enforcement of the state's energy industries. The RRC also has regulatory and enforcement responsibilities under federal law including the Surface Coal Mining Control and Reclamation Act, Safe Drinking Water Act, Pipeline Safety Acts, Resource Conservation Recovery Act, and Clean Water Act. While the regulation of oil and gas activities in Texas falls primarily under the jurisdiction of the RRC, the Texas Commission on Environmental Quality (TCEQ) also plays an important role in the areas of air quality, surface water management, water quality, and waste management.

Within the TIRZ 24 boundaries, the **Pierce Junction salt dome** has an important place in oil and gas production history as it is one of the earliest oil fields in the Houston area. Drilling at the salt dome resulted in the discovery of oil in 1906. According to the RRC's annual reports, the Pierce Junction salt dome produced 111,232 barrels of oil in 1997. However, the annual production decreased dramatically to 44,375 barrels in 2012. Moreover, gas production continued until 2000, and approximately 15 million cubic feet (Mcf) of gas has been produced from the field. Besides oil and gas production, the Pierce Junction salt dome has been used for brine production and hydrocarbon storage over the last three decades. As Houston has grown, marginal wells in the field have been plugged and abandoned to provide space for subdivisions and industrial developments. Today, **only remnants of oil production still exist** in the area.

Plugged wells and potential environmental hazards from previous oil and gas extraction may pose redevelopment issues. However, remediation and careful site planning can address such concerns. Open space, parks, and private parking areas can be placed over plugged wells. Pipeline corridors have the potential to become linear parks and bike trails which provide needed multi-modal transportation connectivity and recreation inside and outside the District.





SUPERFUND SITES

"Superfund" is the common name derived from the federal Comprehensive Environmental Response, Compensation and Liability Act of 1980, or CERCLA that funds the clean up of polluted sites. Superfund's waste sites fall into two categories: **remedial** and **removal**. The EPA uses a Hazard Ranking System (HRS) based on the size of the site, the toxic materials found, and the site's hazard to human health. The HRS assigns a score from 0-100. Most sites that score above a 28.5 are considered remedial sites. Remedial sites go on the National Priorities List (NPL), and are scheduled for long-term cleanup. Landfills, dumps and abandoned chemical plants are examples of remedial sites. Removal sites are sudden environmental emergencies that are not on the NPL. Mercury spills, oil tanker spills, and factory fires are examples of removal sites. After a Superfund site is identified, an initial cleanup is made. Studies are performed to determine what kind of hazardous waste is on the site and what risk it poses to the environment. Then the EPA decides how to clean up the site. The method of cleanup usually involves labor, chemical treatment, and some construction. After construction is completed, the site is monitored to make sure no waste is leaking into the air, soil, surface water, or groundwater. The site (or parts of the site) is deleted from the National Priorities List once the EPA and the TCEQ determine that the site poses no significant environmental or health risk.

Superfund's ultimate goal is to return hazardous-waste sites back to productive use. Sites have been turned into wetlands, office spaces, new businesses, manufacturing facilities, and more. Houses and apartments have been built on some Superfund sites, however, the Center for Health, Environment, and Justice believes Superfund sites should not be used to build houses.

Superfund Sites in TIRZ 24

Map of Superfund Sites in TIRZ 24 Southern Sector

HOUSTON LEAD
300 Holmes Rd

SITE SUMMARY

Houston Lead operated an 11.64 acre site performing secondary smelting and refining of nonferrous metals, manufactured soft pig and ingot lead, and recovered lead from lead-acid batteries. Soils at the site were impacted by lead, cadmium and arsenic.

RESPONSE ACTION

The TCEQ proposed the site to the state Superfund registry in 1987. Potentially Responsible Parties submitted an application to investigate and cleanup the site under the TCEQ Voluntary Cleanup Program (VCP) Program. The site was accepted into the TCEQ VCP in 1996 and deleted from the registry in 1998.

CURRENT STATUS

No further Superfund environmental response actions are required according to TCEQ website information.

A conversation was initiated with Scott Settemeyer, the Texas State Superfund Program Manager to obtain additional information. According to Mr. Settemeyer the site was delisted from the State Superfund and enrolled in the VCP program in 1999. In 2007, the TCEQ VCP issued a Conditional Certificate of Completion (CCOC) documenting the attainment of applicable cleanup standards in place at the time. The cleanup included consolidation and relocation of the contaminated to the "center" of the site and a cap was placed as a cover. The site has attained commercial and industrial land use but not residential.

CCOC CONDITIONS APPLIED AT THE SITE:

1. The cap shall be maintained and reports documenting the cover system's condition shall be submitted to TCEQ.
2. Excavation in the area underlying the cap is prohibited without TCEQ's approval.
3. No groundwater wells may be installed in the shallow zone for the extraction of groundwater, except for pumping in order to achieve remedial goals, if applicable.
4. Perform groundwater monitoring for chemicals of concern including sampling, analysis, and reporting activities in accordance with the Response Action Workplan.

(Source – TCEQ)

SOL LYNN/INDUSTRIAL TRANSFORMERS
1415, 1417, 1419 S Loop West

BACKGROUND

The 0.75-acre site is the former location of an electrical transformer salvage and recycling company that operated between 1965 and 1975. A chemical recycling and supply company later operated at the same location from 1979 to 1980. Site activities contaminated soil and groundwater with hazardous chemicals. In 1971, the City of Houston's Water Pollution Control Division investigated and concluded that workers at the site poured oil out of electrical transformers as they dismantled them. Oil and grease were in the soil and floating on ponded water as well as in ditches on the site. In 1980, an inspection by the Texas Water Commission (TWC), predecessor to the TCEQ, discovered old drums stored at the site. An oily discharge was leaking from a drum storage area behind the warehouses. In 1981, a site inspection by TWC and the Houston Department of Health identified about 75 drums scattered on the site. Most of the drums were labeled "trichloroethene" and were empty and punctured.

RESPONSE ACTION

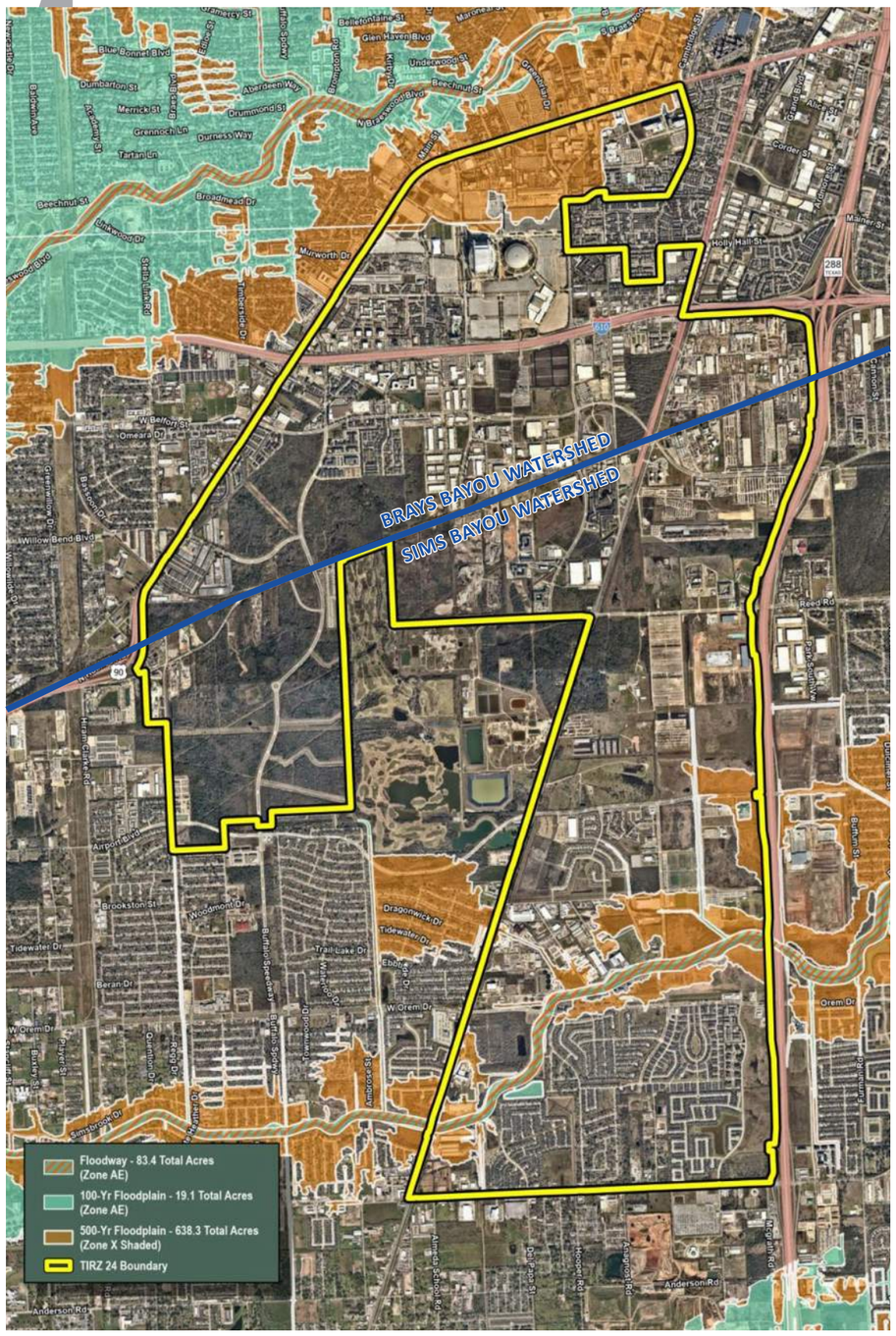
The site is being addressed through federal and state actions. EPA has conducted several five-year reviews of the site's remedy. The most recent review concluded that response actions at the site are in accordance with the remedy selected by EPA and that the remedy continues to be protective of human health and the environment in the short term. Continued protectiveness of the remedy requires performing the planned remedial action, institutional controls, proper disposal of drums, replacement of locks on monitoring wells, and interviewing the owner of the on-site building.

CURRENT STATUS

The site's long-term remedy included excavation and treatment of polychlorinated biphenyl (PCB)-contaminated soil, and extraction and treatment of contaminated groundwater. EPA later updated the remedy, changing the soil treatment technology and changing the groundwater remedy to monitored natural attenuation and institutional controls to control residential land use. Construction of the remedy finished in 1993. Operation and maintenance activities and monitoring are ongoing. A supplemental remedial investigation was completed in 2002 which identified nine water zones to a depth of 200 feet. Trichloroethene was found at concentrations exceeding 1 percent of its solubility in water, indicating that dense non-aqueous phase liquids (DNAPL) may exist. The site remains on EPA National Priorities List.

A conversation was initiated with Nathaniel Applegate, the EPA's Remedial Project Manager to obtain additional information. According to Mr. Applegate, the site is suitable for commercial and industrial development but not residential development since soil, water, and air contamination exceeds allowable limits for residential development. However, Mr. Appleton noted that additional mitigation measures could be taken to allow for residential development.

(Source – EPA)



FEMA Floodplains

FLOODPLAINS & WATERSHEDS

Since the 1970's, the United States has had flood maps available through the Federal Emergency Management Agency (FEMA) via its National Flood Insurance Program. These maps depict the areas that are subject to periodic flooding. The issued maps are known as Flood Insurance Rate Map (FIRM) panels. These maps are used to require flood insurance for homes with federally backed mortgages that are located within the 100-year floodplain. Many other mortgage lenders also require this type of insurance for houses located in these flood prone areas.

Source rainfall data for these maps is provided by the National Oceanic and Atmospheric Administration (NOAA). NOAA recently updated their rainfall data for the state of Texas since it had not been updated since the 1960's and in the aftermath of Hurricane Harvey in August, 2017. Consequently, communities across the county are going through the process of updating their floodplain maps to align with NOAA's higher rainfall data.

The base flooding event used to require flood insurance is the 100-year flood. This flooding event has a 1 percent annual exceedance probability (AEP) flood, or a 1 in 100 chance of occurring in any given year at any given location. Statistically, a 1 percent AEP flood has a 26 percent chance of occurring during a 30-year period, which is equal to the duration of many home mortgages.

> Contrary to what the term suggests, a "100-year flood" is not a flood that occurs only once every 100 years. A "100-year flood" can occur multiple times in a century. A 100-year floodplain is an area at risk for flooding from a bayou, creek, or other waterway overflowing during a 1 percent AEP flood. However, structures not located in a mapped 1 percent AEP floodplain are still at risk for flooding.

After Hurricane Harvey, Harris County adopted short term regulations until the revised FIRM panels are issued. These regulations designated the 500-year floodplain as the interim base flood event. These are the areas on the existing FIRM panels that depict areas subject to the 0.2 percent AEP flood event. Similar to the 100-year or 1 percent AEP event, these are the areas subject to the 0.2 percent AEP or 500-year flooding event happening in any given year. Statistically, structures located in a 0.2 percent AEP or 500-year floodplain have a 6 percent chance of flooding during a 30-year period. Flood Insurance is typically not mandatory for structures in the mapped 0.2 percent AEP or 500-year floodplain. It is anticipated that the 100-year floodplain or 1 percent AEP on the new FIRM panels will be similar to the 0.2 AEP or 500-year floodplain on the current maps. The anticipated release date for the updated FEMA map is in early 2024.

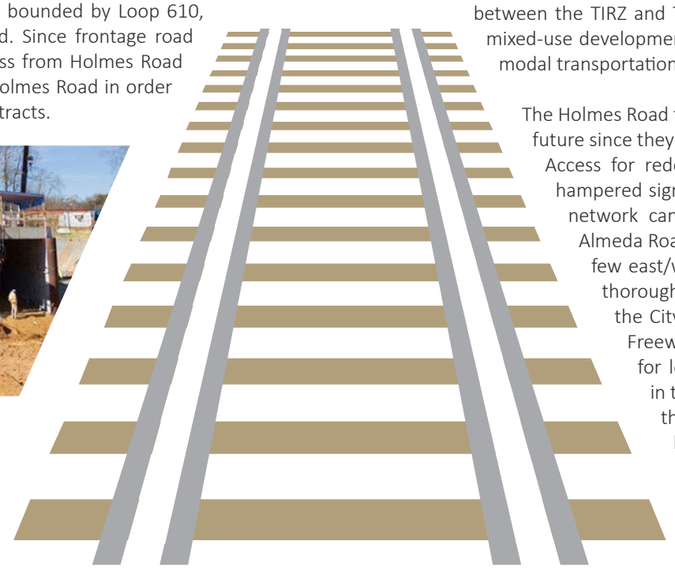
The current FIRM panels show the existing 100-year and 500-year floodplain areas within the TIRZ 24 boundaries. Holmes Road is the boundary between the Brays Bayou Watershed to the north and the Sims Bayou Watershed to the south as discussed previously in this study report. Properties are impacted by the 500-year floodplain in the northernmost area of the District along Old Spanish Trail near Brays Bayou. Potential redevelopment tracts will need to be designed to elevate permanent habitable structures above the 500-year flood elevation. To the south, recent Harris County drainage improvements on Sims Bayou have dramatically decreased areas within the floodplain and were vastly successful in protecting property during Hurricane Harvey. Several vacant parcels and potential redevelopment tracts in the Sims Bayou Watershed will also need to address the 500-year floodplain. On the whole, most areas within TIRZ 24 are not affected by FEMA floodplain assignments making new development simpler in regard to drainage.

RAILROADS

Construction of Texas' rail network has had a profound economic and social impact on the development of the State and the City of Houston. The first railroad line was the Buffalo Bayou, Brazos and Colorado Railway, started in 1853, which operated between Harrisburg (Houston) and Stafford, Texas. Today's major rail carriers have been created from the consolidation and mergers of several smaller predecessor railroads that served the state for well over a century. Within TIRZ 24, Union Pacific Railroad (UPRR), headquartered in Omaha, Nebraska, operates two rail corridors.

Adjacent the north right-of-way of Holmes Road lie two parallel UPRR rail lines serving points as far west as Mexico and San Antonio, Texas, connecting to the Port of Houston. The two lines are heavily traveled with a total of 9 at-grade crossings and 2 grade separated crossings within the District. Harris County and the Port of Houston Authority conducted a study in June, 2005 titled *"Harris County Freight Rail Corridor and Urban Mobility Program"* that identified more than 900 railroad crossings of public roadways within the greater Harris County study area. Approximately 80 percent of the crossings are at-grade. Since at-grade crossings are potentially dangerous for train/automobile interactions, UPRR has been attempting to limit the number of crossings by requiring closure of several crossings in exchange for any new crossings. Since new at-grade crossings have become so difficult to create, flyover and tunnel options may be required in order to access tracts adjacent to rail lines. The extension of Kirby Drive south of Holmes Road is an opportunity to bridge over the rail lines similar to the Buffalo Speedway overpass completed in 2018. Conversely, 205 acres of land are currently operating as multiple pipe supply yards bounded by Loop 610, SH 288, Homes Road and Almeda Road. Since frontage road connectivity and access is limited, access from Holmes Road might require depressing a section of Holmes Road in order to create a tunnel entry to redeveloped tracts.

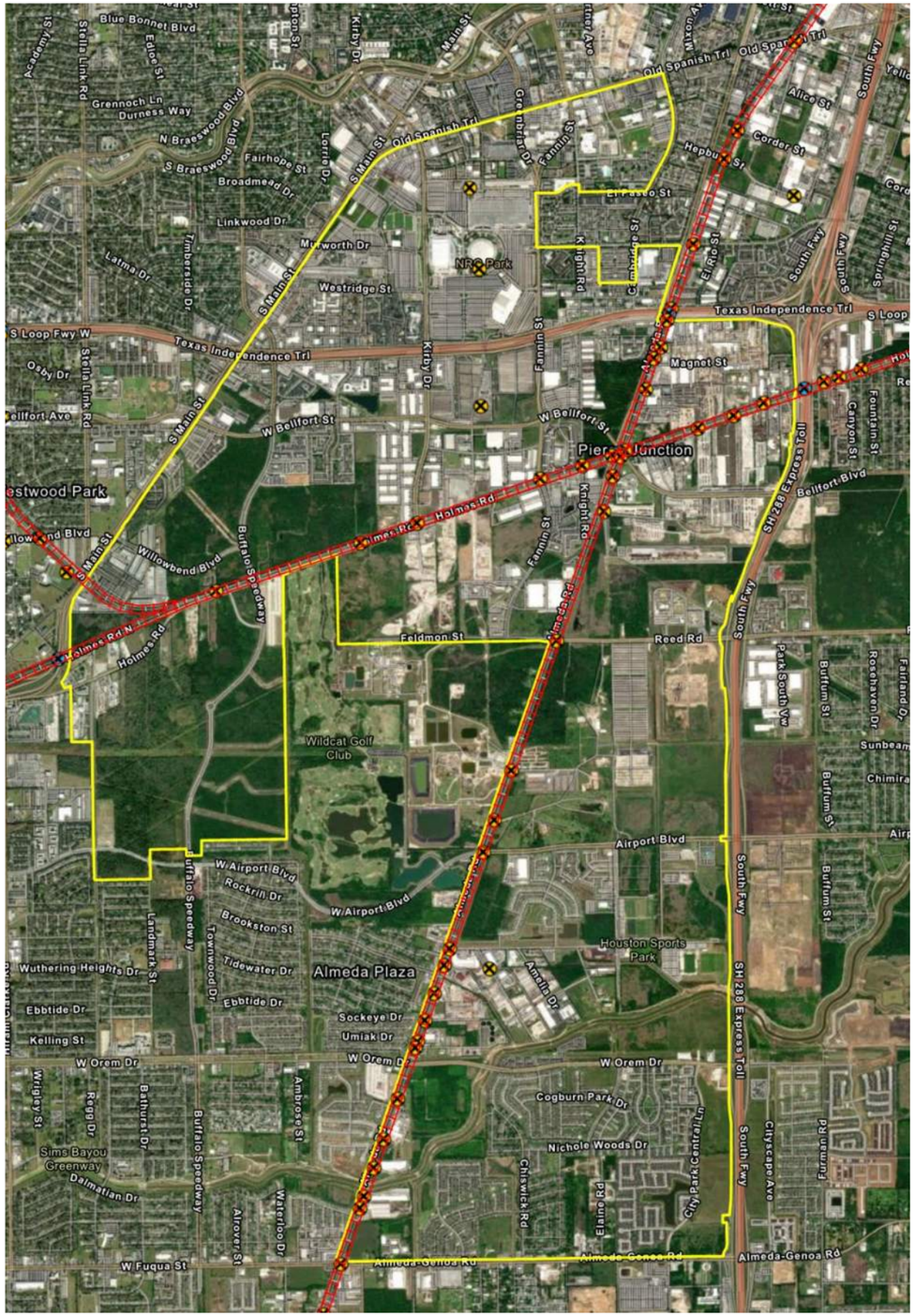
Tunneling Option



Another UPRR single rail line exists along the east right-of-way of Almeda Road. The line originates at the Port of Freeport and currently terminates at Holcombe Boulevard just north of the TIRZ boundary. This line has dozens of at-grade crossings, many of them private driveways, and one grade separated crossing. This line is not as heavily travelled since it is at the end of the rail line. However, several spur lines serve pipe supply companies located near Pierce Junction where Holmes Road, Almeda Road, and Bellfort Avenue meet.

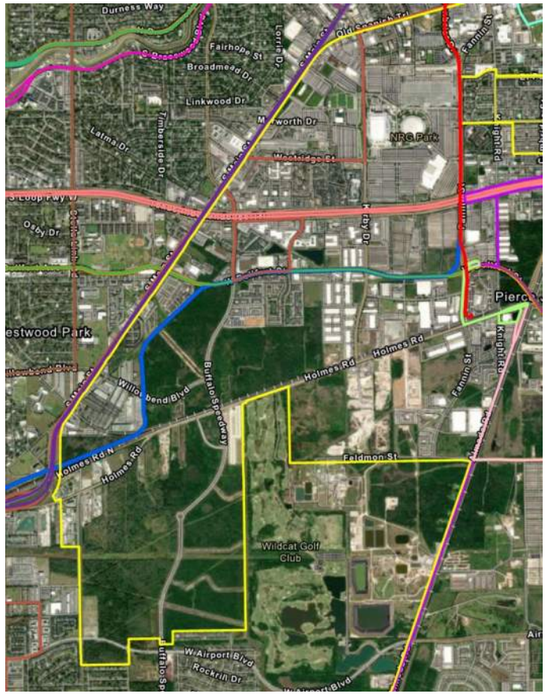
Recent redevelopment at the Texas Medical Center near SH 288 has negated the need for rail service as warehouse/distribution facilities have redeveloped into various residential land uses. This fact has seen the rail line shortened over the last several decades in favor of a popular bike and pedestrian path known as the **Columbia Tap Rail-Trail.** The 100-foot wide, 4-mile long trail corridor is the result of a Rails-to-Trails project and connects Texas Southern University to Hermann Park. It is conceivable that as redevelopment occurs near Pierce Junction that this rail line could continue to be shortened and additional bike/greenway connectivity could occur. Gaining a strong off-street connection between the TIRZ and TMC would make new residential and mixed-use developments even more attractive from a multi-modal transportation perspective.

The Holmes Road tracks will be in use for the foreseeable future since they provide a vital link to the ship channel. Access for redevelopment of adjacent tracts is not hampered significantly since the existing local street network can be used. Since the rail lines along Almeda Road are on the east side of the ROW and few east/west local streets exist between major thoroughfares, the extension of Kirby Drive per the City of Houston Major Thoroughfare and Freeway Plan becomes even more important for local access. As redevelopment occurs in this corridor, businesses currently using the line may disappear and the rail spurs become obsolete, thus alleviating the access issue. It would be wise to consider these factors before investing in new crossings along the Almeda rail corridor.



Current Rail Corridors in TIRZ 24 Southern Reach

METRO/MASS TRANSIT



METRONext Map

TMC Existing and Proposed Campus Locations

TIRZ 24 is served by multiple METRO bus routes and is also home to the Fannin South Transit Center station which is the current METRORail Red Line terminus for the light rail transit system (LRT). The Almeda, Lyons, Bellfort, West Bellfort, and Sunnyside bus routes provide connections at the station. Just north of Brays Bayou and a half-mile north of the District is the TMC Transit Center, which is also on the METRORail Red Line LRT. This transit center serves the Texas Medical Center and has connections for 17 bus routes, making it one of the city's major public transportation hubs. The Hiram Clarke and Missouri City-SH 6 bus routes originate at the TMC Transit Center and extend along the western edge of TIRZ 24 along South Main Street. On the northeastern TIRZ 24 boundary, the Cambridge bus route provides several stops for apartments located between the TIRZ boundary and SH 288. Lastly, the South Point-Monroe bus route serves several locations in the Texas Medical Center along its large loop on I-45, Loop 610 and SH 288.

The METRONext Plan proposes METRORail extensions at the Fannin South Transit Center. An extension of the current Red Line, the bus would require a partnership with entities in Fort Bend County to provide future service to Missouri City and Sugar Land. This proposed alignment is shown in solid blue on the maps. The Red Line could also be extended along Kirby Dr. to Pearland. Kirby Dr. has already been classified as a Principal Thoroughfare at 120 feet wide by the City of Houston from Fannin to the south ETJ limit. This is shown in dashed blue on the map. The METRONext plan also proposes enhancements to the BOOST network, which according to METRO focuses on bus stop relocations, adding new shelters, upgrading accessibility, and prioritizing transit signals. Bus Routes #8 and #73 on West Bellfort Avenue through TIRZ 24 are identified as BOOST corridors.

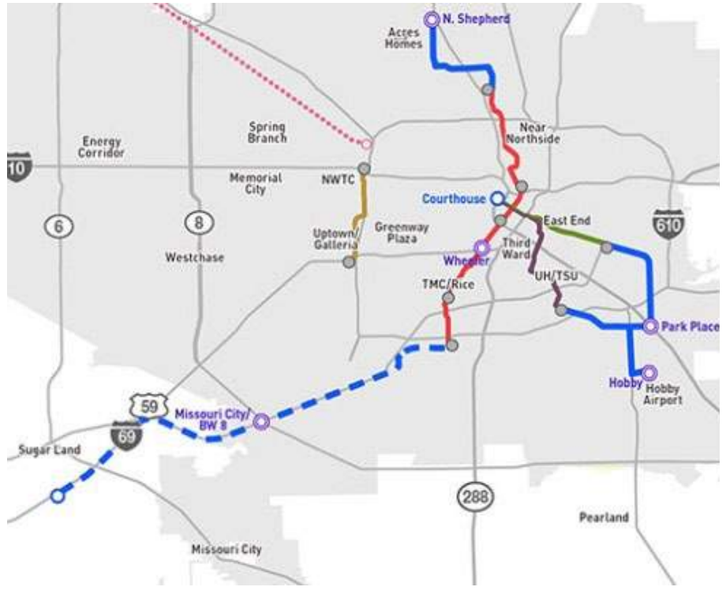
Future METRO augmentation within TIRZ 24 should focus on three potential projects: transit service to Pearland via Kirby Drive, enhanced service to NRG Park, and expanded Bus Rapid Transit (BRT) on Buffalo Speedway.

The completion and extension of Kirby Drive between Holmes Road and Beltway 8 is described in detail on page 22 of this study. The potential for METRO to add transit service in partnership with Brazoria County along Kirby Drive when completed would serve numerous residential communities between the TMC and Pearland.

Over 800-acres of currently undeveloped land is accessible via Buffalo Speedway between West Bellfort Avenue and West Airport Boulevard. This area is the best option for new development in the TIRZ and has already been targeted for potential medical research and product distribution. The mixed-use development potential for this acreage indicates that public transportation options need to be extended into this western part of the TIRZ. A METRO BRT line on Buffalo Speedway connecting to TMC via the Fannin South Station would be an excellent way to provide access between the medical campus, the new Helix Park on OST, and proposed redevelopment along Buffalo Speedway.

METRORapid Bus on Post Oak Boulevard

METRORail Train at Fannin South Transit Center

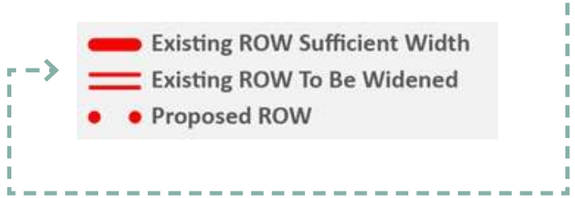


Dashed blue line represents future METRORail potential partnership serving Fort Bend County, per METRONext Plan

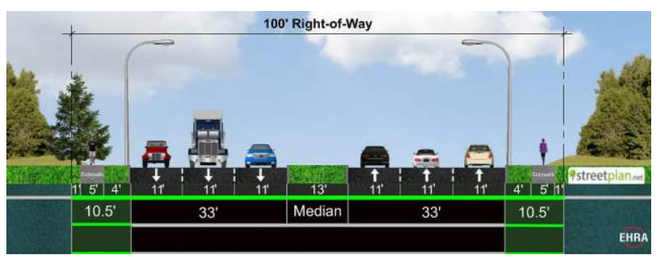
THOROUGHFARES

The City of Houston maintains a Major Thoroughfare and Freeway Plan (MTFP) which guides the planning and development of major streets within the city limits and the extraterritorial jurisdiction (ETJ). Thoroughfares typically form a network that resembles a grid pattern, providing good local vehicular circulation. The wider thoroughfares are roughly located at 1-mile intervals, serve moderate to long length trips, and accommodate moderate to high traffic volumes. These wider thoroughfares are referred to as "arterials" and are most commonly classified as "Major Thoroughfares." Most often they are 100 feet wide. Typically, arterials connect to the State and Interstate roadway systems. For example, within TIRZ 24, major thoroughfares, like Kirby Drive and Buffalo Speedway among others, are arterial streets serving moderately long trips with high traffic volumes and distribute that traffic to Loop 610.

The MTFP uses symbology to depict the status of ROW and colors to indicate the width of ROW. For example, the MTFP map shows Major Thoroughfares in red with the following Right-of-Way (ROW) roadway classifications:



For major thoroughfares, sufficient width is defined by the City of Houston as a 100-foot wide ROW and can accommodate as many as 6 travel lanes with a median or center turn lane. Public utilities such as water, wastewater, power, cable, phone and gas all have access to the same ROW and are located either underground or mounted on poles between the edge of the travel lane pavement and the outside limits of the ROW.



Example 100' Street Right-Of-Way Section

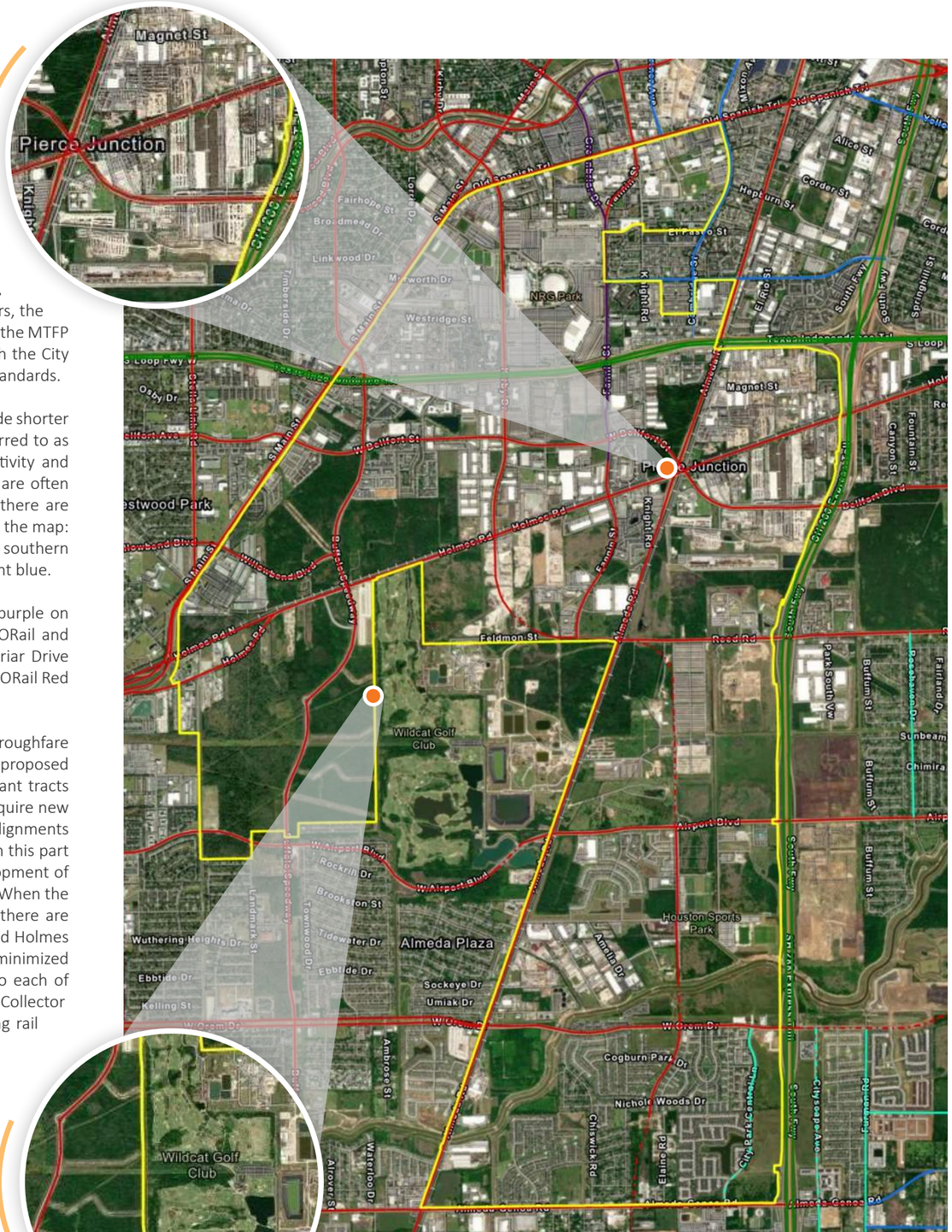
As seen on the map, most arterial streets shown in red have been designated as having sufficient width. Kirby Drive is the lone exception and is shown as a proposed principal thoroughfare, meaning that ROW does not currently exist. As development occurs, the City of Houston requires the dedication of ROW in compliance with the MTFP alignments and ordinances. Developers enter into agreement with the City for construction of the travel lane pavement and must meet city standards.

Another category of thoroughfares that are usually narrower, provide shorter length trips, and accommodate moderate traffic volumes are referred to as "collectors." These roadways provide additional network connectivity and link neighborhoods to the arterial street system. Collector roads are often located at the halfway point between arterials. Within TIRZ 24, there are only two Major Collector designated streets shown in dark blue on the map: Cambridge Street and Holly Hall Street. City Park Central Lane in the southern portion of the TIRZ is designated as a Minor Collector, shown in light blue.

The final MTFP category is the Transit Corridor street shown in purple on the map. This designation was created to encompass the METRORail and Bust Rapid Transit (BRT) corridors as defined by METRO. Greenbriar Drive and Fannin Street in TIRZ 24 have this designation due to the METRORail Red Line.

The District is adequately served with the current Major Thoroughfare alignments since the spacing between the existing streets and proposed Kirby Drive form a good network. Development of the larger vacant tracts and redevelopment of land assemblages within the District will require new collector streets to distribute traffic effectively. Examples of such alignments are shown below adjacent to Buffalo Speedway. The vacant land in this part of the TIRZ is characterized by large single ownerships and development of these tracts will need secondary streets per City of Houston code. When the Pierce Junction tracts at Loop 610 and SH288 are redeveloped, there are multiple tracts over 30-acres which will need access to Almeda and Holmes Roads. Since the number of railroad crossings are required to be minimized by UPRR, it is reasonable to assume that only one connection to each of these thoroughfares will be allowed. Thus, planning a Major Collector street pattern will allow redevelopment to occur while minimizing rail intersections. See Appendix 7.

Redevelopment near Pierce Junction will require crossing rail lines along Holmes and Almeda Roads. New Major Collector alignments can minimize crossings while providing access to multiple 20-50 acre parcels.



2022 COH MTFP Alignments in TIRZ 24 Southern Sector

New development of over 700 total acres will require consideration of new Major Collector alignments. Wildcat Golf Course is located on a former landfill and prevents connectivity east of the TIRZ boundary.

KIRBY DRIVE IMPROVEMENTS

$124.2 Million

Kirby Drive has been designated by the City of Houston as a Principal Thoroughfare on the Major Thoroughfare & Freeway Plan (MTFP) since 1942. Major thoroughfares typically have a minimum right-of-way width of 100 feet. Within the District, some portions of Kirby Drive have been constructed. Others have dedicated ROW but no pavement, and other sections ROW needs to be acquired. The extension and completion of Kirby Drive from Holmes Road to Beltway 8 would facilitate the connection of the Houston Central Business District (CBD) to the City of Pearland. Additionally, Kirby Drive connects several employment centers, including the Texas Medical Center, Uptown, and Greenway Plaza to residential neighborhoods along the route.

Currently, SH 288 and Almeda are the only major north-south corridors within TIRZ 24. However, these corridors fail to provide adequate access to underdeveloped properties in the heart of the District. This lack of roadway and transit connectivity coupled with a lack of water and sewer infrastructure have resulted in thousands of acres of land remaining vacant or underdeveloped within the District. Kirby Drive is key to providing this needed infrastructure to stimulate growth and development of these vacant/underdeveloped tracts. Kirby Drive provides additional mobility and a utility corridor for future developments in the District. Further, Kirby Drive from Fannin to the ETJ limit has already been designated as a Principal Thoroughfare on Houston's MTFP at the request of METRO which increases the required right-of-way width to 120 feet. Extending Kirby Drive across Sims Bayou will also provide multi-modal accessibility to a shared-use path along the bayou.

Kirby Dr. is proposed in **three phases.** Their costs include design, property acquisition, and construction. *(See detail cost breakdowns in Appendix 6)*

20% **local match can be shared among potential partners**

The Kirby Drive has the support of local governments and stakeholders such as **METRO, Harris County Precinct 1, Brazoria County, City of Pearland, and the Houston Livestock Show and Rodeo.** Agency support and the need for Kirby Drive as described make this a candidate project for HGAC TIP funding.

PHASE I

Phase I is divided into three phases and represents the simplest parts to achieve due to available ROW. Segment 1 from Holmes Road to Fannin Street is an at-grade portion with some current ROW dedication. Traffic patterns would temporarily flow along Feldman Street/Reed Road to Segment 2 which sits between Reed Road and W. Airport Road through the HLSR property. Segment 3 is a needed bridge over Sims Bayou connecting to W. Orem Drive.

Estimated Cost $50.5M *See Appendix 3*

PHASE II

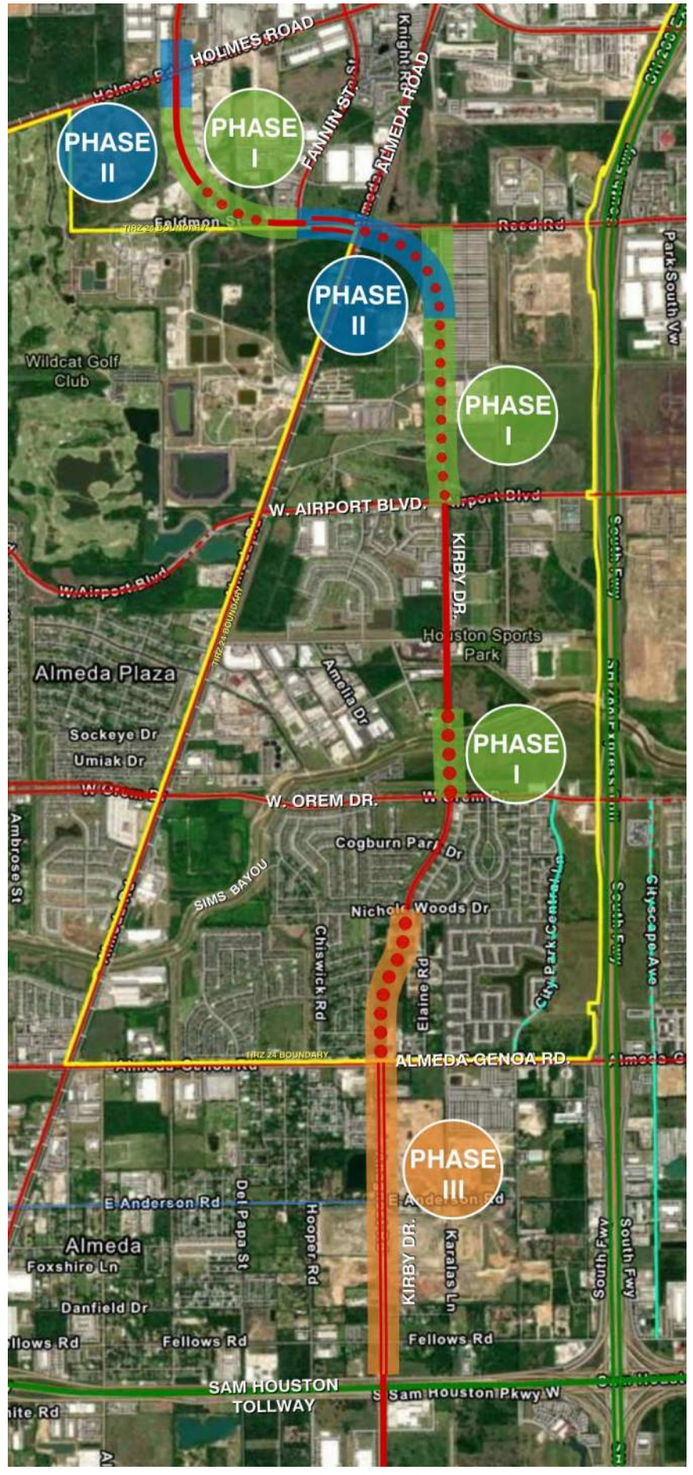
Kirby Drive currently terminates at Holmes Road which has two parallel Union Pacific Rail lines north of the intersection. Almeda Road is paralleled by UPRR on the east side with a single rail line. Efficient traffic movement via Kirby Drive for the possible METRO transit corridor will require bridges over both Holmes Road and Almeda Road and the adjacent rail lines. Grade separation (bridge) already exists on Buffalo Speedway within the District and a similar bridge crossing in these locations would complete the necessary local street connectivity pattern.

Estimated Cost $47.9M *See Appendix 4*

PHASE III

A segment of Kirby Drive was constructed as a 4-lane boulevard within the City Park development but ends at Nichols Woods Drive. ROW needs to be acquired between Nichols Woods Drive and Almeda Genoa Road at the south TIRZ 24 boundary. One final segment from Almeda Genoa Road to Beltway 8 outside the District boundary would complete Kirby Drive for over 16 miles from Allen Parkway to the Pomona subdivision in Pearland.

Estimated Cost $25.8M *See Appendix 5*



Kirby Drive Proposed Construction Phases

2

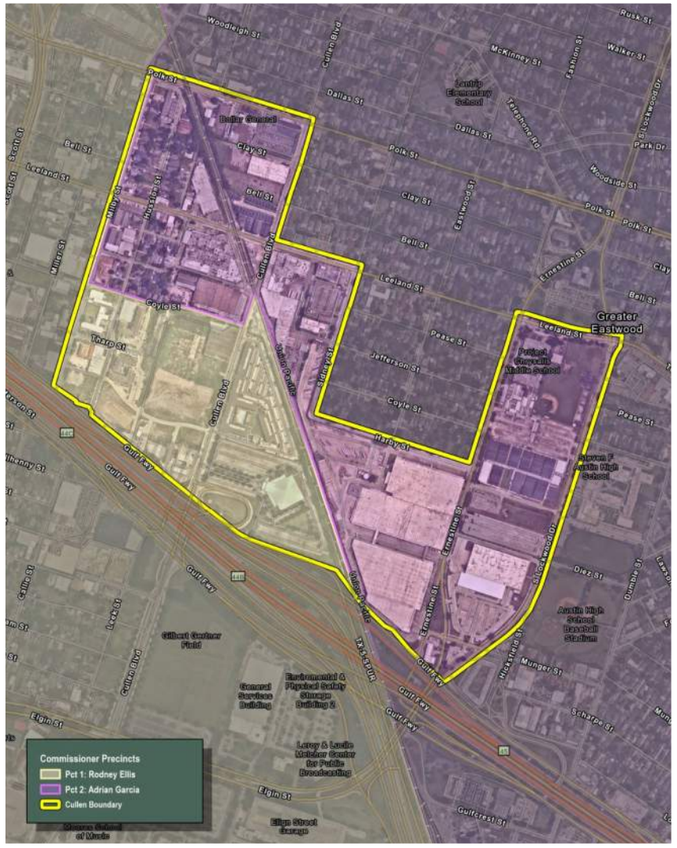
CHAPTER TWO: TIRZ 24 CULLEN ANNEX STUDY

INTRODUCTION

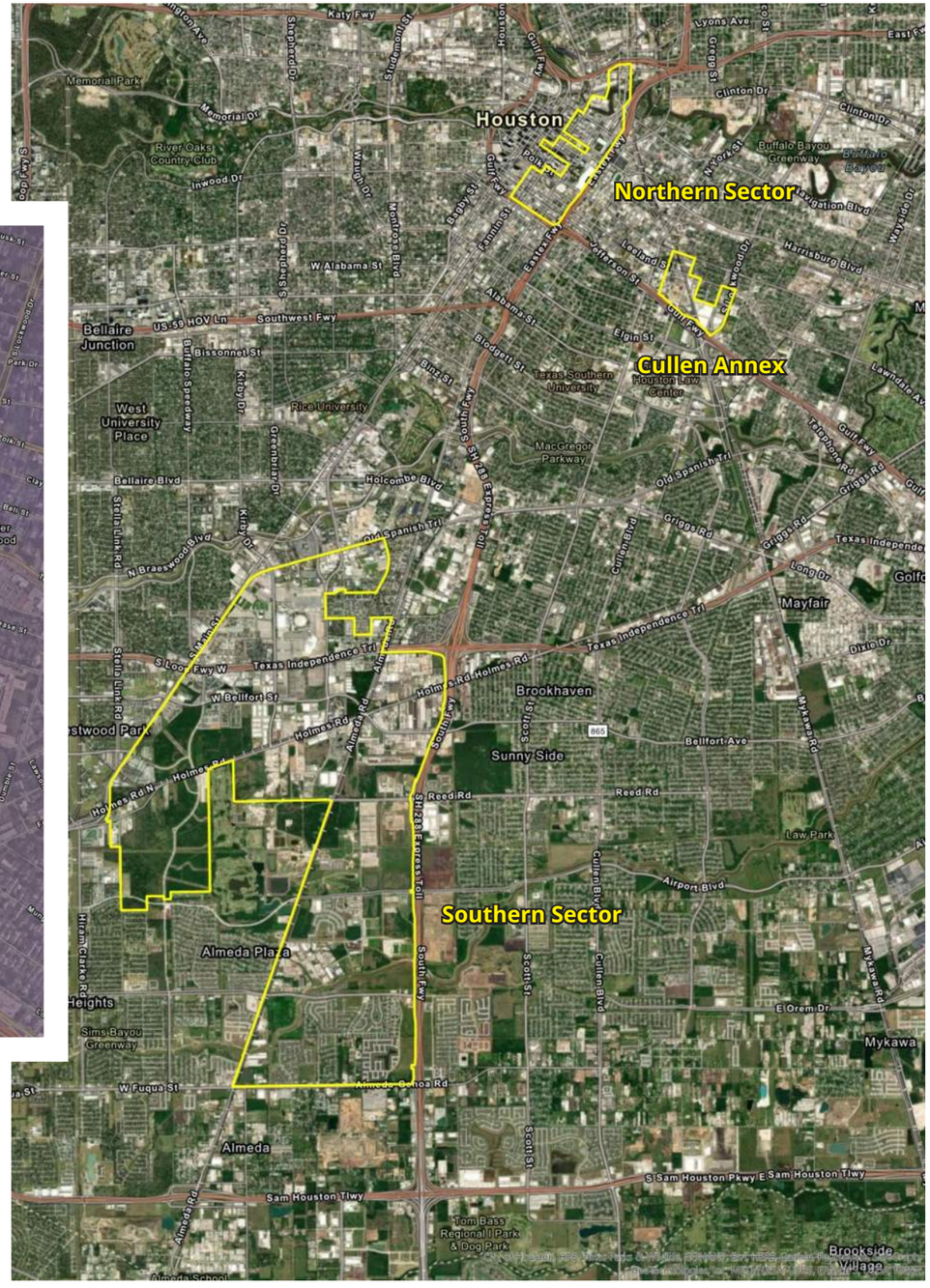
TIRZ 24 consists of three separate areas, the largest of which, called Southern Sector, includes the NRG Park campus and areas south of Loop 610, and which has been studied in its own infrastructure report. Following similar methodology, this study analyzes an area generally defined between Interstate 45 on the south, Milby Street to the west, Leeland and Polk Streets to the north, and South Lockwood Drive to the east. This area is referred to as the "Cullen Annex" (or the Annex) and consists of 190.6-acres. A Union Pacific Rail corridor bisects the Annex study area. The Annex straddles Harris County precinct lines, with 56.4-acres in Precinct 1 and 134.2-acres in Precinct 2. The EHRA infrastructure study of the Southern Sector and Cullen Annex totals 7,336-acres. Since the Southern Sector is entirely in Precinct 1, only 1.8% of the study area is within Precinct 2.

Developments within the Annex boundary include Macy's Distribution Center, City of Houston Water Customer Services, Houston Independent School District campuses, The Catholic Charismatic Center, New Hope Housing, single and multi-family residential, and commercial and industrial businesses. Only 11.5-percent of the study area remains vacant, largely limited to individual single-family tracts, however 70.3-acres are logical to redevelop into higher-density land uses in the future.

TIRZ 24 can stimulate efforts to develop vacant tracts and revitalize underdeveloped areas by working to provide the public infrastructure needed to serve new development. Extensive investigation has occurred to determine where such investment is needed based on projected land use. Other physical and environmental factors have also been considered. In total, over 89-acres of undeveloped or underdeveloped land has been studied and proposed for redevelopment representing over 47% of the Annex area. These areas will need streets reconstruction, storm sewers, water and wastewater lines, and detention facilities in order for new development to occur. This planning document will propose and outline how these objectives can be achieved.



Within TIRZ 24 Cullen Annex, 56.4-acres are in Harris County Precinct 1, 134.2-acres are in Precinct 2



TIRZ 24 Three Sectors

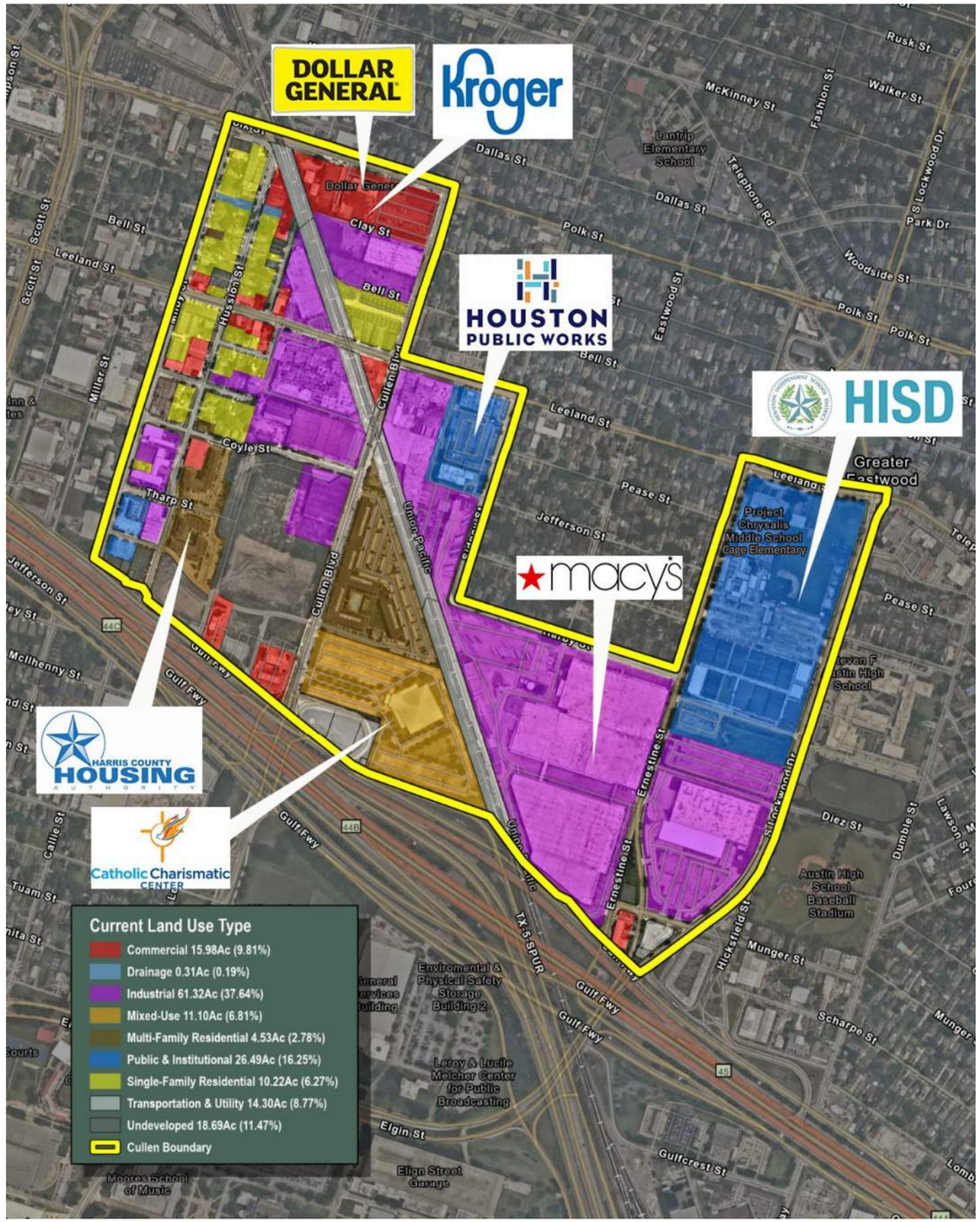
CURRENT LAND USE ANALYSIS

The TIRZ 24 Infrastructure and Investment Planning Study for the Cullen Annex began with an analysis of the current land use within the study area boundaries. While several sources are available for such data, none proved accurate enough to rely upon fully. Therefore, EHRA performed a reassessment and accurate accounting of the current land uses within the Annex. Standard accepted land use colors (denoted on the map) indicate the wide range of uses and the percentages of each use. Compiling an accurate snapshot of all land uses and development trends currently within the Annex is a critical starting point for this study. Infrastructure improvements that will spark new development cannot be planned without understanding and projecting where the best locations for such improvements should occur.

The Annex is primarily built-out, with few vacant tracts. The predominant land use is warehouse and distribution tracts due to the adjacency of the Union Pacific rail line which has linked Houston to the Port of Galveston for over a century. Interstate 45 and Spur 5 are major freeways adjacent and south of the Annex providing further transportation connectivity for such uses. However, surrounding the Annex to the northeast is the historic Eastwood Neighborhood consisting primarily of century-old Craftsman Style homes. Bordering the Annex to the northwest is the rapidly redeveloping East Downtown (EADO) district which is seeing both new retail and new residential redevelopment. Immediately south of I-45 are the University of Houston Main Campus and Texas Southern University, as well as the Greater Third Ward which is also seeing redevelopment occur. Redevelopment activities surrounding the Annex will likely spur redevelopment of the large warehouse distribution tracts within the Annex.

In fact, several tracts in the Annex have already redeveloped into multi-family housing including the Harris County Housing Authority's Villas at Eastwood. Demolition of the former Finger Furniture warehouse has occurred with new commercial pad sites now open on the I-45 frontage road and new corporate offices announced at the rear of the site in the only remaining structure. The majority of the remainder of the site will likely become a mixed-use land use project.

Several religious institutions currently reside in the Annex as well Houston Independent School District Cage Elementary School/Project Chrysalis Middle School Campus and satellite classrooms for Austin High School, which is located adjacent the study area on South Lockwood Drive. 8-blocks of existing single-family residential homes are located in the northeast corner of the Annex. A handful of vacant lots exist in this area, suitable for infill homes construction. A Kroger grocery store and Dollar General store are located at the corner of Cullen Boulevard and Polk Street, one of the few such vendors in the Greater Eastwood/Third Ward areas.



Current Land Uses and major land owners in TIRZ 24 Cullen Annex

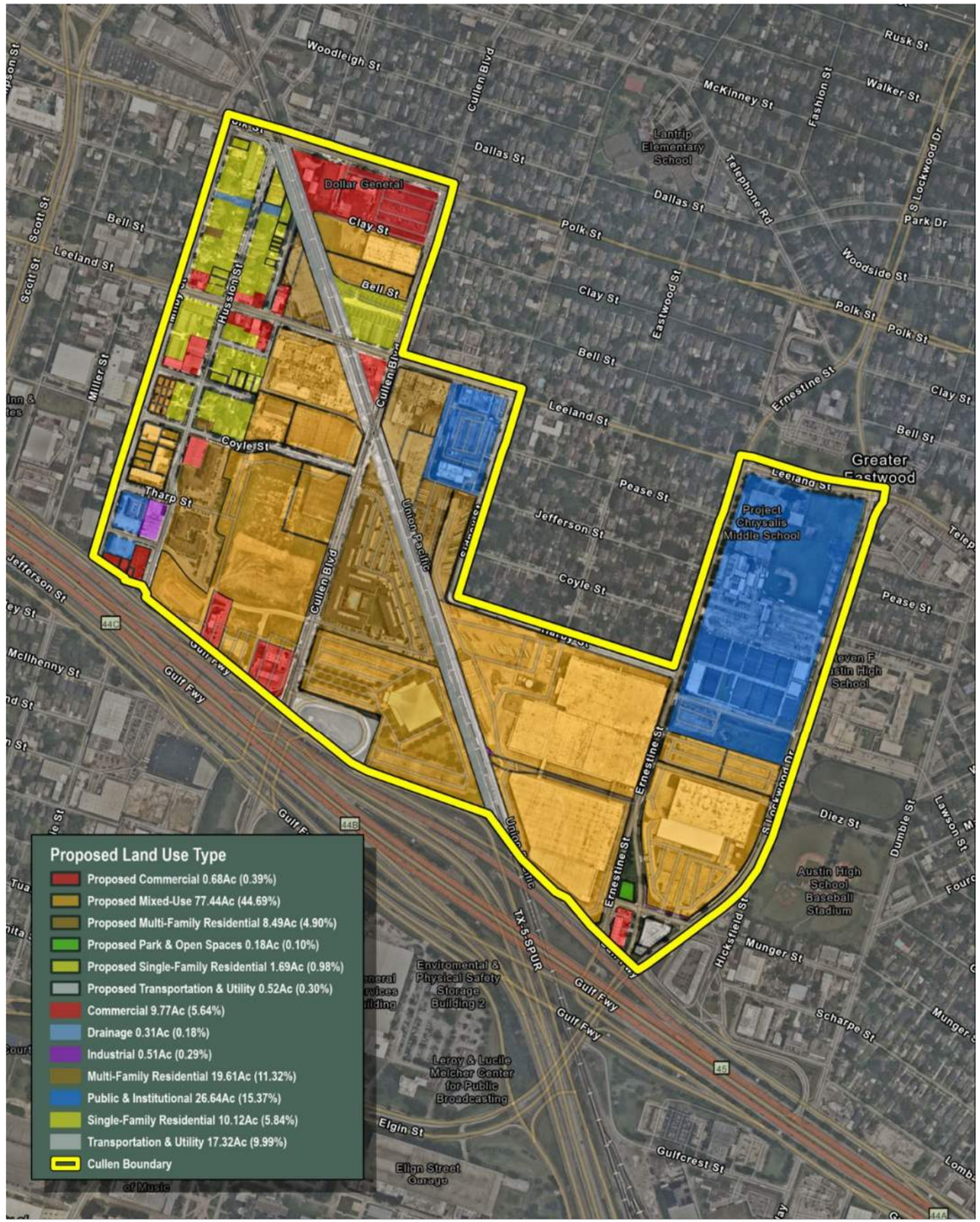
POTENTIAL LAND USE

Following the analysis of existing land uses and overall use conditions within the Annex, a Potential Land Use map has been created to guide the forecast of infrastructure improvements needed to support redevelopment. Actual new development or redevelopment depends greatly on factors which are market based. At this time, most candidate tracts within the Annex boundary require some measure of infrastructure improvement in order to occur. The primary function of this Planning Study is to identify how best to serve the future development needs of the Annex by programming the required infrastructure. Thus, projecting what land uses may be best or appropriate in the future is a very necessary step.

This map illustrates potential land uses which have been chosen based on intense study of many planning factors including the need for specific land uses, vehicular and multi-modal access, proximity or adjacency to other land uses, and timeliness of new infrastructure and/or redevelopment. One of the most important factors in planning future land use is the availability and cost of land. Land values are constantly on the rise which requires developers to create value on tracts commensurate to land cost and development cost. This reality is easily observed in many near-town neighborhoods throughout Houston where smaller lots and increasingly dense townhomes are being built alongside mid-rise or even high-rise multi-family buildings. Increasing density is one way to combat the higher cost of land in today's market. Higher density also equates to a greater stress on all infrastructure- thus this Potential Land Use map puts an emphasis on identifying where higher density development is likely to occur so that the proposed infrastructure improvements identified later in this plan do not miss the mark. It would be a real shame if the water, sewer, drainage, and transportation systems proposed herein were not big enough to support the proposed improvements.

It is not difficult to imagine that mixed-use projects with medium to high density land uses will be common as new development occurs within the Annex. The proximity of the study area to major thoroughfares and freeways makes transportation and connectivity issues an attractive sales point. And, being only 1.5 miles from Houston's Central Business District, adjacent to EADO new redevelopment and being immediately adjacent to two major universities, new residential units in the Annex will be highly desired. With current median home prices above $300,000, the price of single-family lots will surely increase to a point which is not sustainable in this area. Thus, it is reasonable to assume that new single-family homes will be using the townhome model to keep lot prices within reach. The next increased level in density is the mixed-use model which is akin to merging commercial/retail with multi-family residential. Such examples are now found throughout Houston and are experiencing good growth and high rental rates. In addition, the amenities offered by mixed-use projects create places to live, work, and play resulting in vibrant new communities.

The potential land use map relies heavily on new mixed-use areas in response to the need for dwelling units and results in appropriate utility demand assumptions. In all, nearly 89 acres within the Annex study area have been proposed for new land uses which is 47% of the total land area. As proposed, such development would be transformational for the Annex when the primary land uses evolve from warehouse and distribution tracts to residential areas with vibrant retail and associated parks and recreation.



Potential Land Use in TIRZ 24 Cullen Annex

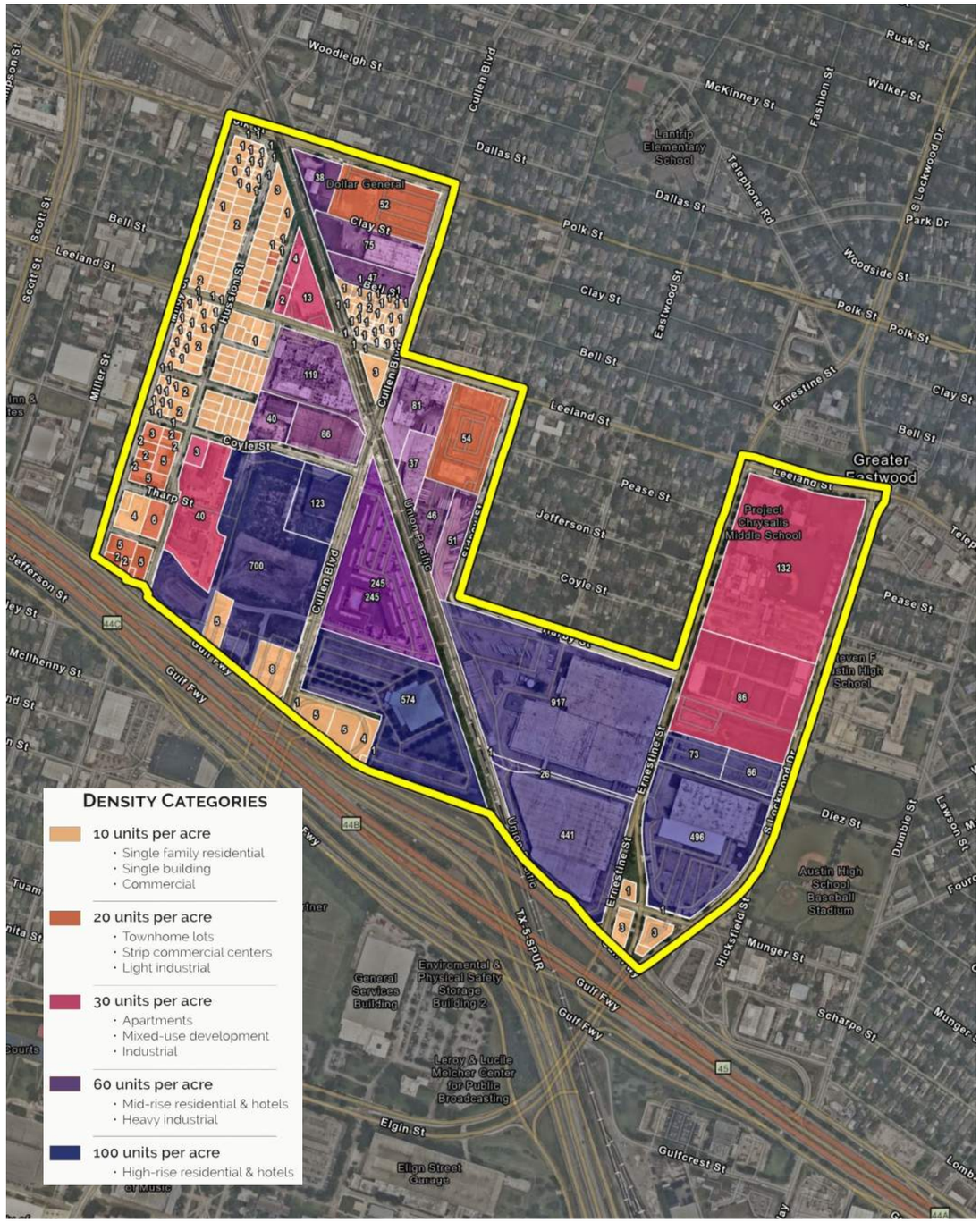
DENSITY ASSUMPTIONS

In order to properly anticipate the need for water and sewer capacity needs as well as roadway capacity needs, the projected land uses have been translated into a future projected density map. Based on an assumed population for each land use, EHRA has taken these densities and translated them into an industry standard known as “equivalent single-family connections” (ESFC’s or connections).

In this way, the expected increase in land use density and hence, population can be extrapolated into an appropriately sized infrastructure. In other words, projecting a land use for a certain tract and adjacent tracts allow an estimate of how many persons will occupy residences and businesses in a given area. That estimated population translates to the number of connections needed for water and sewer service, and accordingly the size of water and sewer pipes needed to deliver such services. Once pipe sizes are determined, a cost estimate can be prepared for an estimate of actual dollars for a project.

The density map at the right separates the study’s land use projections into five density categories which are programmed into the GIS database.

Also, from the density assumptions, new roadway needs can be forecasted. Since densities relate to population, population is related to traffic. From the forecasted traffic, roadway capacities can be estimated. From this information, preliminary construction cost estimates can be prepared for water and sewer lines, street paving, and sidewalks. Total estimated project cost is key in understanding how much value needs to be created within the Annex to offset the infrastructure investments that are needed. Knowing these costs will also allow TIRZ 24 to find funding programs and partners to invest in infrastructure improvements which will allow development/redevelopment in the Annex area to become a reality.



Density projection and equivalent water and sewer connections

UTILITIES

From the forecasted land uses and their corresponding populations/densities, a high-level analysis of the water, wastewater, and storm sewer systems was conducted to estimate the infrastructure required to serve the future development of vacant and underdeveloped tracts.

WATER:

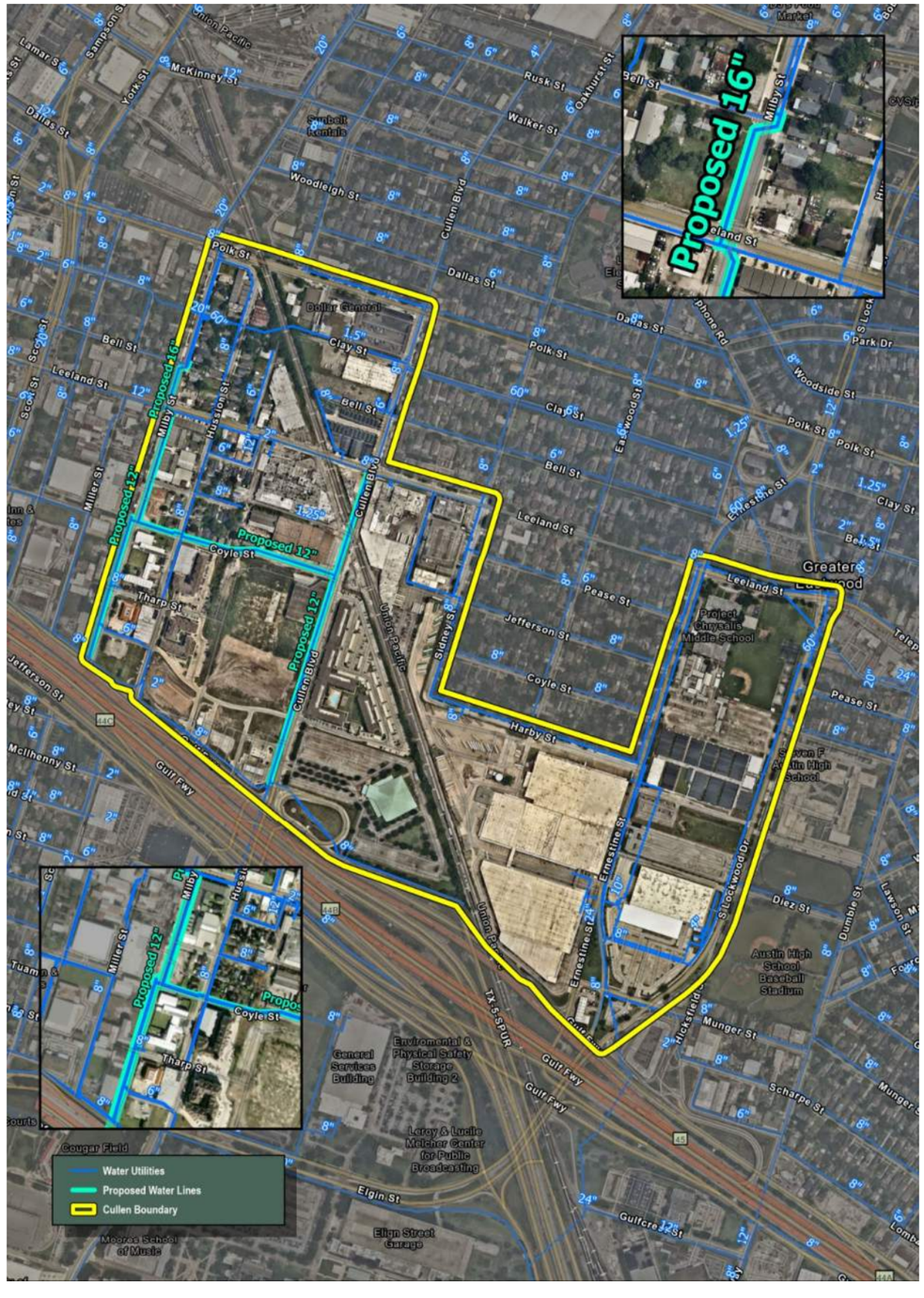
The City of Houston provides water service to all tracts in the Annex study area. Analysis of the existing water system was limited to pipe capacity and the ability of existing pipes to deliver water service without losing pressure. As redevelopment occurs, parcel density and thus the number of water utility users will increase resulting in the need for pipe sizes to be increased. Analyzing the condition of existing water pipes was not in the scope of this study and should be considered in future infrastructure projects and as redevelopment occurs.

Within the Annex study area, a 60-inch large diameter water main is located on Clay Street, 20-inch mains are on Milby Street and Bell Street, and a 24-inch main is located on Ernestine Street.

Redevelopment currently occurring on Cullen Boulevard indicates the need to upsize existing water lines so that other projected redevelopment will also have adequate service. Infrastructure improvements such as these should be carried out in conjunction with roadway reconstruction to leverage construction dollars. To facilitate redevelopment as presented in this study, the following water mains are proposed for upsizing:

PROPOSED WATER LINES

STREET NAME	FROM	TO	EXIST SIZE	PROPOSED SIZE	TOTAL LENGTH (LF)
MILBY	GULF	LEELAND	8"	12"	1,520
MILBY	LEELAND	BELL	8"	16"	340
CULLEN	GULF	LEELAND	8"	12"	1,890
COYLE	MILBY	CULLEN	8"	12"	1,230



Existing and Proposed Water Lines

UTILITIES

From the forecasted land uses and their corresponding populations/densities, a high-level analysis of the water, wastewater, and storm sewer systems was conducted to estimate the infrastructure required to serve the future development of vacant and underdeveloped tracts.

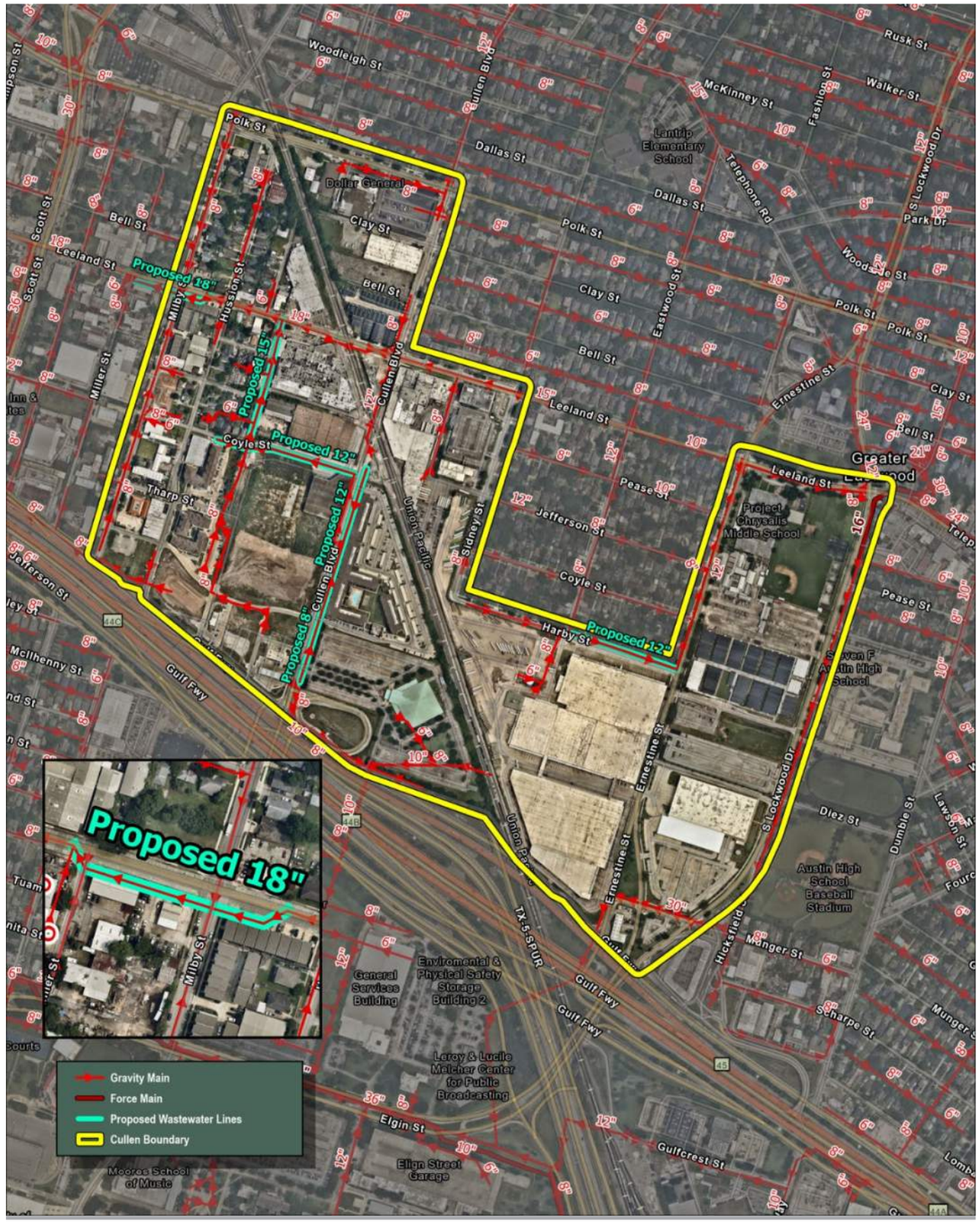
WASTEWATER:

The City of Houston provides wastewater service to all tracts in the Annex study area. Analysis of the existing wastewater system was limited to pipe capacity and the ability of existing pipes to handle additional inflows. As redevelopment occurs, parcel density and thus the number of wastewater utility users will increase resulting in the need for pipe sizes to be increased. Analyzing the condition of existing wastewater pipes was not in the scope of this study and should be considered in future infrastructure projects and as redevelopment occurs.

Wastewater is currently conveyed in the study area through two separate wastewater mains conveying to Scott Street Lift Station No. 1. On the east side of the Annex study area, the Leeland Street wastewater main is an 18-inch pipe which conveys flows westward to the Scott Street 36-inch main. On the west side of the study area the Leeland Street 12-inch wastewater main conveys to a 30-inch main on South Lockwood Drive which eventually connects to a 36-inch main on Elgin Street. Both wastewater main lines terminate at the 3100 Scott Street Lift Station.

Recent development on Hussion Street and redevelopment currently occurring on Cullen Boulevard indicate the need to upsize existing wastewater lines so that other projected redevelopment will also have adequate service. Infrastructure improvements such as these should be carried out in conjunction with roadway reconstruction to leverage construction dollars. To facilitate redevelopment as presented in this study, the following improvements to the wastewater system are proposed:

PROPOSED WASTEWATER LINES					
STREET NAME	FROM	TO	EXIST SIZE	PROPOSED SIZE	TOTAL LENGTH (LF)
LEELAND	MILLER	HUSSION	15"	18"	520
KEATING	LEELAND	COYLE	6"&8"	15"	740
COYLE	KEATING	CULLEN	8"	12"	790
CULLEN	GULF	WINCHESTER	6"	8"	360
CULLEN	WINCHESTER	COYLE	8"	12"	870
HARBY (NON-PRIORITY PROJECT)	EASTWOOD	ERNESTINE	8"	12"	650



Existing and Proposed Wastewater Lines

UTILITIES

From the forecasted land uses and their corresponding populations/densities, a high-level analysis of the water, wastewater, and storm sewer systems was conducted to estimate the infrastructure required to serve the future development of vacant and underdeveloped tracts.

STORM SEWER:

The entirety of the Cullen Annex study area is located in the Brays Bayou Watershed. The Union Pacific Rail corridor acts as a dam, creating a high point bisecting the study area. As rainfall occurs, water will sheet flow traveling both east and west away from the rail corridor. Storm water at developed properties enters the storm drains located on the sides of public streets, and storm sewer pipes convey the storm water to the Leeland Street underground storm mains. These storm pipes range in size from 80-inch to 96-inch, eventually connecting to a 144-inch system on South Lockwood Drive. This flow ultimately outfalls in the Brays Bayou.

Rather than curb and gutter systems with underground pipes as just described, roadside ditches are in use on Coyle Street, Keating Street, and Hussion Street. The storm water flows on these streets are conveyed from the open ditches to inlets located on adjacent streets.

Augmentation of several blocks of storm sewers will eliminate potential choke points and ensure that redeveloped tracts have adequate underground storm sewers to drain into. Since storm sewers are located immediately adjacent to street paving and the inlets are part of the street curbs, it is reasonable to make storm sewer improvements in conjunction with street reconstruction to save costs. Thus, several priority projects are being proposed to also include new storm sewers.

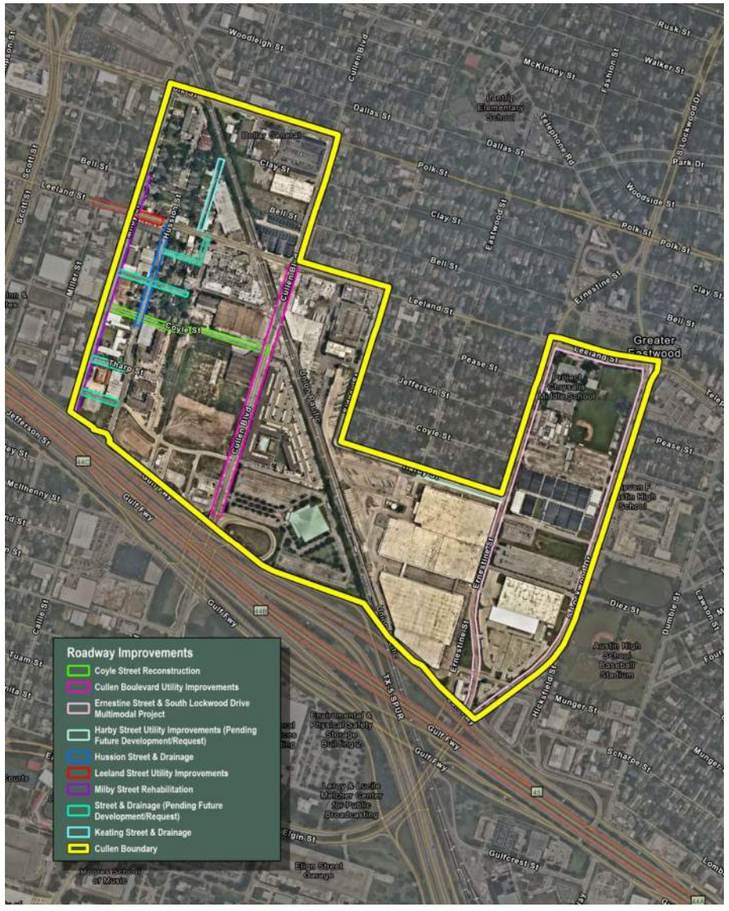
Existing Storm Sewer lines

TRANSPORTATION

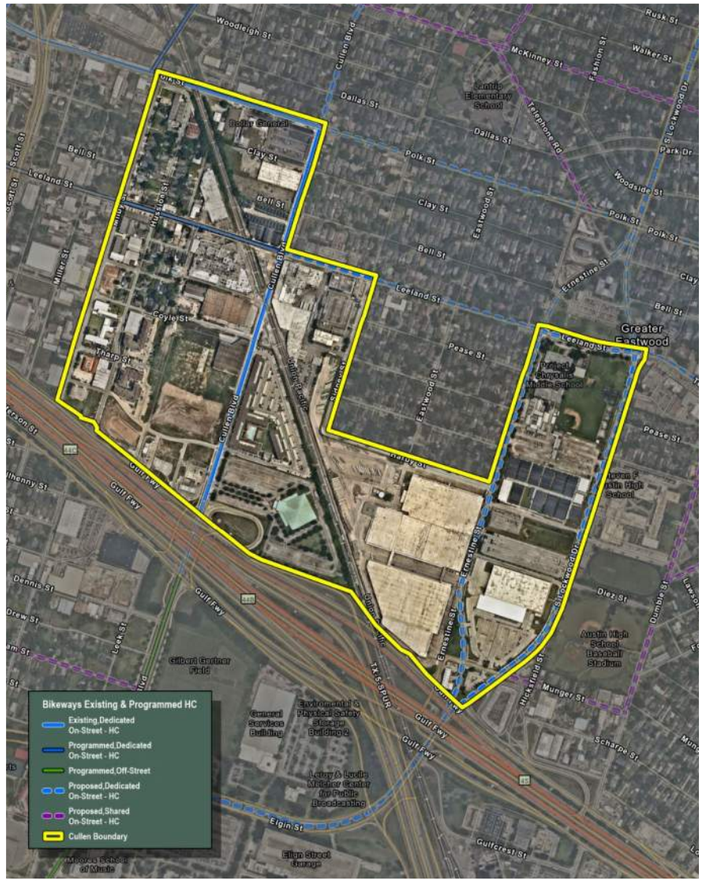
LOCAL STREETS:

Local streets within the TIRZ 24 Annex study area were analyzed for pavement conditions, right-of-way (ROW) width, pavement width, street classification, sidewalk conditions, and multi-modal mobility to determine what infrastructure improvements, if any, were justified. Based on the City of Houston's Pavement Condition Index (PCI), segments of Coyle, Hussion, Milby, Leeland, and Polk Streets were rated "Very Poor". These streets are therefore proposed for reconstruction or rehabilitation in conjunction with any needed water, wastewater, and drainage improvements already identified as necessary. Regardless of the observed PCI, streets within the Annex which need significant underground infrastructure replacement will require pavement reconstruction in combination with the utility work. Several roadways are served by open-ditch drainage and are proposed to be converted to underground storm sewers so as to match other existing conditions and provide space within the ROW for sidewalks.

The City of Houston's Bike Plan includes several existing and programmed high comfort bike lanes within the Annex as shown in the map at the far right. The Roadway Improvements exhibit to the right illustrates the proposed segments listed below:



Proposed Roadway Improvements, reference table below



City of Houston existing bikeways and programmed high-comfort bikeways

PROPOSED ROADWAY IMPROVEMENTS

PROJECT NAME	FROM	TO	IMPROVEMENT
COYLE STREET RECONSTRUCTION	MILBY	CULLEN	STREET & UTILITY RECONSTRUCTION
MILBY STREET REHABILITATION	GULF	BELL	STREET REHABILITATION & UTILITY IMPROVEMENTS
HUSSION STREET & DRAINAGE	COYLE	LEELAND	STREET & DRAINAGE
CULLEN BOULEVARD UTILITY IMPROVEMENTS	GULF	LEELAND	UTILITY IMPROVEMENTS & ROADWAY RESTORATION
LEELAND STREET UTILITY IMPROVEMENTS	MILLER	MILBY	UTILITY IMPROVEMENTS & ROADWAY RESTORATION
ERNESTINE & SOUTH LOCKWOOD DRIVE MULTIMODAL PROJECT	GULF	LEELAND	MULTIMODAL IMPLEMENTATION PER HOUSTON BIKE PLAN (Non-Priority Project)
PEASE STREET & DRAINAGE	HUSSION	KEATING	STREET & DRAINAGE (Non-Priority Project)
JEFFERSON STREET & DRAINAGE	MILBY	KEATING	STREET & DRAINAGE (Non-Priority Project)
THARP STREET & DRAINAGE	MILBY	HUSSION	STREET & DRAINAGE (Non-Priority Project)
WINCHESTER STREET & DRAINAGE	MILBY	HUSSION	STREET & DRAINAGE (Non-Priority Project)
HARBY STREET UTILITY IMPROVEMENTS	EASTWOOD	CULLEN	SANITARY SEWER IMPROVEMENTS (Non-Priority Project)

TRANSPORTATION

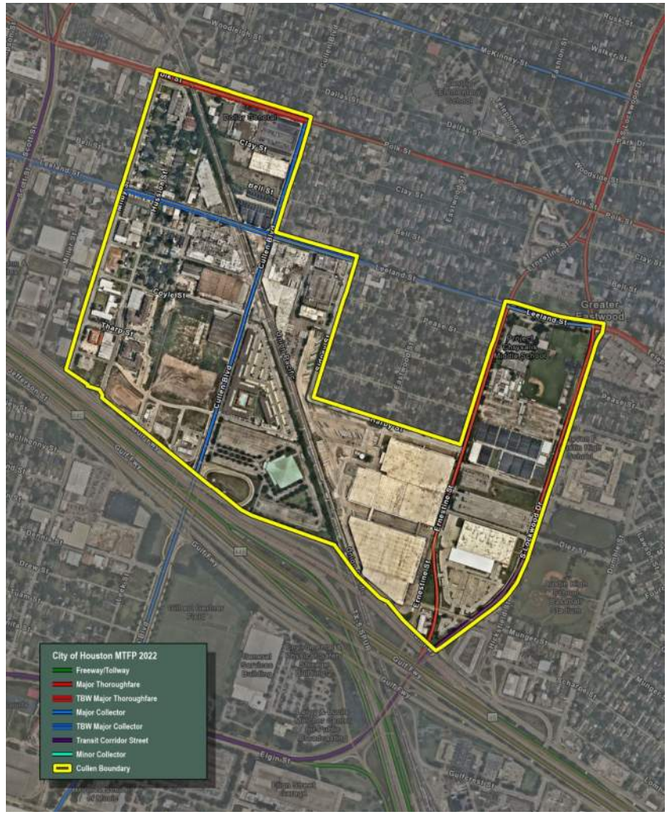
MAJOR THOROUGHFARE PLAN AND RIGHT-OF-WAY ACQUISITION:

The City of Houston maintains the Major Thoroughfare and Freeway Plan (MTFP) which describes alignments and ROW widths for thoroughfares and collectors in the city limits and ETJ. Several streets in the Annex currently lack the MTFP designated widths. As a policy, the City has relied on landowners to dedicate ROW when platting their property in order to acquire ROW widening. As properties redevelop within the Annex, replatting will likely be necessary and the City would require ROW widening dedication at that time.

The following table summarizes streets within the Annex that currently do not meet the MTFP designated ROW width.

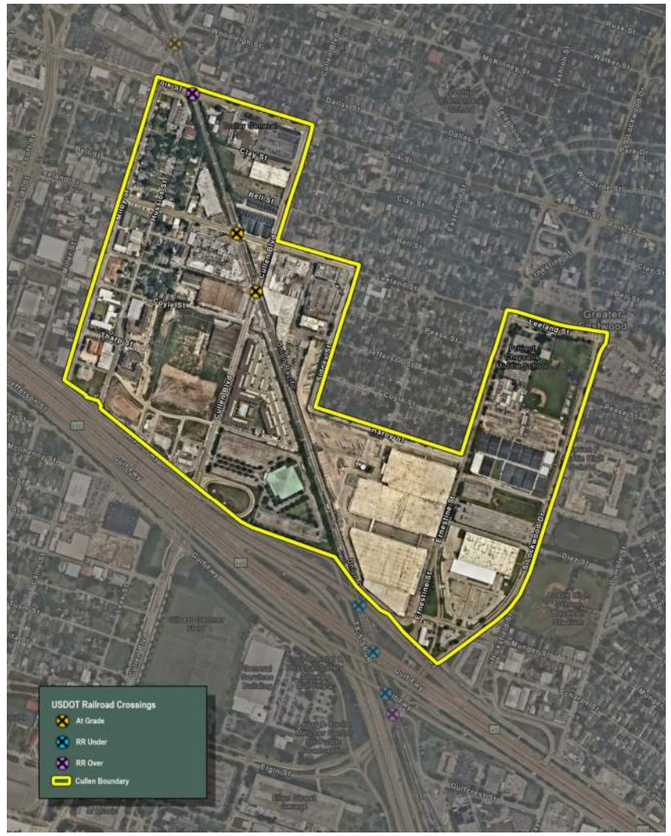
RIGHT-OF-WAY TABLE

STREET NAME	STREET CLASSIFICATION	EXISTING ROW	REQUIRED ROW PER MTFP
LEELAND	MAJOR COLLECTOR	60'-75'	80'
CULLEN	MAJOR COLLECTOR	70'-75'	80'
ERNESTINE	MAJOR THOROUGHFARE	60'-70'	100'
SOUTH LOCKWOOD	MAJOR THOROUGHFARE	70'	100'



City of Houston Major Thoroughfare and Freeway Plan

Example of Quad Gates RR crossing



Railroad and local street intersections in Cullen Annex

GULF COAST RAIL DISTRICT – WEST BELT SEALED CORRIDOR:

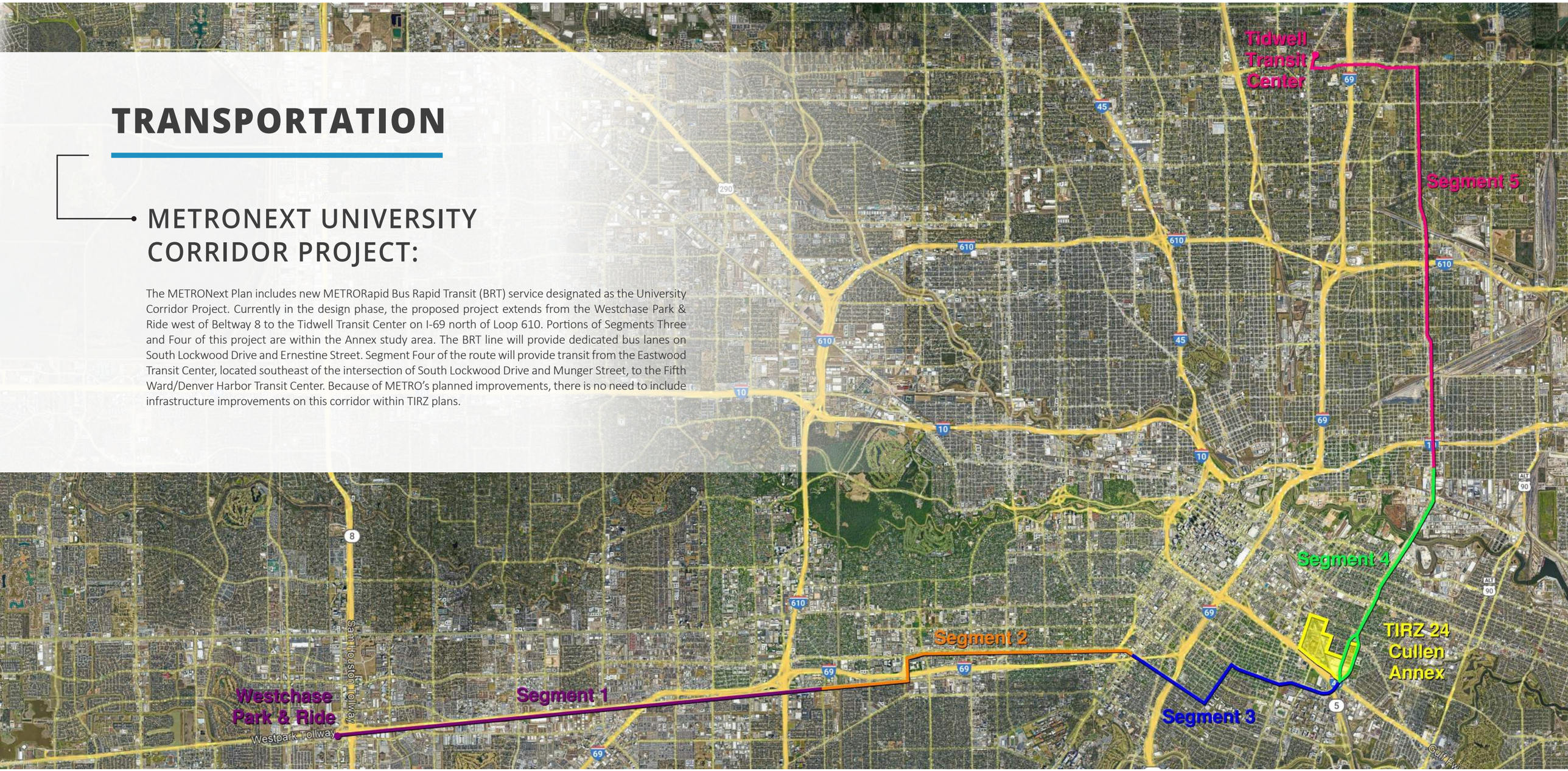
The Union Pacific rail line which runs through the Annex study area is an important north/south connection between Houston and the ports of Galveston and Freeport. The line is highly traveled at regular intervals. Within the Annex study area, at-grade intersections with the rail line occur at Cullen and Leeland Streets, and an underpass is located on Polk Street. The Gulf Coast Rail District (GCRD), which was created to enhance the economic benefits of rail and passenger transport while improving regional quality of life, has studied the Union Pacific line with the goal of eliminating conflicts between the rail and other modes of transportation as well as increasing the safety of all roadway users. The GCRD study proposes to upgrade the intersections with Leeland Street and Cullen Boulevard with quad gates which will prevent the ability to drive around the gates when closed. Just north of the Annex study area, the GCRD study proposes to close the at-grade crossing at Milby Street.

Further local street circulation can be enhanced by studying the opportunity for a new underpass at Leeland Street. Currently classified as a Major Collector, Leeland Street provides direct access through the EADO District to Houston's Central Business District to the west and becomes Telephone Road to the east, leading to Hobby Airport. Along this entire route, multiple single-family neighborhoods are connected via Leeland Street and the current at-grade crossing of the railroad is an impediment to timely traffic circulation. Since the GCRD study proposes multiple crossing closures, assessing if Leeland Street could include a future underpass would ensure adequate circulation at all times and fit with the goals of the GCRD. Projects such as this are eligible for Federal funding with 20% local match via the Transportation Improvement Program which equates to a $10 million budget amount.

TRANSPORTATION

METRONEXT UNIVERSITY CORRIDOR PROJECT:

The METRONext Plan includes new METRORapid Bus Rapid Transit (BRT) service designated as the University Corridor Project. Currently in the design phase, the proposed project extends from the Westchase Park & Ride west of Beltway 8 to the Tidwell Transit Center on I-69 north of Loop 610. Portions of Segments Three and Four of this project are within the Annex study area. The BRT line will provide dedicated bus lanes on South Lockwood Drive and Ernestine Street. Segment Four of the route will provide transit from the Eastwood Transit Center, located southeast of the intersection of South Lockwood Drive and Munger Street, to the Fifth Ward/Denver Harbor Transit Center. Because of METRO's planned improvements, there is no need to include infrastructure improvements on this corridor within TIRZ plans.



FUTURE VALUES AND INFRASTRUCTURE COST

Expenditures on infrastructure as programmed in this study must yield corresponding increases in property values in order to justify such public investment. As proposed, the total infrastructure investment in roadways, water and wastewater line upgrades, drainage improvements, and sidewalks totals $30,203,873. As infrastructure projects are funded and completed, the adjacent land can be redeveloped and will become more valuable with higher density land uses.

Based recent redevelopment in the Greater Houston area and associated land and improvement values, a conservative value per acre has been calculated for each potential land use. Thus, a projected value is able to be forecast. When compared with the total infrastructure investment cost, the estimated future values equate to a 9.67 multiplier. This indicates a reasonable return on the public infrastructure investments.

Future values and investment calculations are as follows:

CULLEN ANNEX			
TIRZ 24 ASSUMED IMPROVEMENT VALUES - REDEVELOPED ACREAGE			
Potential Land Use	Acreage	Value per Acre	Projected Value
Commercial	0.67	$2,000,000	$1,340,000
Mixed-Use	66.68	$4,000,000	$266,720,000
Single-Family Residential	1.87	$1,500,000	$2,805,000
Multi-Family Residential	8.45	$2,500,000	$21,125,000
Total	**77.67**		**$291,990,000**
		2023 Infrastructure Cost Estimate	**$30,203,873**
		Multiplier based on Assumed Value	**9.67**

The TIRZ 24 Cullen Annex is already experiencing redevelopment of some of the decades-old warehouse tracts. Proximity to Houston's Central Business District, two major universities, and transformation of the nearby EADO District make the Cullen Annex an attractive redevelopment opportunity. It should be noted that it is possible to add new multi-family and single-family residential units without displacement of existing homes since redevelopment in the Annex can take place on former warehouse and light industrial properties. Additionally, the availability of sizable acreage tracts makes exciting mixed-use projects viable. All of these conditions indicate that the TIRZ 24 Cullen Annex is a wise location for public investment.

Potential land uses and examples of future redevelopment projects (actual construction will vary)

3

CHAPTER THREE: APPENDICES

PCT 1 - PRIORITY PROJECT NO. 1

$4 Million

Panel replacement and Lane Striping on Kirby Drive and Murworth Drive

Roadway conditions near NRG Stadium on Kirby Drive and on Murworth Drive have deteriorated in multiple locations. In some cases, the pavement has experienced both upheaval and potholes creating potentially dangerous driving conditions. As one of the city's premier sports and exhibition venues, these streets are highly utilized and should be prioritized for repair. The **$4,000,000** budget would replace concrete paving and add lane striping on Kirby Drive between South Main Street and Loop 610, and on Murworth Drive between Kirby Drive and South Main Street adjacent to NRG Green and Yellow Lots.

Murworth Drive enhanced pedestrian realm

PCT 1 - PRIORITY PROJECT NO. 2

$5.8 Million

10-foot sidewalks and dynamic signage at NRG Park

Multiple near term and comparatively inexpensive infrastructure projects can be completed near NRG Park that will enhance pedestrian accessibility and safety, and improve vehicular traffic movement within the TIRZ 24 Southern Sector. Due to NRG Park's consistent event schedule and over 23,000 surface parking spaces, local streets near the complex are often extremely crowded with both cars and pedestrians, particularly during full capacity events such as Houston Texans football games or the Houston Livestock Show and Rodeo. Several east/west public streets connecting NRG Park to public transportation on South Main Street currently have 4-foot-wide sidewalks which are inadequate for most pedestrian activities. At this width, people walking side-by-side have difficulty and bicyclists and pedestrians in only 4-feet of space is potentially dangerous. 10-foot sidewalks are a preferred width and can be achieved in the current right-of-way. Sidewalk improvements will enhance safety and are a near term highly visible project within TIRZ 24.

Vehicular traffic exiting NRG Park could be enhanced by adding dynamic street signs at multiple locations. These signs post digital information rather than being static and can illustrate available turn lanes or travel times to various streets and freeways. Drivers can thus be forewarned of which lane to be in to turn appropriately or be able to choose a different exit route based on travel times communicated by the dynamic signs.

Three streets on the west side of NRG Stadium have been identified for such improvements. Murworth Drive, Westridge Street and Lantern Point Drive would all benefit from reconstruction of their existing 4-foot sidewalks. Installation of 10-foot sidewalks on both sides of their respective right-of-ways will greatly improve pedestrian access from NRG Park to METRO bus stops on South Main Street as well as improve local sidewalk connectivity for six apartment complexes to the commercial centers on South Main Street. Dynamic signage on these streets will improve driver information when exiting the Yellow, Teal and Green parking lots at NRG Park. The recommended near-term budget is **$5,800,000** for the design and construction of these projects.

PCT 1 - PRIORITY PROJECT NO. 3

$10.7 Million

Buffalo Speedway water and wastewater

Approximately 980-acres of land generally remain vacant or underdeveloped in the area along Buffalo Speedway between W Bellfort Ave and W Airport Blvd, both north and south of Holmes Road. Though a large diameter water supply line has already been constructed, smaller size water distribution mains and new wastewater gravity lines are needed to promote development of this area. The proposed wastewater lines would serve and promote development of this vast area on the west side of the zone. Therefore, a near-term budget of **$10,700,000** for the design of construction of these utilities is recommended.

PCT 1 - PRIORITY PROJECT NO. 4

$2 Million

Kirby Drive

Kirby Drive is a significant, but expensive project for TIRZ 24 that will have a major impact both within the District and the Greater Houston Area. The RDA submitted proposed projects on Kirby Drive in early 2023 to the Houston-Galveston Area Council (H-GAC) to access potential Federal funding for construction. Under such a scenario, 20% of the construction cost would be paid for by the local sponsor and 80% would be paid through Federal funding. The local sponsor would also contribute the construction documents as part of their obligation. To start construction, the local sponsor will need a complete set of approved construction documents.

To bring such a large project to fruition and in advance of creating construction documents, it is recommended that the RDA/TIRZ start the process of preliminary design for Kirby Drive. The preliminary work involves setting the horizontal alignment for the roadway, preparing boundary and topographic surveys, designing the vertical alignment, and preparing preliminary environmental documents. In addition, the National Environmental Protection Agency (NEPA) process must be followed in order to use Federal funds. Since this preliminary work is needed prior to the final design and construction documents, and since the RDA/TIRZ 24 has funds available, this work should be started as soon as possible. Thus, **$2,000,000** has been budgeted for preliminary design.

PCT 1 - PRIORITY PROJECT NO. 5

$1 Million

South Main Street at Loop 610 intersection redesign

At the South Main Street and Loop 610 intersection, only a single right turn lane currently exists among the total 6-lane width. This intersection should be studied to potentially be reconstructed and restriped to allow two right turn lanes onto the westbound Loop 610 Frontage Road. Additional turning movement at this location would improve backups on South Main Street and allow quicker distribution of NRG event traffic exiting McNee Road, Murworth Drive and Westridge Street. South Main and Loop 610 intersection design will require coordination with TxDOT. The recommended budget for design and construction is **$1,000,000**.

PCT 1 - PRIORITY PROJECT NO. 6

$4.2 Million

shared use path and trails on Kirby Drive

Construction of a 10-foot wide shared-use path on Kirby Drive between Loop 610 and Main Street would provide dramatic improvements in mobility and access. Multi-family units are prevalent and surround NRG Park. Locating a wide shared-use path on Kirby Drive provides a safer north-south corridor. The recommended budget is $4,200,000 for the design and construction of the project.

PCT 1 - PRIORITY PROJECT NO. 7

$3.4 Million

water and wastewater lines east of Almeda Road and north of Reed Road

A review of the different opportunities to focus water and wastewater installation to spur development on the east side of the zone, specifically east of Almeda Road, was made. The chosen candidate area was the approximately 250-acres of land east of Almeda and north of Reed Rd. This area remains vacant or underdeveloped. A targeted installation of water and wastewater lines would promote development by providing the necessary service for the tracts in this area. Therefore, the recommended budget is **$3,400,000** for the design and construction of the project.

PCT 1 - PRIORITY PROJECT NO. 8

$3.4 Million
dynamic signage on South main Street

Further traffic enhancements can also be made on South Main Street by adding dynamic signage. Up to five dynamic signs on South Main Street would allow transmittal of traffic information to northbound and southbound vehicles, potentially distributing traffic more efficiently to other major arteries such as Braeswood Boulevard and Old Spanish Trail. South Main Street dynamic signs will require coordination with TxDOT. The recommended budget for these signage improvements is **$3,408,750.**

PCT 1 - PRIORITY PROJECT NO. 9

$2 Million
water and wastewater Lines

The Master Plan for water and wastewater utilities has been envisioned for the zone. However, in the area east of Almeda Road it is not readily evident when these utility lines should be constructed. Therefore, it is recommended that a budget for the design and construction of some of these lines be set for the near term and be dictated by request from the development community. The recommended budget is **$2,000,000** for water and wastewater lines.

PCT 2 - PRIORITY PROJECTS

$15.9 Million
Water, Wastewater, Storm, Paving for Harris County Precinct 2

Install/replace water, wastewater, storm and paving infrastructure in Harris County Precinct 2 portion that resides within the TIRZ 24 Cullen Annexed boundary. The recommended budget is **$15,913,000**.

PCTS 1 & 2 - PRIORITY PROJECTS

$8.4 Million
Water, Wastewater, Storm, Paving for Harris County Precinct 2

Install/replace water, wastewater, storm and paving infrastructure in Harris County Precincts 1 & 2 portion that resides within the TIRZ 24 Cullen Annexed boundary. The project location will be identified in the Cullen Annexed study scheduled for completion in the fourth quarter of 2023. The recommended budget is **$8,406,790**.

PRIORITY PROJECTS COSTS					
No.	Project Name	Location	Description	Cost Estimate (Design & Construction) PRECINCT 1	Cost Estimate (Design & Construction) PRECINCT 2
PRECINCT 1 PROJECTS					
1	Pavement Panel Replacement and Lane Striping on Kirby Dr. and Murworth Dr.	Kirby Dr. from Main St. to IH610; Murworth from Kirby Dr. to Main St.	Replace concrete pavement and add lane striping	$4,000,000	
2	Sidewalk Replacement and New Digital Signs at NRG Park	NRG Park - Westridge, Murworth, Lantern	Replace w/ 10-foot-wide sidewalks, install digital directional signs	$5,800,000	
3	Buffalo Spwy Water & Wastewater	Buffalo Spwy b/t W Belfort and Holmes	Install water and wastewater lines on Buffalo Spwy	$10,700,000	
4	Kirby Dr Preliminary Engineering Report (NEPA process)	Kirby from Holmes to Beltway 8 (all 3 phases)	Study Kirby alignment, ROW & environmental impacts, costs, and information needed for HGAC TIP application	$2,000,000	
5	S. Main Street at H610 Intersection Redesign	S. Main & IH610 Intersection	Provide double right turn from SB Main St to WB 610 frontage road	$1,000,000	
6	Shared Use Path on Kirby Dr	Kirby (from IH610 to Main)	Construction of 10-foot Shared-Use Path for pedestrians	$4,200,000	
7	Water and Wastewater Lines east of Almeda and north of Reed Rd.	East of Almeda and north of Reed Rd.	Install water and wastewater lines	$3,400,000	
8	S. Main Street Digital Dynamic Signs	S. Main between IH610 and Kirby	Install dynamic digital message signs	$3,408,750	
9	Water and Wastewater Lines (Southern Sector)	Within TIRZ 24 boundary	Install water and wastewater lines to be determined by developer's request	$2,000,000	
			TOTAL PRECINCT 1 PROJECT COSTS	**$36,508,750**	
PRECINCT 2 PROJECTS					
10	Hussion Paving and Drainage (Cullen Annex)	Hussion from Coyle to Leeland	Street reconstruction and utility improvements		$2,484,000
11	Keating St. Paving and Drainage (Cullen Annex)	Keating from Leeland to Clay	Street reconstruction and drainage improvements		$1,656,000
12	Sidewalk Replacement for Polk and Leeland (Cullen Annex)	Polk from Milby to Cullen, Leeland from Milby to Sidney, Leeland from Earnestine to Lockwood	Replacement of sidewalk panels		$1,773,300
13	Leeland Underpass Proposed TIP 20% match	Leeland west of Cullen	Tunnel installation on Leeland at Railroad tracts west of Cullen		$10,000,000
			TOTAL PRECINCT 2 PROJECT COSTS		**$15,913,300**
PRECINCT 1 & 2 PROJECTS					
14	Coyle St. Reconstruction (Cullen Annex)	Coyle from Milby to Cullen	Street reconstruction and utility improvements	$1,933,897	$1,922,897
15	Milby Street Rehabilitation (Cullen Annex)	Milby from Gulf Freeway to Bell	Milling and asphalt overlay and utility improvements	$1,119,076	$1,285,573
16	Cullen Blvd. Utility Improvements (Cullen Annex)	Cullen from Gulf Freeway to Leeland	Installation of Water and Wastewater lines	$1,480,290	$665,057
			PRECINCTS 1 & 2 SPLIT COSTS	**$4,533,263**	**$3,873,527**
			TOTAL FOR PRECINCT 1 & 2	**$41,042,013**	**$19,786,827**
			COMBINED PRECINCT 1 & 2 PROJECT COSTS	**$60,828,840**	

OVERALL COST SUMMARY

In contemplating the future development potential within the TIRZ 24 Southern Sector and Cullen Annex, this report has demonstrated the need to project future land use, determine expected built environment density, estimate population growth, and account for environmental factors. In all, 7,336-acres have been studied in this Infrastructure and Investment Study.

Of the 7,145 total acres in the southern sector study area, 52% of the acreage, equaling 3,745-acres, is appropriate for new development. This is a significant area, located near major employment and entertainment centers as well as regional freeways and transportation corridors. In other words, the TIRZ 24 Southern Sector is primed for an explosion of development. However, allowing development of new homes, commercial, and industry in the Southern Sector study area requires the design and construction of numerous infrastructure projects. Water, wastewater, drainage, and street construction projects all need to be scoped and designed before construction.

Though significantly smaller in area at only 190.6-acres, the Cullen Annex is also a candidate for significant redevelopment of existing warehouse land uses. 89-acres representing over 47% of the Annex study area is suitable for potential higher density redevelopment if the water and sewer infrastructure in existing streets were to be upgraded appropriately.

As already discussed in this report and summarized in the Overall Cost Summary, a wide range of infrastructure projects are required in order to activate the developable acreage within the two TIRZ 24 study areas. The summary includes costs for design and construction and indicates if the dollar amount is obtained through an itemized cost estimate found in the appendices or a budgeted amount useful in preparing for future expenditures.

TOTAL PROJECTED COST IS

$714.4

Million Dollars

SUMMARY OF PROPOSED INFRASTRUCTURE INVESTMENTS		
SUMMARY OF INFRASTRUCTURE COSTS (SOUTHERN SECTOR)		
Projects	Cost Design & Construction	References
Kirby Drive Phase, I, II & III	$124,105,000	Appendix 3, 4, 5, 6
Kirby Drive Bus Rapid Transit (BRT)	$15,000,000	Budgeted Amount, no Cost Detail
Kirby Drive Major Landscape Package	$20,000,000	Budgeted Amount, no Cost Detail
Almeda/IH610/SH288 Connectors	$158,400,000	Budgeted Amount, no Cost Detail
Collector Streets	$18,631,000	Appendix 7
Bikeway/Trails	$9,159,413	Appendix 8
Sidewalk & Signs	$5,801,000	Appendix 9
Wastewater System	$150,455,000	Appendix 1
Water System	$75,249,000	Appendix 2
AT&T, CenterPoint Energy, Comcast	$20,000,000	Budgeted Amount, no Cost Detail
Redundancy for Water, Sewer, Power	$50,000,000	Budgeted Amount, no Cost Detail
Detention	$25,000,000	Budgeted Amount, no Cost Detail
TOTAL SOUTHERN SECTOR PROJECTS (CONSTRUCTION & DESIGN)	**$671,800,413**	
SUMMARY OF INFRASTRUCTURE COSTS TO SERVE 89-ACRES OF NEW DEVELOPMENT (CULLEN AREA)		
Coyle Street Reconstruction - Milby to Cullen	$3,867,795	Appendix 10
Milby Street Rehabilitation - Gulf Freeway to Bell	$2,404,650	Appendix 11
Hussion Street & Drainage - Coyle to Leeland	$2,484,000	Appendix 12
Cullen Boulevard Utility Improvements - Gulf Freeway to Leeland	$2,145,348	Appendix 13
Leeland Street Utility Improvements - Miller to Milby	$820,410	Appendix 14
Keating Street & Drainage - Leeland to Clay	$1,656,000	Appendix 15
Polk Street Sidewalk Improvements - Milby to Cullen	$648,600	Appendix 16
Leeland Street Sidewalk Improvements - Milby to Sidney	$483,000	Appendix 17
Leeland Street Sidewalk Improvements - Ernestine to Lockwood	$641,700	Appendix 18
Leeland/UPRR Rail Grade Separation - 20% TIP Match	$10,000,000	Appendix 19
Ernestine & S. Lockwood Multimodal Project - Gulf Freeway to Leeland	$938,400	Appendix 20
Pease Street & Drainage - Hussion to Keating	$1,269,600	Appendix 21
Jefferson Street & Drainage - Milby to Keating	$1,407,600	Appendix 22
Tharp Street & Drainage - Milby to Hussion	$1,035,000	Appendix 23
Winchester Street & Drainage - Milby to Hussion	$1,035,000	Appendix 24
Harby Street Utility Improvements - Eastwood to Ernestine	$771,420	Appendix 25
Urban landscape & Streetscape	$7,000,000	Budgeted Amount, no Cost Detail
AT&T, CenterPoint Energy, Comcast	$4,000,000	Budgeted Amount, no Cost Detail
TOTAL CULLEN ANNEX PROJECTS (CONSTRUCTION & DESIGN)	**$42,608,523**	
TOTAL SOUTHERN SECTOR & CULLEN ANNEX	**$714,408,936**	

APPENDIX 1

PROPOSED WASTEWATER SYSTEM COST ESTIMATE				
Description	Unit	Quantity	Unit Price	Total Cost
8-inch San Swr, by Open Cut	LF	3,415	$65	$221,975
8-inch San Swr, by Bore	LF	400	$175	$70,000
12-inch San Swr, by Open Cut	LF	15,935	$100	$1,593,500
12-inch San Swr, by Bore	LF	1,000	$400	$400,000
15-inch San Swr, by Open Cut	LF	2,225	$125	$278,125
15-inch San Swr, by Bore	LF	410	$500	$205,000
18-inch San Swr, by Open Cut	LF	9,950	$200	$1,990,000
18-inch San Swr, by Bore	LF	1,400	$650	$910,000
24-inch San Swr, by Open Cut	LF	9,255	$225	$2,082,375
24-inch San Swr, by Bore	LF	800	$800	$640,000
27-inch San Swr, by Open Cut	LF	1,265	$285	$360,525
27-inch San Swr, by Bore	LF	140	$950	$133,000
30-inch San Swr, by Open Cut	LF	265	$325	$86,125
30-inch San Swr, by Bore	LF	60	$1,400	$84,000
Manhole	EA	261	$10,000	$2,610,000
Lift Station & Force Main	LS	1	$10,000,000	$10,000,000
Pavement Restoration	SY	25,000	$120	$3,000,000
Wastewater Treatment Plant Expansion	LS	1	$70,000,000	$70,000,000
Miscellaneous	LS	1	$10,000,000	$10,000,000
			Sub-Total	$104,664,625
			Contingency (25%)	$26,166,156
			Total Construction	$130,830,781
			Engineering (15%)	$19,624,617
			TOTAL	**$150,455,398**

APPENDIX 2

PROPOSED WATER SYSTEM COST ESTIMATE				
Description	Unit	Quantity	Unit Price	Total Cost
8-inch Water Line PVC C-900	LF	2,200	$85	$187,000
8-inch Water Line PVC C-900, Auger	LF	100	$175	$17,500
12-inch Water Line PVC C-900	LF	24,950	$115	$2,869,250
12-inch Water Line PVC C-900, Auger	LF	3,050	$400	$1,220,000
16-inch Water Line PVC C-905	LF	8,550	$175	$1,496,250
16-inch Water Line PVC C-905, Auger	LF	800	$190	$152,000
30-inch Water Line PVC C-905	LF	7,400	$800	$5,920,000
30-inch Water Line PVC C-905, Auger	LF	1,800	$950	$1,710,000
Water Line Connection (All Sizes)	EA	16	$25,000	$400,000
Fire Hydrant Assembly	EA	130	$7,500	$975,000
Pavement Repair	SY	20,000	$120	$2,400,000
Water Treatment, Storage Tanks, Booster Pumps	LS	1	$25,000,000	$25,000,000
Miscellaneous	LS	1	$10,000,000	$10,000,000
			Sub-Total	$52,347,000
			Contingency (25%)	$13,086,750
			Total Construction	$65,433,750
			Engineering (15%)	$9,815,063
			TOTAL	**$75,248,813**

APPENDIX 3

KIRBY DR PHASE I - HOLMES TO AIRPORT & SIMS BAYOU BRIDGE

		Item/Description	Quantity		Rate $	Total $
DEMOLITION & REMOVAL	**Street/Paving Demolition**					
	1	Clearing New ROW	113.50	sta	$6,275.00	$712,213
	2	Remove Existing Concrete Road	9,000	sy	$10.00	$90,000
	3	Remove Existing Asphalt Pavement	20,000	sy	$10.00	$200,000
		Subtotal Street/Paving Demolition				**$1,002,213**
	Environmental					
	4	SWPPP	1	ls	$83,000.00	$83,000
		Subtotal Environmental				**$83,000**
					Subtotal Demolition & Removal	**$1,085,213**
PAVING & IMPROVEMENTS	**Paving**					
	5	Roadway Excavation	50,000	cy	$10.00	$500,000
	6	Roadway Embankment	71,111	cy	$13.00	$924,443
	7	8-Inch Stabilized Subgrade Preparation	75,845	sy	$7.00	$530,915
	8	Type "B" Lime (36#/SY)	1,365	tons	$265.00	$361,725
	9	11-Inch Reinforced Concrete Pavement	72,233	sy	$85.00	$6,139,833
	10	6-Inch Concrete Curb	39,400	lf	$8.00	$315,200
	11	Sidewalk (6')	14,903	sy	$70.00	$1,043,233
	12	Pipeline Zero Load Slabs	6	ea	$165,000.00	$990,000
		Subtotal Paving				**$10,805,350**
	Signage & Striping					
	13	Permanent Signing/Pavement Markings	1	ls	$110,000.00	$110,000
		Subtotal Signage & Striping				**$110,000**
	Drainage					
	14	54" RCP Trunkline	-	lf	$400.00	-
	15	8' x 6' RCB Trunkline	11,350	lf	$985.00	$11,179,750
	16	24" RCP Leads	2,106	lf	$95.00	$200,070
	17	Precast Junction Boxes	26	ea	$18,000.00	$468,000
	18	Type "A" Manholes	-	ea	$7,750.00	-
	19	Inlets	52	ea	$6,125.00	$318,500
	20	Outfalls	-	ea	$55,000.00	-
	21	Cement Stabilized Backfill	14,320	cy	$70.00	$1,002,400
	22	Cement Stabilized Backfill (Inlet or MH)	644	cy	$70.00	$45,080
		Subtotal Drainage				**$13,213,800**
	Landscaping					
	23	Hydromulch/Seeding	5.2	ac	$5,000.00	$26,000
	24	Fertilizer	5.2	ac	$1,000.00	$5,200
	25	Compost Manufactured Topsoil	25,222	sy	$1.50	$37,833
	26	Permanent Seeding (Broadcast)	25,222	sy	$0.50	$12,611
	27	Straw	25,222	sy	$0.50	$12,611
	28	Vegetative Watering	0.7	mg	$28.50	$19.95
		Subtotal Landscaping				**$94,276**
	Traffic					
	29	Detour Pavement	5,141	sy	$110.00	$565,473
	30	Traffic Control	1	ls	$220,000.00	$220,000
		Subtotal Traffic				**$785,473**
	Traffic Signals					
	31	Traffic Signals	2	ea	$200,000.00	$400,000
		Subtotal Traffic Signals				**$400,000**
					Subtotal Paving & Improvements	**$25,408,899**
STRUCTURES	**Structures**					
	32	Almeda/UPRR Bridge (90' Wide)	-	sf	$110.00	-
	33	Sims Bayou Bridge (90' Wide)	47,250	sf	$93.50	$4,417,875
		Holmes Bridge (90' Wide)	-	sf	$110.00	-
	34	Retaining Walls	7,000	sf	$77.00	$539,000
	35	Retailing Wall Embankment CSBE	3,889	cy	57.00	$221,673
		Subtotal Structures				**$5,178,548**
					Subtotal Structures	**$5,178,548**
		KIRBY ROAD (SECTION 1) SUBTOTAL				**31,672,659**
		Contingency - 20%				6,334,532
		Engineering - 10%				3,800,719
		ROW Acquisition				8,648,400
		KIRBY ROAD (SECTION 1) CONSTRUCTION TOTAL				**$50,456,310**

APPENDIX 4

KIRBY DR PHASE II - HOLMES, ALMEDA BRIDGE

		Item/Description	Quantity		Rate $	Total $
DEMOLITION & REMOVAL	**Street/Paving Demolition**					
	1	Clearing New ROW	16.25	sta	$6,275.00	$101,969
	2	Remove Existing Concrete Road	-	sy	$10.00	-
	3	Remove Existing Asphalt Pavement	-	sy	$10.00	-
		Subtotal Street/Paving Demolition				**$101,969**
	Environmental					
	4	SWPPP	1	ls	17,000.00	$17,000
		Subtotal Environmental				**$17,000**
					Subtotal Demolition & Removal	**$118,969**
PAVING & IMPROVEMENTS	**Paving**					
	5	Roadway Excavation	-	cy	$10.00	-
	6	Roadway Embankment	(12,778)	cy	$13.00	($166,114)
	7	8-Inch Stabilized Subgrade Preparation	8,432	sy	$7.00	$59,021
	8	Type "B" Lime (36#/SY)	152	tons	$265.00	$40,280
	9	11-Inch Reinforced Concrete Pavement	8,030	sy	$85.00	$682,550
	10	6-Inch Concrete Curb	4,400	lf	$8.00	$35,200
	11	Sidewalk (6')	-	sy	$70.00	-
	12	Pipeline Zero Load Slabs	2	ea	$165,000.00	$330,000
		Subtotal Paving				**$980,937**
	Signage & Striping					
	13	Permanent Signing/Pavement Markings	1	ls	$11,000.00	$11,000
		Subtotal Signage & Striping				**$11,000**
	Drainage					
	14	54" RCP Trunkline	1,100	lf	$400.00	$440,000
	15	8' x 6' RCB Trunkline		lf	$985.00	
	16	24" RCP Leads	324	lf	$95.00	$30,780
	17	Precast Junction Boxes		ea	$18,000.00	
	18	Type "A" Manholes	4	ea	$7,750.00	$31,000
	19	Inlets	8	ea	$6,125.00	$49,000
	20	Outfalls	1	ea	$55,000.00	$55,000
	21	Cement Stabilized Backfill	1,871	cy	$70.00	$130,970
	22	Cement Stabilized Backfill (Inlet or MH)	99	cy	$70.00	$6,930
		Subtotal Drainage				**$743,680**
	Landscaping					
	23	Hydromulch/Seeding	0.4	ac	$5,000.00	$2,000
	24	Fertilizer	0.4	ac	$1,000.00	$400
	25	Compost Manufactured Topsoil	3,611	sy	$1.50	$5,417
	26	Permanent Seeding (Broadcast)	3,611	sy	$0.50	$1,806
	27	Straw	3,611	sy	$0.50	$1,806
	28	Vegetative Watering	0.1	mg	$28.50	$2.85
		Subtotal Landscaping				**$11,431**
	Traffic					
	29	Detour Pavement	-	sy	$110.00	-
	30	Traffic Control	1	ls	$16,500.00	$16,500
		Subtotal Traffic				**$16,500**
	Traffic Signals					
	31	Traffic Signals	1	ea	$200,000.00	$200,000
		Subtotal Traffic Signals				**$200,000**
					Subtotal Paving & Improvements	**$1,963,547**
STRUCTURES	**Structures**					
	32	Almeda/UPRR Bridge (90' Wide)	148,500	sf	$110.00	$16,335,000
	33	Sims Bayou Bridge (90' Wide)	-	sf	$93.50	-
	34	Holmes Bridge (90' Wide)	108,000	sf	$110.00	$11,880,000
	35	Retaining Walls	50,000	sf	$77.00	$3,850,000
	36	Retailing Wall Embankment CSBE	27,778	cy	$57.00	$1,583,346
		Subtotal Structures				**$33,648,346**
					Subtotal Structures	**$33,648,346**
		KIRBY ROAD (SECTION 2) SUBTOTAL				**$35,730,862**
		Contingency - 20%				$7,146,172
		Engineering - 10%				$4,287,703
		ROW Acquisition				$728,400
		KIRBY ROAD (SECTION 2) CONSTRUCTION TOTAL				**$47,893,138**

APPENDIX 5

KIRBY DR PHASE III - NICHOL WOODS TO BELTWAY 8

		Item/Description	Quantity		Rate $	Total $
DEMOLITION & REMOVAL	**Street/Paving Demolition**					
	1	Clearing New ROW	85.75	sta	$6,275.00	$538,081
	2	Remove Existing Concrete Road	-	sy	$10.00	-
	3	Remove Existing Asphalt Pavement	8,776	sy	$10.00	$87,756
		Subtotal Street/Paving Demolition				**$625,837**
	Environmental					
	4	SWPPP	1	ls	$55,000.00	$55,000
		Subtotal Environmental				**$55,000**
					Subtotal Demolition & Removal	**$680,837**
PAVING & IMPROVEMENTS	**Paving**					
	5	Roadway Excavation	25,000	cy	$10.00	$250,000
	6	Roadway Embankment	5,000	cy	$13.00	$65,000
	7	8-Inch Stabilized Subgrade Preparation	66,028	sy	$7.00	$462,193
	8	Type "B" Lime (36#/SY)	1,188	tons	$265.00	$314,820
	9	11-Inch Reinforced Concrete Pavement	62,883	sy	$85.00	$5,345,083
	10	6-Inch Concrete Curb	34,300	lf	$8.00	$274,400
	11	Sidewalk (6')	13,129	sy	$70.00	$919,053
	12	Pipeline Zero Load Slabs	2	ea	$165,000.00	$330,000
		Subtotal Paving				**$7,960,549**
	Signage & Striping					
	13	Permanent Signing/Pavement Markings	1	ls	$44,000.00	$44,000
		Subtotal Signage & Striping				**$44,000**
	Drainage					
	14	54" RCP Trunkline	8,575	lf	$400.00	$3,430,000
	15	8' x 6' RCB Trunkline		lf	$985.00	
	16	24" RCP Leads	1,620	lf	$95.00	$153,900
	17	Precast Junction Boxes		ea	$18,000.00	
	18	Type "A" Manholes	20	ea	$7,750.00	$155,000
	19	Inlets	40	ea	$6,125.00	$245,000
	20	Outfalls	-	ea	$55,000.00	-
	21	Cement Stabilized Backfill	14,151	cy	$70.00	$990,570
	22	Cement Stabilized Backfill (Inlet or MH)	495	cy	$70.00	$34,650
		Subtotal Drainage				**$5,009,120**
	Landscaping					
	23	Hydromulch/Seeding	3.9	ac	$5,000.00	$19,500
	24	Fertilizer	3.9	ac	$1,000.00	$3,900
	25	Compost Manufactured Topsoil	19,056	sy	$1.50	$28,583
	26	Permanent Seeding (Broadcast)	19,056	sy	$0.50	$9,528
	27	Straw	19,056	sy	$0.50	$9,528
	28	Vegetative Watering	0.5	mg	$28.50	$14.25
		Subtotal Landscaping				**$71,053**
	Traffic					
	29	Detour Pavement	-	sy	$110.00	-
	30	Traffic Control	1	ls	$110,000.00	$110,000
		Subtotal Traffic				**$110,000**
	Traffic Signals					
	31	Traffic Signals	4	ea	$200,000.00	$800,000
		Subtotal Traffic Signals				**$800,000**
					Subtotal Paving & Improvements	**$13,994,722**
STRUCTURES	**Structures**					
	32	UPRR Bridge (90' Wide)	-	sf	$110.00	-
	33	Sims Bayou Bridge (90' Wide)	-	sf	$93.50	-
	34	Holmes Bridge (90' Wide)	-		$110.00	-
	35	Retaining Walls	-	sf	$77.00	-
	36	Retailing Wall Embankment CSBE	-	cy	$57.00	-
		Subtotal Structures				**-**
					Subtotal Structures	**-**
		KIRBY ROAD (SECTION 3) SUBTOTAL				**$14,675,559**
		Contingency - 20%				$2,935,112
		Engineering - 10%				$1,761,067
		ROW Acquisition				$6,383,400
		KIRBY ROAD (SECTION 3) CONSTRUCTION TOTAL				**$25,755,138**

APPENDIX 6

KIRBY DR PHASE I, II & III

		Item/Description	Quantity		Rate $	Total $
DEMOLITION & REMOVAL	**Street/Paving Demolition**					
	1	Clearing New ROW	215.50	sta	$6,275.00	$1,352,263
	2	Remove Existing Concrete Road	9,000	sy	$10.00	$90,000
	3	Remove Existing Asphalt Pavement	28,776	sy	$10.00	$287,756
		Subtotal Street/Paving Demolition				**$1,730,018**
	Environmental					
	4	SWPPP	1	ls	$155,000.00	$155,000
		Subtotal Environmental				**$155,000**
					Subtotal Demolition & Removal	**$1,885,018**
PAVING & IMPROVEMENTS	**Paving**					
	5	Roadway Excavation	75,000	cy	$10.00	$750,000
	6	Roadway Embankment	63,333	cy	$13.00	$823,329
	7	8-Inch Stabilized Subgrade Preparation	150,304	sy	$7.00	$1,052,128
	8	Type "B" Lime (36#/SY)	2,705	tons	$265.00	$716,825
	9	11-Inch Reinforced Concrete Pavement	143,147	sy	$85.00	$12,167,467
	10	6-Inch Concrete Curb	78,100	lf	$8.00	$624,800
	11	Sidewalk (6')	28,033	sy	$70.00	$1,962,287
	12	Pipeline Zero Load Slabs	10	ea	$165,000.00	$1,650,000
		Subtotal Paving				**$19,746,835**
	Signage & Striping					
	13	Permanent Signing/Pavement Markings	1	ls	$165,000.00	$165,000
		Subtotal Signage & Striping				**$165,000**
	Drainage					
	14	54" RCP Trunkline	9,675	lf	$400.00	$3,870,000
	15	8' x 6' RCB Trunkline	11,350	lf	$985.00	$11,179,750
	16	24" RCP Leads	4,050	lf	$95.00	$384,750
	17	Precast Junction Boxes	26	ea	$18,000.00	$468,000
	18	Type "A" Manholes	24	ea	$7,750.00	$186,000
	19	Inlets	100	ea	$6,125.00	$612,500
	20	Outfalls	1	ea	$55,000.00	$55,000
	21	Cement Stabilized Backfill	30,342	cy	$70.00	$2,123,940
	22	Cement Stabilized Backfill (Inlet or MH)	1,238	cy	$70.00	$86,660
		Subtotal Drainage				**$18,966,600**
	Landscaping					
	23	Hydromulch/Seeding	10	ac	$5,000.00	$47,500
	24	Fertilizer	10	ac	$1,000.00	$9,500
	25	Compost Manufactured Topsoil	47,889	sy	$1.50	$71,833
	26	Permanent Seeding (Broadcast)	47,889	sy	$0.50	$23,944
	27	Straw	47,889	sy	$0.50	$23,944
	28	Vegetative Watering	1	MG	$28.50	$37.05
		Subtotal Landscaping				**$176,759**
	Traffic					
	29	Detour Pavement	5,141	sy	$110.00	$565,473
	30	Traffic Control	1	ls	$346,500.00	$346,500
		Subtotal Traffic				**$911,973**
	Traffic Signals					
	31	Traffic Signals	7	ea	$200,000.00	$1,400,000
		Traffic Signals				**$1,400,000**
					Subtotal Paving & Improvements	**$41,367,168**
STRUCTURES	**Structures**					
	32	UPRR Bridge (90' Wide)	148,500	sf	$110.00	$16,335,000
	33	Sims Bayou Bridge (90' Wide)	47,250	sf	$93.50	$4,417,875
	34	Holmes Bridge (90' Wide)	108,000	sf	$110.00	$11,880,000
	35	Retaining Walls	57,000	sf	$77.00	$4,389,000
	36	Retailing Wall Embankment CSBE	31,667	cy	$57.00	$1,805,019
		Subtotal Structures				**$38,826,894**
					Subtotal Structures	**$38,826,894**
		KIRBY ROAD SUBTOTAL				**$82,079,080**
		Contingency - 20%				$16,415,816
		Engineering - 10%				$9,849,490
		ROW Acquisition				$15,760,200
		KIRBY ROAD CONSTRUCTION TOTAL				**$124,104,586**

APPENDIX 7

COLLECTOR STREET						
Street		Location	Serving	Type	ROW	Length	Cost
1	Clearview Circle Extension	Extension between Main Street and Willow Bend	Mixed Park and Open spaces	Proposed Collector	80	2,963	$1,795,578
2	Collector Street	Between W Belfort Street and Holmes Rd	Mixed Use	Proposed Collector	80	6,178	$3,743,868
3	Willow Bend Extension	Extension between Ground Fountain Dr and Buffalo Speedway	Mixed Use	Proposed Major Collector	80	2,588	$1,568,328
4	Grand Fountain Dr Extension	Extension between Buffalo Speed way and Proposed Collector	Mixed Use	Proposed Collector	80	2,000	$1,212,000
5	Collector Street	Extension between Fannin Speedway and Holmes Rd	SFR	Proposed Collector	80	3,115	$1,887,690
6	Collector Street	Extension between SH 288 and Reed Rd	SFR	Proposed Collector	80	4,805	$2,911,830
7	Collector Street	Extension between Kirby and W Orem	SFR	Proposed Collector	80	2,000	$1,212,000
						Construction	$14,331,294
						Engineering & Contingency (30%)	$4,299,388
						TOTAL	**$18,630,682**

APPENDIX 8

BIKE & TRAILS					
	Street	Location	Type	Length	Cost
1	Kirby Shared Use Path	From 610 to Main	10-foot Shared Use Path	6,100	$2,883,900
				Construction	$2,883,900
				Engineering & Contingency (35%)	$1,009,365
				TOTAL	**$3,893,265**

APPENDIX 9

SIDEWALK & SIGNS						
	Street	Location	Serving	Type	Length/Qty	Cost
2	Westridge St	Between Kirby and Main	Mult-Family, NRG, Mixed Use	10-foot sidewalk both sides	7,200	$1,647,000
				Dynamic Sign (Arrows for thru & turn lanes)	1	$100,000
1	Murworth Dr	Between Kirby and Main	Mult-Family, NRG, Mixed Use	10-foot sidewalk both sides	5,675	$1,298,156
				Dynamic Sign (Arrows for thru & turn lanes)	1	$100,000
3	McNee	(no proposed work)				
4	Lantern	Between McNee and Westridge	Mult-Family, NRG, Mixed Use	10-foot sidewalk both sides	4,600	$1,052,250
				Dynamic Sign (Arrows for thru & turn lanes)	1	$100,000
					Construction	$4,297,406
					Engineering & Contingency (35%)	$1,504,092
					TOTAL	**$5,801,498**

APPENDIX 10

Coyle Street Reconstruction - Milby to Cullen	Cost
Paving	$1,500,000
Drainage	$400,000
Water	$253,750
Wastewater	$149,000
Mobilization, TCP, SWPPP, Permits, Signing & Striping	$500,000
Total	$2,802,750
Construction + Contingency (20%)	$3,363,300
Engineering (15%)	$504,495
TOTAL	**$3,867,795**

APPENDIX 11

Milby Street Rehabilitation - Gulf Freeway to Bell	Cost
Paving: Mill & Overlay & Utility Trench Restoration	$810,000
Sidewalk & Curb	$250,000
Water	$382,500
Mobilization, TCP, SWPPP, Permits, Signing & Striping	$300,000
Total	$1,742,500
Construction + Contingency (20%)	$2,091,000
Engineering (15%)	$313,650
TOTAL	**$2,404,650**

APPENDIX 12

Hussion Street & Drainage - Coyle to Leeland	Cost
Paving	$1,000,000
Drainage	$300,000
Mobilization, TCP, SWPPP, Permits, Signing & Striping	$500,000
Total	$1,800,000
Construction + Contingency (20%)	$2,160,000
Engineering (15%)	$324,000
TOTAL	**$2,484,000**

APPENDIX 13

Cullen Boulevard Utility Improvements - Gulf Freeway to Leeland	Cost
Paving	$500,000
Water	$351,250
Wastewater	$203,350
Mobilization, TCP, SWPPP, Permits, Signing & Striping	$500,000
Total	$1,554,600
Construction + Contingency (20%)	$1,865,520
Engineering (15%)	$279,828
TOTAL	**$2,145,348**

APPENDIX 14

Leeland Street Utility Improvements - Miller to Milby	Cost
Paving	$100,000
Wastewater	$194,500
Mobilization, TCP, SWPPP, Permits, Signing & Striping	$300,000
Total	$594,500
Construction + Contingency (20%)	$713,400
Engineering (15%)	$107,010
TOTAL	**$820,410**

APPENDIX 15

Keating Street & Drainage - Leeland to Clay	Cost
Paving	$500,000
Drainage	$200,000
Mobilization, TCP, SWPPP, Permits, Signing & Striping	$500,000
Total	$1,200,000
Construction + Contingency (20%)	$1,440,000
Engineering (15%)	$216,000
TOTAL	**$1,656,000**

APPENDIX 16

Polk Street Sidewalk Improvements - Milby to Cullen	Cost
Sidewalk & Curb	$270,000
Mobilization, TCP, SWPPP, Permits, Signing & Striping	$200,000
Total	$470,000
Construction + Contingency (20%)	$564,000
Engineering (15%)	$84,600
TOTAL	**$648,600**

APPENDIX 17

Leeland Street Sidewalk Improvements - Milby to Sidney	Cost
Sidewalk & Curb	$140,000
ADA Ramps	$10,000
Mobilization, TCP, SWPPP, Permits, Signing & Striping	$200,000
Total	$350,000
Construction + Contingency (20%)	$420,000
Engineering (15%)	$63,000
TOTAL	**$483,000**

APPENDIX 18

Leeland Street Sidewalk Improvements - Ernestine to Lockwood	Cost
Sidewalk & Curb	$100,000
ADA Ramps	$15,000
APS Push Button Improvements	$50,000
Mobilization, TCP, SWPPP, Permits, Signing & Striping	$300,000
Total	$465,000
Construction + Contingency (20%)	$558,000
Engineering (15%)	$83,700
TOTAL	**$641,700**

APPENDIX 19

Leeland/UPRR Rail Grade Separation		Cost
**20% TIP Match*	**TOTAL**	***$10,000,000**

APPENDIX 20

Ernestine Street & South Lockwood Drive Multimodal Project - Gulf Freeway to Leeland	Cost
Paving: Patch Repairs	$150,000
Multimodal Signing & Striping & Bike Lane Curbs	$230,000
Mobilization, TCP, SWPPP, Permits	$300,000
Total	$680,000
Construction + Contingency (20%)	$816,000
Engineering (15%)	$122,400
TOTAL	**$938,400**

APPENDIX 21

Pease Street & Drainage - Hussion to Keating	Cost
Paving	$400,000
Drainage	$170,000
Mobilization, TCP, SWPPP, Permits, Signing & Striping	$350,000
Total	$920,000
Construction + Contingency (20%)	$1,104,000
Engineering (15%)	$165,600
TOTAL	**$1,269,600**

APPENDIX 22

Jefferson Street & Drainage - Milby to Keating	Cost
Paving	$500,000
Drainage	$170,000
Mobilization, TCP, SWPPP, Permits, Signing & Striping	$350,000
Total	$1,020,000
Construction + Contingency (20%)	$1,224,000
Engineering (15%)	$183,600
TOTAL	**$1,407,600**

APPENDIX 23

Tharp Street & Drainage - Milby to Hussion	Cost
Paving	$300,000
Drainage	$100,000
Mobilization, TCP, SWPPP, Permits, Signing & Striping	$350,000
Total	$750,000
Construction + Contingency (20%)	$900,000
Engineering (15%)	$135,000
TOTAL	**$1,035,000**

APPENDIX 24

Winchester Street & Drainage - Milby to Hussion	Cost
Paving	$300,000
Drainage	$100,000
Mobilization, TCP, SWPPP, Permits, Signing & Striping	$350,000
Total	$750,000
Construction + Contingency (20%)	$900,000
Engineering (15%)	$135,000
TOTAL	**$1,035,000**

APPENDIX 25

Harby Street Utility Improvements - Eastwood to Ernestine	Cost
Paving	$150,000
Wastewater	$109,000
Mobilization, TCP, SWPPP, Permits, Signing & Striping	$300,000
Total	$559,000
Construction + Contingency (20%)	$670,800
Engineering (15%)	$100,620
TOTAL	**$771,420**